

requirements for bending and permitted number of conductors; edges welded and ground smooth. Leaving interior fillets; galvanized after fabrication; gasketed covers; stainless steel screws; factory painted with gray enamel. Gaskets to be factory made or an approved type.

2. Interior Junction or Pull Boxes:
  - a. Code gauge sheet steel construction, rust resistant zinc coating, with full access screwed on covers and cadmium plated or galvanized machine screws, minimum size per the governing electrical code; barriers for required separation; special configuration, where determined from field measurements to surmount structural conditions. For flush mounting, extend covers 3/4" beyond edge of boxes.
  - b. Factory Finish: Wash and phosphate undercoat. ANSI 49 gray enamel paint for NEMA 1, ANSI 61 gray polyester powder finish for NEMA 3R and 12.
- B. Knockout Closures and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts, offset connectors, of types and sizes, to suit respective installation requirements and applications.

## **PART 3 - EXECUTION**

### **3.1 CONDUIT**

- A. Use rigid steel conduit up to 6", or intermediate steel conduit up to 4": Exposed on exterior; encased in exterior masonry or concrete; in wet locations; where conduit is routed exposed within 7' of floor or walking surfaces.
- B. Use rigid or intermediate steel conduit, or electric metallic tubing up to 4" for: Dry concealed locations; where conduit is routed exposed above 7' from floor or walking surfaces; including but not limited to mechanical rooms, in electrical and telephone rooms at all heights.
- C. For Underground Installations:
  1. Below the building, use rigid or intermediate steel, or Schedule 80 PVC conduit, unless otherwise noted. Provide rigid or intermediate steel conduit elbows (2" minimum above floor) for stub-ups and risers. Mandrel conduits before slabs are poured. Route conduit to avoid column footings and foundations.
  2. Outside the building footprint, use rigid intermediate steel or Schedule 40 PVC, encase in a concrete envelope of rectangular cross section not less than 3" beyond any surface of conduit. Where steel conduit extends above grade from concrete encasement, paint conduit with two coats of bitumastic paint for 12" minimum on both sides of junction with concrete. Use precast concrete or plastic separators to secure uniform spacing between conduits of 2". Concrete to have 2,500 psi minimum compressive strength at 28 days. Reinforce envelope with No. 4 rebar rods at four corners parallel to conduit run with 1" concrete cover and with No.3 ties on 2 foot centers (minimum). For runs over 150', provide bends with a minimum radius of ten times the internal radius of the conduit. Ball mandrel conduit. Equip conduit with end bells for termination in manholes. Slope conduit away from building and towards manholes or pull boxes with slope of 3" per 100'. Submit sections and details.
  3. Unless otherwise noted wrap all underground steel conduit by one of the following methods before encasing in concrete, or routing in non-corrosive soil below the building slab.
    - a. Factory wrap with one-half lap of twenty mil thick identified polyvinyl tape to provide uniform forty mil coating. Field taped joints shall provide equivalent coating.
    - b. Factory coat with forty mil thick PVC coating bonded to conduit. Coating on couplings shall extend beyond coupling ends for one conduit diameter up to 1-1/2".
    - c. Extend wrap for 12" minimum where conduit emerges from ground.
  4. Provide factory made sweeps and elbows for nonmetallic conduit.

### **3.2 INSTALLATION OF RACEWAYS**

- A. Deliver raceways and wireways to the site in standard lengths, and store where continuously protected from moisture and weather.

- B. Conduit sizes on the drawings are minimum, sized for copper conductors, for normal dimension insulation. Unless otherwise noted, use 3/4" trade size minimum. Increase sizes where required by physical conditions, or conductor insulation. Do not combine runs without written approval. Allow for grounding conductor.
- C. In the building conceal conduit from view above ceilings. Coordinate with Architectural Sections and Details.
- D. Conduit may be exposed to view in shop and utility areas and where indicated. Install all conduit runs parallel with or perpendicular to structural members. Surmount obstructions by use of bends, offsets, and where necessary with junction and pull boxes. For surface mounted outlets and small junction boxes within 7' of floor, use cast boxes and/or conduit bodies.
- E. Cut conduits and raceways square and free of burrs. Ream conduit ends and clean conduits before pulling conductors.
- F. Cap open ends of conduits with approved manufactured conduit seals until ready to pull in conductors.
- G. Where conduits or wireways cross expansion or seismic joints, provide approved expansion fittings, or combinations of fittings, which allow deflection in directions equivalent to twice the movement allowed in the structural design. For conduits 1-1/4" trade size or smaller, 18" length minimum of liquidtight flexible steel conduit, slack mounted may be used.
- H. For bends and offsets in conduit, use large radius factory fittings, or bend with a hydraulic bender meeting the NEC (or CEC) requirements. Replace all flattened, deformed or kinked conduit.
- I. Route raceways and wireways so as to prevent insulated conductors from being subjected to high ambient temperature conditions. Maintain the Following Minimum Clearances:
 

Crossing noninsulated pipe or duct	- 3 inches
Crossing insulated pipes or ducts	- 1 inch
Parallel to noninsulated pipes or ducts	- 3 feet
Parallel to insulated pipes or ducts	- 6 inches
- J. Provide No. 14 AWG black iron pull wire or polyethylene or nylon pull rope in all empty conduits and stubs over 10' in lengths, extending at least 12" beyond conduit. Pull rope tensile strength to be 240 pounds up to 1-1/2" conduit and 800 pounds for larger conduit.
- K. Secure rigid or IMC conduits to panelboards, interior pull boxes, and junction boxes with locknuts, inside and out, and provide impact resistant plastic, insulated throat or malleable iron bushings at terminations in pull boxes, and junction boxes. Zinc insulated throat hubs with "O" ring gaskets may be used in lieu of double locknut and bushing. For EMT, provide insulated throat connectors secured with locknut on interior of box or enclosure. Use approved couplings or unions. Running thread, threadless coupling, or split coupling connections are not permitted.
- L. Field thread rigid and IMC conduit to conform to American Standard Pipe Threads tapered for the entire length at 3/4 inch/foot. Treat threads with protective coating to prevent corrosion, but maintain electrical continuity.
- M. For underground steel conduit, coat joints and points where wrenches have been applied, with bitumastic paint.
- N. Where conduit extending into building from site enters occupied level, slope conduits to drain away from building, and seal penetration to prevent entrance of moisture into building.
- O. Where crossing existing pavement, place conduit under pavement by approved jacking method. Keep jack pits 2' clear of edge of pavement. Do not undermine paving with excessive water. If jacking cannot be accomplished, obtain Architect's permission in writing to cut and patch paving.
- P. When forming bends in nonmetallic conduit, apply heat without distorting or discoloring conduit.

### **3.3 INSTALLATION OF JUNCTION BOXES AND FITTINGS**

- A. General: Install electrical boxes and fittings in accordance with manufacturer's written instructions, applicable requirements of the Code and NECA's "Standard of Installation," and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate installation of electrical boxes and fittings with conductors, and raceway installation work.
- C. Install boxes in readily accessible locations.
- D. Taps and splices, where permitted by these specifications within exterior junction boxes, shall be performed with an encapsulating watertight splice or tap kit which insulates and moisture seals the connection. Kit shall consist of the appropriate size and type mold, encapsulating resin and end sealing tape.
- E. Subsequent to installation of boxes, protect boxes from construction debris and damage.
- F. Provide additional pull or junction boxes as required to meet code requirements or to facilitate pulling of wires. Locate in utility areas or above accessible ceilings.
- G. Size boxes for the number of wires passing through or terminating therein, but not less than 4" square by 1 1/2" deep. Use pull and junction boxes of adequate size for splices and terminations contained therein.
- H. Use cast metal, gasketed boxes for locations as follows: Surface mounted boxes within 7' of the floor; wet or corrosive locations. Provide threaded plugs in unused hubs.
- I. Install boxes in a rigid manner, with box hangers, expansion shields in masonry, and machine screws on metal work. Do not nail to structure. Use plated or galvanized screws throughout.
- J. Secure pull and junction boxes to the structure independently of the conduits by means of bolts, rod hangers or brackets.

### **3.4 ADJUSTING AND CLEANING**

- A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

END OF SECTION



**SECTION 260543**  
**UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Division 01 specification sections.

**1.2 SUMMARY**

- A. This section describes the components and work related to underground electrical site distribution, including pullboxes and duct banks.
- B. Coordinate this work with the other underground site utilities, existing and new.

**1.3 RELATED APPLICABLE SECTIONS**

- A. Section 260502, BASIC ELECTRICAL REQUIREMENTS.
- B. Section 260505, MANUFACTURERS.
- C. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- D. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
- E. Section 260553, IDENTIFICATION FOR ELECTRICAL SYSTEMS.
- F. Section 260593, TESTING AND CERTIFICATION.
- G. Division 31 – Earthwork (Trenching and Backfilling).
- H. Division 32 – Exterior Improvements: Concrete work.

**1.4 SUBMITTALS**

- A. Submit manufacturer's product data for the following:
  - 1. Precast concrete pullboxes and hand holes.

**1.5 QUALITY ASSURANCE**

- A. Comply with code requirements of the authority having jurisdiction, as applicable to the installation and construction of underground electrical work.

**PART 2 - PRODUCTS**

**2.1 CONCRETE PULL BOXES AND HAND HOLES**

- A. Precast Concrete Pull Boxes Outside Building, Branch Circuiting: Where not otherwise noted or detailed, provide bottomless units with bolt down steel traffic cover, outside dimensions 1" by 22" by 24" deep minimum. Provide minimum 12" depth of crushed rock or pea gravel below boxes for drainage. Mark covers "Lighting".

- B. Hand Holes (Grounding System): 10" round (I. D.) cast traffic box with cast iron or galvanized steel cover.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Determine exact location of each pullbox after careful consideration has been given to location relevant to other utilities, grading, and paving. Do not begin installation until the location of each pullbox has been reviewed by the Architect/Engineer, including the Civil Engineer.
- B. Set pull boxes on 6" deep gravel or sand bed, flush with paving in paved areas, with paving sloping away from pull boxes. In unpaved areas locate boxes so that runoff water will not drain to pull box. Set cover 2" above finished grade and provide 6" thick by 12" wide concrete apron around box, sloping away from cover.
- C. Caulk between all sections of pullboxes and coat exteriors with weatherproof compound.

#### **3.2 DUCT BANK**

- A. Form all duct banks in square or rectangular fashion, and place concrete so that voids around conduits are filled.
- B. Adjust final slopes on-site to coordinate with utilities and structure.
- C. Install on undisturbed soil where possible. Use pit run gravel and sand, placed in 8 inch lifts and compacted for backfill.
- D. After installation, clean and swab ducts.
- E. Provide black iron pullwires or nylon pull ropes in spare conduits. Cap empty conduits with screw covers.
- F. Label conduit at stub-up and manhole penetrations in accordance with Section 260504, ELECTRICAL IDENTIFICATION.
- G. Refer to Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS, for additional information.

END OF SECTION

**SECTION 260923  
LIGHTING CONTROL DEVICES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections.

**1.2 SUMMARY**

- A. The types of lighting control devices specified in this section include time switches, photocells, contactors, relays.
- B. Refer to other Division 26 sections for wires/cables, raceways, electrical boxes, fittings, and wiring devices required in conjunction with lighting control devices to perform work of this section.

**1.3 OTHER APPLICABLE SECTIONS**

- A. Section 260502, BASIC ELECTRICAL REQUIREMENTS.
- B. Section 260505, MANUFACTURERS.
- C. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
- D. Section 260933, CENTRAL DIMMING CONTROLS
- E. Section 260943: NETWORK LIGHTING CONTROLS.

**1.4 SUBMITTALS**

- A. Submit manufacturer's Product Data for the specified lighting control devices.

**1.5 QUALITY ASSURANCE**

- A. Codes Compliance: Components and installation shall comply with NFPA 70 "National Electrical Code:.
- B. NEMA Compliance: Comply with applicable requirements of NEMA's standards pertaining to lighting control devices.
- C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to lighting control devices. Provide products and components listed and labeled by UL.

**PART 2 - PRODUCTS**

**2.1 PHOTOCCELL CONTROL**

- A. Conformally coated cadmium sulfide photocell. UV-Resistant, high impact, polypropylene cover with clear UV-stabilized window. Meeting ANSI color-coded standards. ABS high temperature base crosslinked polyethylene weatherproof seal.
- B. Turn-On: Nominal 1 footcandle. Turn-On, Turn-Off Ratio: 1:5. Rated life of 5,000 operations minimum at rated load of 1800 VA HID or 1000 watt tungsten. Temperature range of minus 40°F to +158°F. Voltage range of 105-285V.

- C. Mount to a 3 pole locking receptacle, in a polycarbonate housing that incorporates a 1/2" pipe thread for securing to a cast weatherproof box. Maximum line voltage of 480V. Load rated at 15A maximum, tungsten or HID.
- D. UL listed and/or recognized. CSA certified.
- E. Use with double throw electrically-held relays for operation of mechanically-held relays and contactors. Locate relay module in a NEMA 3R enclosure on roof in conjunction with photocell, or adjacent to associated time switch.

## 2.2 TIME SWITCHES

- A. General: Type, voltage, and with number of poles indicated; heavy duty, self-starting, high torque, synchronous motors, 20A, tungsten rated contacts at 277V. Manual bypass switch for each pole, accessible without opening door or externally mounted, which does not disturb automatic settings. Spring driven reserve to operate clock for 10 hours minimum on power failure and automatically rewind on power restoration. Terminal strip for No. 10 AWG wire minimum, dead front with door open. Set On-Off trips based on an Owner approved schedule. List time switch, load controlled and On-Off times. Include schedule in Operating and Maintenance Manual.
- B. For control of exterior lights on photocell: Seven Day Calendar Type: 6-1/2" minimum dial. Accuracy of plus or minus 15 minutes, integral hand-off automatic control, accessible, without opening cover, or externally mounted, for each circuit, ON-OFF trippers with minimum one hour on period and two hours between consecutive OFF and ON operation.
- C. For Control of Exterior Lighting and Signs (where not Photocell Controlled) and Where Noted: 24-hour, astronomic dial. One to six day skip operation. Sunset ON, adjustable OFF, in one-half hour increments. Set for city of use.
- D. For Control of Mechanically-Held Contactors: Double throw contacts.
- E. For Control of Mechanically-Held Contactors in Parallel with Other Control Devices: Double throw, momentary contacts, rated for 120A inrush at 120V.
- F. Where solid-state switching is employed, isolate time switch circuit from loads being switched, per manufacturer's instructions.
- G. Engraved micarta nameplate to indicate clock designation and load controlled.
- H. Wiring diagrams govern installation.

## 2.3 CONTACTORS AND RELAYS

- A. For Remote Control of Lighting Circuits (unless Otherwise Specified): UL listed, mechanically-held, electrically operated, momentarily energized, single solenoid, relays and/or contactors of indicated ratings, operating independently of gravity or switch position, positive locking in both positions, manual operation without tools, manual operating lever for ratings 60A and above. For branch circuit control, use 20A rated relays with required number of poles. Where controlled by two wire device such as photocell, provide SPDT, module integral with relay or contactor. Install on sound absorbing shock mounts in switchboards, panels, or where individually mounted. Designation "LC".

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install the lighting control devices according to the manufacturer's written instructions.



### **3.2 GROUNDING**

- A. Provide equipment grounding connections for lighting control devices. Tighten connectors to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

### **3.3 PROTECTION**

- A. Protect installed components from damage. Replace damaged items prior to final acceptance.

### **3.4 FIELD QUALITY CONTROL**

- A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices, and demonstrated compliance with requirements. Operate each operable device at least six times.

### **3.5 CLEANING**

- A. The Contractor shall remove all paint spatters and other spots, dirt and debris from the equipment. Clean equipment and devices internally and externally using methods and materials recommended by the manufacturers.

END OF SECTION



**SECTION 265600  
EXTERIOR LIGHTING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections.

**1.2 SUMMARY**

- A. The section includes, but is not limited to providing area lighting fixtures, poles and standards, trenching, backfill and required concrete work.
- B. High-intensity discharge (HID):
  - 1. Metal halide.
- C. Applications of lighting poles and standards specified in this section include the following:
  - 1. Vehicle parking lots.
  - 2. Pedestrian walkways.

**1.3 OTHER APPLICABLE SECTIONS**

- A. Section 260502, BASIC ELECTRICAL REQUIREMENTS.
- B. Section 260505, MANUFACTURERS.
- C. Section 260519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
- D. Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- E. Section 260533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
- F. Division 31 Section, EARTHWORK (TRENCHING AND BACKFILLING).
- G. Division 32 – Exterior Improvements: Concrete work.

**1.4 SUBMITTALS**

- A. Submit shop drawings, samples, and prototypes as specifically instructed herein and as follows:
  - 1. Submit fixture shop drawings in booklet form with a separate sheet for each fixture, assembled in "luminaire type" alphabetical or numerical order, with proposed fixture and accessories clearly indicated on each sheet.
  - 2. Manufacturer's dimensioned scale drawings showing in complete detail, the fabrication of all electrical pole standards, arms, and hardware including overall and detail dimensions, finishes, metal thickness, type, fabrication methods, support method, hinges, gaskets, wind loading, wire/cable connections, and all other information to show compliance with the Contract Documents.
  - 3. Manufacturer's dimensioned scale drawings showing in complete detail, the fabrication of all lighting fixtures including overall and detail dimensions, finishes, gauge of metal, fabrication methods, support method, ballasts, transformers, sockets, type of shielding, reflectors, trims, hinges, gaskets, provisions for relamping, and all other information to show compliance with the Contract Documents.
  - 4. Test Data: Submit certified test data and reports including photometric data prepared by an independent testing laboratory developed according to methods of the Illuminating Engineering Society of North America.

5. Operating and Maintenance Data: Submit parts list for each lighting fixture, and accessory, "trouble-shooting" maintenance guide, and final approved shop drawings, in accordance with the general requirements of Division 01.
  6. Submit with shop drawings, for the electronic ballasts, a certified test report for the electronic ballasts, from an independent test laboratory illustrating conformance with the specified requirements.
  7. Submit evidence, with shop drawings from the electronic ballast supplier, of three projects of significant magnitude, employing the proposed ballasts, in satisfactory operation for a minimum of one year. Identify projects, operating personnel familiar with the ballast performance, and frequency of ballast failure.
  8. Structural calculations and details for concrete pole bases as specified.
- B. Samples:
1. Partial pole standard samples may be requested for any or all of the fixtures specified.
  2. Submit for approval samples requested by the Architect or Engineer when and where directed, and the components tagged with the name of the project. Samples will not be returned. Allow two weeks from the date of receipt for thorough examination and review by the Architect and Engineer.
  3. All samples require a submission of material finish samples and component approval to be reviewed prior to shipment of any material to the project.
  4. Fixtures and electrical pole standards under this contract shall be identical with the approved sample. No fixtures or portions or parts of the electrical pole standard used as a sample will be allowed to be installed on the project.
  5. In the event the samples are not approved, the samples will be returned to the Contractor. Provide a resubmittal of the electrical pole standards samples that complies with the contract requirements.
  6. All costs associated for samples are to be borne by the Contractor. No additional cost to the Owner for samples or mock-ups will be allowed.
- C. Wiring Diagrams: Submit wiring diagrams for electrical poles and standards showing connections to electrical power panel feeders, switches, and controllers. Differentiate between portions of electrical wiring which are manufacturer-installed and portions which are field-installed.
- D. Shop drawings and samples requested shall be submitted for approval before fabrication. Any material produced prior to the approval of shop drawings or samples, and not in conformance with the Contract Documents, shall be disapproved with the Contractor bearing full responsibility and cost.
- E. When required and requested by the Architect or Engineer, samples submitted per above shall be subjected to thermal, mechanical, electrical, or water testing at an independent test laboratory, at no expense to the Owner.
- F. No deviation from the general arrangement and details indicated on the drawings shall be made on the shop drawings unless required to suit the actual conditions on the premises, and then only with the written acceptance of the Architect. All deviations must be clearly marked as such on the drawings submitted for approval.
- G. Manufacturers not listed must be pre-qualified prior to bid. For approval of all electrical pole standards substitutions, the fabricator shall comply to specifications herein and as outlined below:
1. Manufacturer shall have not less than 5 years experience in design and manufacture of lighting fixtures and pole standards of the type and quality shown. Pre-qualification submissions must include a list of completed projects and dated catalogue pages and drawings indicating length of experience.
  2. Manufacturer shall also submit a prototype sample of each fixture and a partial prototype sample of each pole standard for review by the Architect and Engineer. Prototype samples shall be sufficiently detailed to allow evaluation of compliance with the salient features of the specification. Preliminary design or shop drawings shall not be accepted in place of prototype samples.

3. Printed physical, electrical, and technical data clearly highlighted to show the differences between the proposed substitutions and the specified electrical pole standards.
4. Photometric information in IES standard format on a CD.
5. Point by point lighting calculations of areas affected by proposed substitution.
6. The Architect and Engineer shall determine whether the prototype sample complies with the specifications and shall reserve the right to disqualify any proposed substitutions.

## **1.5 QUALITY ASSURANCE**

- A. **Manufacturer's Qualifications:** Firms regularly engaged in the manufacture of light fixtures and electrical poles and standards of types and sizes required, whose products have been satisfactorily used in similar service for not less than 5 years.
- B. **Installer's Qualifications:** Firms with at least 5 years of successful installation experience with projects utilizing electrical poles and standards similar to that required for this project.
- C. **Codes and Standards:**
  1. **Electrical Code Compliance:** Comply with applicable local code requirement of the authority having jurisdiction and NEC Articles 220, 225, 250, 410, and 501 as applicable to installation, and construction for electrical poles and standards.
  2. **UL Compliance:** Comply with UL standards, including UL 486A and 486B, pertaining to electrical poles and standards. Provide lighting components and fittings which are UL listed and labeled.
  3. **ANSI/ASTM Compliance:** Comply with applicable requirements of ANSI C2, "National Electrical Safety Code," pertaining to construction and installation of lighting poles and standards.
  4. **AASHTO Compliance:** Comply with applicable requirements of American Association of State Highway and Transportation Officials Standard LTS-1; "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals."
  5. **NEMA Compliance:** Comply with NEMA Stds Pub/No's. LE 2 and TT 1 pertaining to electrical pole and standard units, materials, and installation.
  6. **IES Compliance:** Comply with applicable IES RP-8, 19, 20 and PB-15 pertaining to exterior, parking, and roadway lighting practices and fixtures."

## **1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. Deliver lighting fixtures and electrical pole and standard products, and fittings in factory-fabricated containers or wrapping, which properly protect products from damage.
- B. Store lighting fixtures and electrical pole and standard products and fittings in original cartons in well-ventilated space protected from moisture, construction traffic, and debris.
- C. Handle lighting fixtures and electrical pole and standard products carefully to prevent breakage, denting, and scoring finish. Do not install damaged units or components; replace with new.

## **1.7 SEQUENCING AND SCHEDULING**

- A. Coordinate with other electrical pole work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of electrical pole and standard work with other work.
- B. Sequence electrical pole and standard installation work with other work to minimize possibility of damage and soiling during remainder of construction period.

## **PART 2 - PRODUCTS**

### **2.1 LIGHTING FIXTURES, GENERAL**

- A. Provide a complete parking area lighting system, wired, assembled and operable, including lighting equipment and accessories as shown on the drawings, described in the fixture schedules, specified herein and covered by allowance. Accessories include sockets, holders, reflectors, ballasts, and diffusers.
- B. Fixtures to be factory prewired and preassembled. Catalog numbers are given for manufacturers' identification. Conform to written descriptive requirements governing material and fabrication, either in the general or specific sections. Where catalog numbers are indicated as modified, no modification will be required if the standard unit fully conforms to all descriptive requirements in the specifications and conforms with specified ceiling construction.
- C. Fixtures of the same type to be of one manufacturer and of identical finish and appearance.
- D. Provide adequate lamp shielding, proper ventilation and heat dissipation.
- E. Secure diffusers by devices not requiring tools for removal, or for relamping. Provide safety chain attachment to fixture housing for portions of fixtures which are removed for servicing or relamping.
- F. General Construction:
  - 1. Sheet Metal: Free of tool marks and dents. Painted after punching and forming to eliminate exposed unpainted edges. Intersections and joints formed true, sufficiently rigid to prevent distortion after assembly.
  - 2. Aluminum Surfaces, Nonreflecting: Anodized clear or with color as indicated.
  - 3. Aluminum Reflectors: Treat with alzak process to provide permanent reflective surface of 85% minimum. Extruded reflectors to be unscored, bright dipped and clear anodized.
- G. Lighting Fixture Description: Refer to the schedule on the drawings, or in the specifications, and to General Requirements in other paragraphs herein for full fixture description.
- H. All parking area lighting fixtures to be UL listed for wet locations.

## **2.2 HIGH INTENSITY DISCHARGE FIXTURES**

- A. Provide porcelain, screw type mogul sockets with nickel plated brass shells, silicone prelubricated, UL listed at 600V, 1500 watts, securely fastened to fixture body to prevent twisting or rocking of socket when lamping or relamping.
- B. For exterior use, where not otherwise specified, provide integral constant wattage, weatherproof, minus 20°F rated, high power factor ballasts complete with automotive type fuses in plastic fuse holders, wired into primary circuit. Where specified, provide integral luminaire construction, utilizing core and coil units, to provide same performance.
- C. Where fixtures are indicated to be connected to emergency circuits, provide a standby quartz iodine lamp for temporary illumination until HID lamp restrikes.
- D. Conform with ballast guarantee requirements of Section 260502, BASIC ELECTRICAL REQUIREMENTS.
- E. Provide ballast compatible with specified lamps and so certify.

## **2.3 MARKING OF FIXTURES**

- A. Fixtures shall be marked with the operating voltage.

## **2.4 LAMPS**

- A. General: Unless specified otherwise herein, furnish and install lamps for each fixture of type and wattage indicated on drawings or other section of the specification, compatible with specified ballast. For fixtures on exterior or in cold locations, use lamps suitable for 0°F start.
- B. Metal Halide: Phosphor coated, pulse start technology, incorporating a protective arc tube shroud design and UV shield. Universal burning. Unless otherwise described in the lighting fixture schedule on the drawings, provide the following for use in open or enclosed fixtures:

<u>Wattage</u>	<u>Base</u>	<u>ANSI Designation</u>	<u>Initial Lumens</u>	<u>Life Hours</u>
100	Medium/Mogul	M90	8,100	15,000
150	Medium/Mogul	M102	13,500	15,000
175	Medium/Mogul	M137	16,600	15,000
250	Mogul	M138	23,800	15,000
400	Mogul	M135	40,000	20,000

**2.5 AREA LIGHTING LUMINAIRES AND POLE STANDARDS**

- A. Complete installation including poles, anchor bolts, luminaries, lamps, ballasts, wiring as detailed and/or specified, mounted on reinforced concrete bases.
- B. Exterior pole mounted fixtures to withstand minimum lateral load of 30 lbs/s.f. of exposed surface. Certify conformance on shop drawings.
- C. Pole selection shall be based on a 100mph wind load, with a 1.3 gust factor for the effective projected area (EPA) of the application.
- D. Poles for exterior fixtures to be round tapered steel (unless otherwise detailed or specified), 11 gauge minimum, height as indicated, with welded steel baseplate, four galvanized anchor bolts, eight nuts and washers and hand hole with cover. Poles to be galvanized and field painted to match fixture. Painting to conform with Division 09 - FINISHES section of specifications.
- E. Stainless steel or nonferrous hardware throughout on exterior fixtures.
- F. Grounding lugs on pole mounted fixtures.
- G. Acrylic diffusers on exterior of high heat resistance type. When used with H.I. D. lamps include an ultraviolet absorber to limit yellowing index change to +0.5 after 4000 hours exposure to 400 watt lamp.
- H. For poles exceeding 12 feet in height, provide structural calculations for the concrete base to enforcing authority and obtain approval.
- I. The concrete pole base shall be designed by a professional structural engineer who is hired by the contractor to insure that the pole base meets AASHTO requirements of 100 mph wind load with a 1.3 gust factor.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine areas and conditions under which pole standards, equipment, and components are to be installed, and substrate which will support equipment. Notify Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

**3.2 INSTALLATION OF AREA LIGHTING**

- A. Install pole and standard units and products in accordance with manufacturer's written instructions, applicable requirements of NEC, NESC, and NEMA standards, and with recognized industry practices to ensure that area lighting equipment fulfill requirements.
- B. Utilize belt slings or rope (not chain or cable) to protect finishes when raising and setting finished poles and standards.
- C. Set poles and standards plumb. Support adequately during backfilling, or when anchoring them to the foundations.
- D. Provide sufficient space encompassing hand access and cable entrance holes for installation of underground cabling and conduit.
- E. Fasten electrical lighting fixtures and brackets securely to structural supports, including poles/standards; and ensure that installed fixtures are plum and level.
- F. 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 486B, and the National Electrical Code.

### **3.3 GROUNDING**

- A. Provide equipment grounding connections for poles and standards. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounding.
- B. Refer to Section 260526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS, for additional requirements.

END OF SECTION



## **SECTION 311000 SITE CLEARING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
1. Protecting existing vegetation to remain.
  2. Removing existing vegetation.
  3. Clearing and grubbing.
  4. Stripping and stockpiling topsoil.
  5. Removing above- and below-grade site improvements.
  6. Disconnecting, capping or sealing site utilities.
  7. Temporary erosion- and sedimentation-control measures.

#### **1.2 MATERIAL OWNERSHIP**

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

#### **1.3 PROJECT CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Architect/Engineer and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed traffic ways if required by Architect/Engineer or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- D. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Foot traffic.
  4. Erection of sheds or structures.
  5. Impoundment of water.
  6. Excavation or other digging unless otherwise indicated.
  7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section 312000 "Earth Moving."

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

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  1. Restore damaged improvements to their original condition, as acceptable to Architect/Engineer.

#### **3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### **3.3 TREE AND PLANT PROTECTION**

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect/Engineer.

#### **3.4 EXISTING UTILITIES**

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  1. Notify Architect/Engineer not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Architect's written permission.

#### **3.5 CLEARING AND GRUBBING**

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

1. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
  2. Use only hand methods for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

### **3.6 SITE IMPROVEMENTS**

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction. The existing AC can be peeled up and removed for recycling and used as aggregate base, or it can be ground up, stockpiled, and incorporated into the subgrade.

### **3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Architect/Engineer's property.
- B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

**END OF SECTION**



## **SECTION 312000 EARTH MOVING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
  2. Excavating and backfilling for buildings and structures.
  3. Drainage course for concrete slabs-on-grade.
  4. Subbase course for concrete walks.
  5. Subbase course and base course for asphalt paving.
  6. Excavating and backfilling for utility trenches.

#### **1.2 DEFINITIONS**

- A. Backfill: Soil material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect/Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect/Engineer. Unauthorized excavation, as well as remedial work directed by Architect/Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

### **1.3 QUALITY ASSURANCE**

- A. Pre-excavation Conference: Conduct conference at Project site.

### **1.4 PROJECT CONDITIONS**

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- B. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

## **PART 2 PRODUCTS**

### **2.1 SOIL MATERIALS**

- A. The clean sands encountered in the borings may be difficult to moisture condition and compact. Close monitoring of the soil moisture content and proper choice of compaction equipment should help mitigate problems with moisture sensitive soils. Specifically, the soil's moisture content should be kept to within two percent of the optimum moisture content as determined by ASTM D1557. It is recommended that rubber-tired or steel roller type compaction equipment be utilized.
- B. Import soil used as fill should be equal to or better than onsite soil in strength, expansion, and compressibility characteristics. Generally, import material should be free of organic matter and other deleterious substances, have 100% passing a two inch sieve, 50% to 90% passing a #4 sieve, no more than 20% passing a #200 sieve, and an Expansion Index less than 20. Import soil will not be prequalified by the geotechnical engineer. Comments on the characteristics of import soil will be given after the material is on the project, either in place, or stockpiled in adequate quantity to complete the project.
- C. Base Course: Crushed aggregate base compacted to a minimum of 95% of maximum dry density per ASTM D 1557.

### **2.2 ACCESSORIES**

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.

- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### **3.2 EXCAVATION, GENERAL**

- A. **Unclassified Excavation:** Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

### **3.3 EXCAVATION FOR STRUCTURES**

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. **Excavations for Footings and Foundations:** Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. **Excavations at Edges of Tree- and Plant-Protection Zones:**
  - 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### **3.4 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### **3.5 EXCAVATION FOR UTILITY TRENCHES**

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. **Clearance:** 12 inches each side of pipe or conduit.
- C. **Trench Bottoms:** Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.
- D. **Trenches in Tree- and Plant-Protection Zones:**
  - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### **3.6 SUBGRADE INSPECTION**

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect/Engineer, without additional compensation.

### **3.7 UNAUTHORIZED EXCAVATION**

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2,500 psi, may be used when approved by Architect/Engineer.
  1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect/Engineer.

### **3.8 STORAGE OF SOIL MATERIALS**

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### **3.9 UTILITY TRENCH BACKFILL**

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete".
- D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."
- E. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
  1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.



### **3.10 SOIL FILL**

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.

### **3.11 SOIL MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### **3.12 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

### **3.13 GRADING**

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1/2 inch.
  - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

### **3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS**

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
  - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
  - 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

### **3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE**

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### **3.16 FIELD QUALITY CONTROL**

- A. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- B. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect/Engineer.
- C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### **3.17 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

**3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off site.

**END OF SECTION**



**SECTION 312315  
SITE EARTHWORK AND BUILDING EXCAVATION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Site earthwork preparation.
- B. Excavation for building foundations within building area.
  - 1. Building Area: Areas indicated on Drawings, plus 10 feet minimum beyond footing lines, including covered walks.
- C. Excavation for site structures.

**1.2 REFERENCES**

- A. ASTM D 1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.
- B. AQMD – South Coast Air Quality Management District, Local Regulations, Rule 403 for Fugitive Dust.

**1.3 GENERAL REQUIREMENTS**

- A. Existing Conditions: Contractor shall examine site of Work and verify existing conditions under which work will be performed, including known subsurface conditions.
- B. Drainage and Pumping: Maintain excavations and site free from water throughout work. Run surface water or seepage to sumps with float-switch controlled pumps. Pump to drainage system as approved by Architect.
- C. Protection: Provide and maintain protection to retain earthbanks and protect adjoining existing monuments, grades and structures from caving, sliding, erosions or other damage and suitable forms of protection against bodily injury or property damage.
- D. Provide barricades and berms at top of slopes to prevent water from flowing over top
- E. Borrow. Fill, backfill, aggregate base, and other soil materials obtained from off-site sources shall be sampled and tested in compliance with CA EPA Department of Toxic Substances Control recommendations to prevent the importation of contaminated materials to the Site.
  - 1. Testing Frequency
    - a. For borrow up to 1,000-cu.yrd, conduct 1 test for each 250-cu.yrds.
    - b. For borrow between 1,001- and 5,000-cu.yrd; conduct 4 tests for first 1,000-cu.yrd, if material tests acceptable, conduct 1 test for each additional 500-cu.yrds.
    - c. For borrow over 5,000-cu.yrds, conduct 12 tests during import of first 5,000-cu.yrd, if material tests acceptable, conduct 1 test for each additional 1,000-cu.yrds.
  - 2. Owner's Testing Laboratory shall take samples at source, conduct testing and evaluate test results prior to delivery.
  - 3. Conduct tests for lead and other heavy metals, asbestos, PCB's, pesticides, herbicides, VOCs, and semi-VOCs.
  - 4. When detectable quantities of hazardous materials are found, determine the risk to human health, the environment, or both using the DTSC Preliminary Endangerment Assessment Guidance Manual.
  - 5. Do not import soils that exhibit a known risk to human health, the environment, or both.

## **1.4 FIELD CONDITIONS**

- A. Geotechnical Investigation Report has been prepared under direction of Owner. Geotechnical Investigation Report is hereby referenced as information for Work of this Section. Architect assumes no responsibility for conclusions Contractor may draw, from information provided. Contract Documents take precedence over recommendations that may be contained in Geotechnical Investigation Report and Contractor must obtain approval for deviations from Contract Documents. Copy of the Geotechnical Investigation Report is available at Architect's office.
- B. Verify that survey benchmark and intended elevations for Work are as indicated.

## **PART 2 PRODUCTS**

Not Used

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Examine entire site including subsurface conditions.
- B. Identify required lines, levels, contours and datum.
- C. Identify known underground, above ground and aerial utilities. Stake and flag locations. Replace as necessary throughout construction operations.
- D. Notify utility company to remove and relocate utilities where required for construction operations.
- E. Protect above and below grade utilities that are to remain.
- F. Protect plant life, lawns and other features remaining as portion of final landscaping.
- G. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- H. Repair or replace property damaged by Work of this Section.
- I. Commencement of Work means acceptance of existing conditions.

### **3.2 SITE EARTHWORK**

- A. Conform to Section 311000 for clearing requirements.
- B. Subexcavate and remove loose existing soils to depths recommended by Geotechnical Engineer.
- C. Loose fill and natural on-site soils acceptable to Geotechnical Engineer may be stockpiled for subsequent use as fill material.
- D. After clearing and removal of loose fill, Geotechnical Engineer will inspect exposed surfaces, before commencing further earthwork operations.
- E. After sub-excavating existing soils, Geotechnical Engineer will inspect exposed surfaces. Before commencing further earthwork operations, verify elevations and line. Elevations shall be within 0.2 foot of required.

- F. Correct unauthorized over excavation at no cost to Owner.
- G. Notify Geotechnical Engineer of unexpected subsurface conditions and discontinue affected work until notified to resume work.
- H. Unless otherwise recommended in Geotechnical Report scarify exposed surface to depth of 6 inches. Bring to optimum moisture content and recompact to minimum 90 percent of maximum dry density per ASTM D1557.
- I. Place approved fill in 8 inch or less lifts, each lift with optimum moisture content and compacted to minimum 95 percent of maximum dry density per ASTM D 1557.
- J. Bring fill to elevations indicated on structural drawings or to those indicated on grading plans. Elevations shall be within 0.1 foot of required.
- K. Backfill holes, voids or depressions caused by earthwork operations with identical fill and compaction standards.
- L. Completed earthwork to determine suitability of exposed soils, will be inspected by Geotechnical Engineer, including cuts, fills and earth bank slopes (cut or fill).

### **3.3 BUILDING AREA PREPARATION**

- A. Within building area and to distance of 20 feet beyond exterior footings or covered walks, remove and recompact existing soils to a depth a depth of 10 feet, and in the Education building area and to a distance of 25 feet, remove and recompact existing soils to a depth a depth of 15 feet, as recommended by the Geotechnical Engineer.
- B. Geotechnical Engineer will inspect exposed surfaces. Additional unsuitable soil, as approved by Geotechnical Engineer shall be removed.
- C. Scarify exposed surface to depth of 6 inches. Bring to optimum moisture content and recompact to 95 percent of maximum dry density per ASTM D 1557.
- D. Add approved fill to required subgrade elevation in 8 inch maximum lifts. Bring to optimum moisture content and compact to 95 percent of maximum dry density per ASTM D1557.
- E. Fill: As specified in Section 312000 Earth Moving and as approved by Geotechnical Engineer.

### **3.4 EXCAVATION FOR FOUNDATIONS**

- A. Underpin adjacent structures that may be damaged by excavation work, including utilities, pipes and electrical undergrounding. Protect existing monuments, grades and improvements of any kind. Remove all obstructions to Work.
- B. All footings should rest upon at least 5 feet of properly compacted fill material or a thickness equal to the footing width, whichever is greater. Excavate subsoil to elevations required to accommodate building foundations, slabs-on-grade, construction operations, forms, forms removal and inspection. Sub-excavate existing soils to depths recommended by Geotechnical Engineer.
  - 1. Side forms in foundation excavations may be omitted where earth remains firm with no cave-in providing one inch is added to footing width for each form removed.
  - 2. Finish subgrade to a tolerance of 0.05 foot within required elevations for subgrade.
- C. Machine slope banks. Earth banks shall be sloped to 1-1/2 (horizontal) to 1 (vertical). Tops of earth banks shall be level to distance of 5 feet minimum from existing structures and 5 feet minimum behind construction barricades adjacent to driveways.
- D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Hand trim excavation. Remove loose matter. Machine tamp bottom of excavation.
- G. Remove lumped subsoil, boulders and rock up to any size encountered. Totally remove abandoned pipes and utilities found in excavations. Cap or plug both ends of pipes and conduits to provide complete seal with concrete plugs, threaded caps or other approved methods.
- H. Notify Geotechnical Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- I. Correct over-excavation as recommended by Geotechnical Engineer.
- J. Correct areas over-excavated by error by filling with specified concrete.
- K. Stockpile approved excavated material in area designated on site and remove excess material not being reused from site.
- L. Bulkheads and shoring shall conform to Title 8, California Code of Regulations, Construction Safety Orders.
- M. Maintain excavations free of water throughout operations. Run surface water or seepage to sumps or drainage system.

### **3.5 FIELD QUALITY CONTROL**

- A. Provide for visual inspection of bearing surfaces by Geotechnical Engineer. Do not proceed with concrete placement without approval of Geotechnical Engineer.

### **3.6 SEASONAL LIMITS**

- A. No fill material shall be placed, spread or rolled while it is frozen or thawing or during unfavorable weather conditions. When Work is interrupted by heavy rain, fill operations shall not be resumed until field tests by Geotechnical indicate that moisture content and density of fill are as previously specified.

### **3.7 PROTECTION**

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing or excessive water inundation.

**END OF SECTION**



## **SECTION 312317 TRENCHING**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Excavate trenches for utilities.
- B. Compacted bedding.
- C. Backfilling and compaction to required elevations.
- D. Slurry concrete.
- E. Thrust Blocks.

#### **1.2 REFERENCES**

- A. ASTM C150 - Portland Cement.
- B. ASTM C494 - Chemical Admixtures for Concrete.
- C. ASTM D1557 - Laboratory compaction characteristics of soil using modified effort.
- D. SSPWC - Standard Specifications for Public Works Construction, Latest Edition.
- E. California Code of Regulations, Title 8, Industrial Relations, Construction Safety Orders, Division 01, Chapter 4, Sub-Chapter 4, Article 6 Excavations.
- F. California Public Contract Code, Section 7104 - Public Works Contracts for Digging Trenches or Excavations; Notice on Discovery of Hazardous Waste or Other Unusual Conditions; Investigations; Change Orders; Effect on Contract.
- G. California Labor Code, Section 6705 - Public Works Contracts requiring detailed plans for shoring, bracing, sloping, indicating protection from caving ground for trenching work in excess of 5' deep and contract amounts stipulated therein.

#### **1.3 QUALITY ASSURANCE**

- A. Verify survey benchmark and intended elevations for Work.
- B. Borrow. Fill, backfill, aggregate base, and other soil materials obtained from off-site sources shall be sampled and tested in compliance with CA EPA Department of Toxic Substances Control recommendations to prevent the importation of contaminated materials to the Site.
  - 1. Testing Frequency
    - a. For borrow up to 1,000-cu.yd, conduct 1 test for each 250-cu.yrds.
    - b. For borrow between 1,001- and 5,000-cu.yrd; conduct 4 tests for first 1,000-cu.yrd, if material tests acceptable, conduct 1 test for each additional 500-cu.yrds.
    - c. For borrow over 5,000-cu.yrds, conduct 12 tests during import of first 5,000-cu.yrd, if material tests acceptable, conduct 1 test for each additional 1,000-cu.yrds.
  - 2. Owner's Testing Laboratory shall take samples at source, conduct testing and evaluate test results prior to delivery.
  - 3. Conduct tests for lead and other heavy metals, asbestos, PCB's, pesticides, herbicides, VOCs, and semi-VOCs.

4. When detectable quantities of hazardous materials are found, determine the risk to human health, the environment, or both using the Department of Toxic Substances Control (DTSC) Preliminary Endangerment Assessment Guidance Manual.
5. Do not import soils that exhibit a known risk to human health, the environment, or both.

#### **1.4 SOILS INFORMATION**

- A. Geotechnical Investigation has been prepared under direction of Owner. Investigation is hereby referenced as information for Work of this Section. Architect assumes no responsibility for conclusions Contractor may draw from information provided. The Contract Documents take precedence over recommendations that may be contained in the Investigation and the contractor must obtain approval for any and all deviations from the Contract Documents. Copy of investigation is available at Architect's office.

### **PART 2 PRODUCTS**

#### **2.1 FILL AND BEDDING MATERIALS**

- A. Sand: Sand shall consist of natural or manufactured granular material, or a combination thereof, free of deleterious amounts of organic material, mica, loam, clay and other substances not suitable for the purpose intended. Conform to Subsection 200-1.5.5, SSPWC, for gradation as required for Portland Cement Concrete, sand must achieve compaction of a minimum 90 percent.
- B. Imported Fill: Granular, free of debris, no gravel larger than 3 inches in any dimension, non-expansive, approved by the Architect prior to placement on the site.
- C. Slurry Concrete:
  1. Slump: Between 4 inches and 6 inches.
  2. Aggregate: 40 percent sand by weight, 60 percent pea gravel, minimum 1/4 inch, maximum 5/8 inch.
  3. Portland Cement: ASTM C150
  4. Admixture: Calcium Chloride free, in proportions not to exceed the manufacturer's recommendations.
  5. Artificial Coloring: ASTM C494. Mix in Mapico Red pigment, proportions as recommended by the manufacturer, L.M. Scofield or equal.
- D. Stockpiled Fill: Onsite soils, stored separately on the site, approved for re-use by the Geotechnical Engineer.
- E. Thrust Blocks: Concrete per Section 320523.

#### **2.2 ACCESSORIES**

- A. Underground Warning Tape: Metallic Detection Tape, aluminum core, 6 inches wide AASHTO specification colors, by Safety Sign Company, Cleveland, OH, or equal.
- B. Color Coding and Lettering: as required for type of underground utility.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify fill material to be reused is acceptable to the Geotechnical Engineer.

### **3.2 PREPARATION**

- A. Identify required lines, levels, contours and datum.
- B. Backfill with approved fill and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Prior to commencement of trenching operations, notify Underground Service Alert of Southern California (800) 422-4133, Monday through Friday, 7:00 A.M. to 5:00 P.M.

### **3.3 EXCAVATION**

- A. Conform to Construction Safety Orders, Title 8, CCR, For Sloping, Benching, Shoring, Bracing, Protective Systems, and Shafts.
- B. Conform to Section 7104, Public Contract Code. Promptly notify Owner of any contact with hazardous materials or differing conditions.
- C. Conform to Section 6705, Labor Code. Provide shoring and bracing plan or other provisions intended to prevent caving ground.
- D. Excavate subsoil required for utilities. Trenches shall be level or parallel to finish grade unless designated on drawings to be installed to specific gradient.
- E. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.
- F. Water, storm drainage piping located in the same trench shall be separated by 12 inches horizontally and vertically, and water line shall be placed on a solid shelf excavated on one side of the common trench. Cross-over water lines shall also be separated 12 inches vertically from storm drainage pipe.
- G. Water and sewer piping shall not be located in the same trench and they shall be separated by 12 inches horizontally and 12 inches vertically.
- H. Excavation shall not interfere with normal 45 degree bearing splay of foundations. Parallel trenches, no closer than 18 inches from building foundations.
- I. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- J. Remove lumped subsoil, boulders and rock.
- K. Correct unauthorized excavation.
- L. Stockpile approved excavated material in area designated on site and remove excess material not being used from site.

### **3.4 BEDDING**

- A. Support pipe and conduit during placement and compaction of bedding fill. Provide uniform bearing along entire length. Conform to Section 306, SSPWC.
- B. Bedding: Place and compact materials in continuous layers not exceeding 6 inches compacted depth, ASTM D1557.

### **3.5 BACKFILLING**

- A. Backfill trenches to contours and elevations with unfrozen materials.
- B. Fill areas will be inspected, tested and approved by Geotechnical Engineer.

- C. Soil Fill over Bedding: Place and compact material in continuous layers as scheduled, compacted to ASTM D1557.
- D. Employ placement method that does not disturb or damage conduit, ducts or piping in trench.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density. When operations are interrupted by rain, do not resume Work until field tests indicate that moisture content and density of fill are as previously specified.
- F. Remove surplus backfill materials from site and dispose legally.
- G. Leave fill material stockpile areas completely free of excess fill materials.
- H. Minimum Cover over Piping, Conduits or Duct Banks: 24 inches.
- I. Lay out and install or otherwise confirm invert elevations of all gravity flow systems to avoid conflict with other sub-surface structures or utilities of any kind. Adjust elevations or layout of pipes, conduits or duct banks to permit the required gravity flow.
- J. Jetting for utility trenching compaction may be used outside building perimeter and only when recommended by Geotechnical Engineer, in accordance with Section 306 SSPWC.
- K. Pressurized piping shall be installed level, or shall be installed parallel to finish grades unless designated on the Drawings to be installed to specific gradients.

### **3.6 THRUST BLOCKS**

- A. Install at turns of water lines and as indicated in EWMD standard drawings.

### **3.7 TOLERANCES**

- A. Top Surface of Backfilling Under Paved Areas: 0.2 ft from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 0.2 ft from required elevations.

### **3.8 FIELD QUALITY CONTROL**

- A. Backfill materials and operations will be inspected and approved by Geotechnical Engineer including earth bank slopes (cut or fill).
- B. Tests, analysis and compaction of fill material will be performed in accordance with ASTM D1557.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- D. Frequency of Tests: Geotechnical Engineer may make as many tests as are necessary to ensure specified results.

### **3.9 PROTECTION OF FINISHED WORK**

- A. Protect finished Work.
- B. Recompact fills subjected to vehicular traffic.

### **3.10 TEMPORARY PROTECTION OF UNFINISHED WORK**

- A. Trenching for placement of underground utilities shall be covered and protected with steel trench plates during non-work hours. Adequate warnings and protection indication of open trenches during work hours must be provided for project safety.

### 3.11 SCHEDULE

- A. Storm and Sanitary Piping:
1. Bedding Fill: Sand, minimum thickness below piping 0.4 times outside diameter of pipe but no less than 4 inches. Minimum thickness above top of piping, 12 inches, compacted to 90 percent.
  2. Cover with stockpiled fill in 8-inch lifts to specified subgrade elevations, compact to 90 percent or to 95 percent under vehicle traffic-supporting paved areas.
  3. Fill: Slurry concrete, 6" cover at top, bottom and sides of pipes at exterior paved areas (at vehicle traffic) where minimum fill cover is less than 12" below finished elevation of paving.
  4. Bury warning tape marked "Caution Sewer Line" 12 inches above all concrete-encased piping. Align tape parallel to and within 3 inches of the centerline of the piping.
- B. Power Ducts: Concrete Encased
1. Fill: Slurry concrete, 3 inches cover at top, bottom, between conduits and sides of duct bank.
  2. Fill: Slurry concrete, 6 inches cover at top, bottom and sides of duct bank conduit at exterior paved areas where minimum fill cover is less than 24" below finished elevation of paving, less than 12" below finished elevations of interior floor slabs and at building footings where conduit is in the footing structural splay.
  3. Install two No. 4 bars in slurry concrete at top of bank under paved areas, minimum 3 inch concrete cover.
  4. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or to 95 percent under traffic-supporting paved areas.
  5. Bury warning tape marked "Caution Buried High Voltage Line" 12 inches above all concrete-encased duct banks. Align tape parallel to and within 3 inches of the centerline of the duct bank.
- C. Water Piping and Gas Piping:
1. Bedding Fill: Sand, minimum thickness below piping 0.4 times outside diameter of pipe but not less than 4". Minimum thickness above top of piping, 6 inches, compacted to 90 percent.
  2. Fill: Slurry concrete, 6 inches cover at top, bottom and sides of pipes at exterior paved areas where minimum fill cover is less than 24" below finished elevation of paving, and less than 12" below finished elevations of interior floor slabs and at building footings where piping is in the footing structural splay.
  3. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
  4. Observe joints at pressure tests.
  5. Bury warning tape marked "Caution Buried Gas (or "Pipeline") Line" 12 inches above all trenching. Align tape parallel to and within 3 inches of the centerline of trench.
- D. Fire Lines:
1. Bedding Fill: Manufactured Sand, minimum 6" thickness under piping, minimum thickness above top of piping and sides, 6", compact to 90 percent.
  2. Fill: Slurry concrete, 6" cover at top pipes at exterior paved areas where minimum fill cover is less than 24" below finished elevation of paving.
  3. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
  4. Bury warning tape marked "Caution Buried Pipeline" 12 inches above all trenching. Align tape parallel to and within 3 inches of the centerline of trench.

- E. Low Voltage Conduits and Communications: Direct Burial Minimum trench depth 36 inches.
1. Bedding Fill: Sand, 6 inches at bottom, sides and 12 inches on top, compacted to 95 percent.
  2. Cover with stockpiled fill in 6-inch lifts to specified subgrade elevation, compact to 90 percent, or 95 percent under traffic-supporting paved areas.
  3. Bury warning tape marked "Caution Buried Communication Line Below" 12 inches above conduits. Align tape parallel to and within 3 inches of the centerline of conduits.

**END OF SECTION**

## **SECTION 315000 EXCAVATION SUPPORT AND PROTECTION**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section includes temporary excavation support and protection systems.

#### **1.2 PERFORMANCE REQUIREMENTS**

- A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
  - 1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

#### **1.3 SUBMITTALS**

- A. Shop Drawings: For excavation support and protection system.

#### **1.4 QUALITY ASSURANCE**

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

#### **1.5 PROJECT CONDITIONS**

- A. Survey Work: Engage a qualified land surveyor or professional Architect/Engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
  - 1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect/Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS**

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.
- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.
- E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- A. **Sheet Piling:** Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.
- B. **Bracing:** Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
  - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect/Engineer.
  - 2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
  - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### **3.2 REMOVAL AND REPAIRS**

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
  - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.

**END OF SECTION**



**SECTION 320523**  
**CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Cast-In-Place concrete pedestrian paving and sidewalks.
- B. Curbs and gutters.
- C. Concrete stairs, ramps and landings.
- D. Light standard bases, fence post bases, flagpole bases and similar site structures.
- E. Utility concrete pads.
- F. Perimeter concrete curbing, mow strips, concrete drainage structures, swales.
- G. Thrust Blocks.

**1.2 REFERENCES**

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary, 2003 Edition.
- C. ASTM A185 - Steel Welded Wire Reinforcement, Plain, for Concrete.
- D. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- E. ASTM C33 - Concrete Aggregates.
- F. ASTM C94 - Ready-Mixed Concrete.
- G. ASTM C150 - Portland Cement.
- H. ASTM C171 - Sheet Materials for Curing Concrete.
- I. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- J. ASTM C920 - Elastomeric Joint Sealants.
- K. ASTM C979 - Pigments for Integrally Colored Concrete.
- L. ASTM C1107 - Packaged Dry, Hydraulic - Cement Grout (Non-Shrink).
- M. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete, Paving and Structural Construction.
- N. California Code of Regulations Title 24 Part 1 and 2
- O. CBC - 2007 California Building Code and Supplements
  - 1. CBC-11 – CBC Chapter 11B, Accessibility Requirements for Public Buildings, Public Accommodations, Commercial Facilities and Publicly Funded Housing
  - 2. CBC-17 – CBC Chapter 17, Structural Testing and Special Inspections
  - 3. CBC-19 – CBC Chapter 19[A], Concrete
- P. CACRM - California Access Compliance Reference Manual, updated July 1, 2008 and based on 2007 California Building Code.

### **1.3 SUBMITTALS**

- A. Placement Schedule for approval: Provide details or sketches showing location of each placement of concrete Work. Do not deviate from location of expansion joints or score lines.
- B. Product data on joint filler, sealants, curing compounds and reinforcing.
- C. Project Record Documents
  - 1. Accurately record actual locations of embedded sleeves, utilities and components that are concealed from view.
- D. Submit Certification of experience for Color Stain finisher.

### **1.4 REGULATORY REQUIREMENTS**

- A. CACRM - California Access Compliance Reference Manual, updated July 1, 2008, based on the 2007 California Building Code, CBC Sections 1133B.7.1.1, 1133B.7.2.

### **1.5 QUALITY ASSURANCE**

- A. Maintain one copy of all records on site.
- B. Acquire cement and aggregate from same source for all Work.
- C. Conform to Section 1905A.13, California Building Code, when placing concrete during hot weather.
- D. Conform to Section 1905A.12, California Building Code, when placing concrete during cold weather. No placement of concrete permitted below 50 degrees Fahrenheit.
- E. Mock-up
  - 1. Install minimum 5 feet by 5 feet mock-up of concrete sidewalk for each surface treatment specified.
  - 2. Install mock-up one month prior to installation.
  - 3. Locate as approved by the Architect.
  - 4. Use identical forming system, sub-grade type, reinforcing, expansion joints, score joints, finishing and edge trim as specified for installation.
  - 5. Architect approval required.
  - 6. Mock-up may not be used in final installation.
  - 7. Remove mock-up materials from site and dispose legally.

### **1.6 EXTENDED WARRANTY**

- A. Manufacturer shall warrant prefabricated detectable warning texture products against failure in materials or workmanship for at least the specified warranty periods. Upon written notice from Owner manufacturer shall promptly, without cost, and with least practicable inconvenience to Owner correct such defects.
  - 1. Failures include, but are not limited to, significant degradation in color fastness, conformation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly.
    - a. Significant degradation means that product loses 10 percent or more of its approved design characteristics, as determined by the authority having jurisdiction.
  - 2. Minimum Warranty Period: 5 years from date of Certified Completion.

## **PART 2 PRODUCTS**

## 2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150 - Type I - Normal or Type II - Moderate, Portland Cement type, from one manufacturing plant only.
- B. Aggregates: ASTM C33, single source for all materials. Maximum size aggregate: 1 inch.
- C. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 4,000 psi in 24 hours and 7,500 psi in 7 days unless otherwise indicated on Drawings; of consistency suitable for application and a 30 minute working time.

## 2.2 ACCESSORIES

- A. Expansion Joints:
  - 1. Expansion Joint Filler - ASTM D1751: Close cell bituminous saturated fiberboard, 1/2 inch max. thick; FIBER EXPANSION JOINT manufactured by American Highway Technology, Kankakee, IL, W. R. Meadows, or approved equal.
  - 2. Joint Devices: Integral extruded polystyrene plastic; 1/2 inch max. thick, with removable top strip exposing sealant trough; JOINT CAPS.
  - 3. Sealant: Polyurethane two-component type, self-leveling, for level surface application, UREXPAN NR-200 or DYNATRED for sloped surfaces, manufactured by Pecora Corp., Harleysville PA, or equal. Color shall be selected by Architect from manufacturer's standard list of colors.
  - 4. Primer: As recommended by sealant manufacturer.
  - 5. Joint Backing: ASTM C1330, Cylindrical, Type C, closed cell, polyethylene backer rod; oversized 30 to 50 percent larger than joint width. Green Rod by Nomaco Inc. or equal.
- B. Slip Resistant Finish: Dry shake type aluminum oxide abrasive grains, hardness No. 9 on Mohr's scale; Emery Non-slip, manufactured by Dayton Superior, Kansas City, KS, Emery Aggregate manufactured by Oregon Emery Co., Halsey OR, or equal as approved in accordance with Division 01, General Requirements for Substitutions.
- C. Detectable Warning Texture: Compliance with CBC Sections 1133B.8.3 through 1133B.8.5, IRs 11B-3 and 11B-4 and the California Accessibility Reference Manual.
  - 1. Truncated Domes: provide raised Detectable Warnings with diameter of 0.9 inch at base tapering to 0.45 inch at top, height of 0.2 inch, with center-to-center spacing of 1.67 inches and corner domes spaced at 0.896 inch from the corner edges of tile. Provide raised truncated domes in a square grid (in-line) pattern.
    - a. Truncated Dome: shall contrast visually with adjoining surfaces, light-on-dark or dark-on-light. Material used to provide contrast shall be integral part of walking surface. Warning surface shall differ from adjoining surface in resiliency or sound to cane contact.
  - 2. Detectable Warning Texture (Truncated Domes): Paver Tiles: 12 by 12 inches unless noted otherwise on drawings, with pre-formed fastener locations.
    - a. Pavers: Refer to Section 321413.

## 2.3 CONCRETE MIX

- A. Mix and deliver concrete in accordance with Section 1905A, California Building Code. Deliver concrete in transit mixers only. Mix concrete for 10 minutes minimum at a peripheral drum speed of approximately 200 feet per minute. Mix at jobsite minimum 3 minutes. Discharge loads in less than 1-1/2 hours or under 300 revolutions of the drum, whichever comes first, after water is first added.
  - 1. Design Mix:
    - a) Conform to Section 1905A.3, 2007 California Building Code for Proportioning on the basis of field experience or trial mixtures method.

2. Do not exceed 0.50 water-cement ratio by weight for floor slabs and for other concrete.
3. Quantities of Materials: Weighmaster's records not required for sitework concrete.
4. Required Strength: Minimum 2,500 psi for sitework concrete.

## **2.4 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615; 60 ksi yield grade; deformed billet steel bars, uncoated finish.
- B. Welded Wire Reinforcement: Plain type, ASTM A185; in flat sheets; uncoated finish, 6 x 6 - W4.0 x W4.0 unless otherwise note on drawings.
- C. Tie Wire: Annealed steel, minimum 16 gage size.
- D. Dowels: ASTM A615; 60 ksi yield grade, plain steel, uncoated finish.

## **2.5 FORMS**

- A. Conform to Section 1906A.1 and 1906A.2, California Building Code.
- B. Plywood Forms: APA - Medium density overlay, Group 1, Exterior, PS-1, for exposed surfaces. APA Plyform B-B, Class 1, Exterior, PS-1 for unexposed surfaces.
  1. Use flexible or curved forms for curves with a radius 100 feet or less.
- C. Lumber: Douglas Fir species, construction grade, Surfaced Lumber, with grade stamp clearly visible for smooth and straight exposed surface.
- D. Form Release Agent; commercially formulated form-release agent that will not bond with, stain or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

## **2.6 CURING MATERIALS**

- A. Polyethylene Film ASTM C171; 10 mil thick, clear, manufactured from virgin resin with no scrap or additives, manufactured by Burke-Edoco, Long Beach, CA, or equal as approved in accordance with Division 01, General Requirements for Substitutions.
- B. Water: Potable and not detrimental to concrete.
- C. Curing Compound: ASTM C309, Type 2, Class A; wax resin base, Burke Wax Emulsion White curing compound, by Burke-Edoko, Euclid Chemical Co. or equal as approved in accordance with Division 01, General Requirements for Substitutions.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify site conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in placing concrete.

### **3.2 PREPARATION**

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

- B. In locations where new concrete is doweled to existing Work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

### **3.3 PLACING CONCRETE (GENERAL)**

- A. Convey and deposit concrete in accordance with Section 1905A.9 and 1905A.10, California Building Code. Remove loose dirt from excavations.
- B. Notify Job Inspector minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and accessories are not disturbed during concrete placement.
- D. Ensure sub-base or base materials have been compacted or otherwise treated.
  - 1. Sub-base and base preparation per Section 312316 Excavation and Section 312323 for Backfilling.
  - 2. Remove unsuitable soil, backfill with clean compactable soil or approve granular material to required elevations.
  - 3. Scarify exposed natural sub-base to depth of 6 inches. Bring to optimum moisture content and re-compact to 90 percent in accordance with ASTM D 1557.
  - 4. Add approved base to required elevation in 6 inch maximum lifts. Bring to optimum moisture content and compact to 90 percent in accordance with ASTM D1557.
- E. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.
- F. Place concrete continuously between predetermined expansion joints.
- G. Do not interrupt successive placement; do not permit cold joints to occur. Avoid segregation of materials. Perform tamping and vibrating so as to produce a dense, smooth application free of rock pockets and voids. Do not use vibrators to move concrete horizontally.
- H. Do not allow concrete to fall free from any height which will cause materials to segregate. Maximum height of free fall permitted in any case: 5 feet.
- I. Defective Installation: Repair and clean at Contractor's expense all concrete damaged or discolored during construction. Where concrete requires repair before acceptance, the repair shall be made by removing and replacing entire section between joints and not by refinishing the damaged portion.
- J. Proper curing of concrete surfaces is the responsibility of the Contractor. Concrete failing to meet specified strength shall be removed and replaced.

### **3.4 ON-SITE CONCRETE SIDEWALKS, PEDESTRIAN PAVED AREAS AND RAMPS**

- A. Forms, Wood: Free from warp, with smooth and straight upper edges, surfaced one side, minimum thickness 1-1/2 inches adequate to resist springing or deflection from placing concrete.
- B. Forms, Metal: Gage sufficient to provide rigidity and strength equivalent to wood.
- C. Reinforcing Steel: #4 bars, place bars at 12 inches on center each way for sidewalks and paved areas and #4 bars for edges unless otherwise indicated on Drawings.
- D. Reinforcement: Provide welded steel wire fabric, 6 inches by 6 inches, No. 10 gage at middle of slab for sidewalks and ramps. Interrupt reinforcement at expansion joints.
- E. Concrete Placement: Dampen subgrade to retain moisture in concrete mix. Tamp and spade to consolidate concrete for entire length of pour. Strike off upper surface to specified grades.

- F. Isolation Joints: Locate at slabs abutting vertical concrete surfaces and as patterned on drawings. Install vertically, full depth of concrete with preformed joint filler recessed for plastic cap at 1/2 inch depth at top for sealant application.
  - 1. Doweled Isolation Joints at Heavy Vehicle Driveways and Parking: At abutting building foundations; provide 1/2-inch diameter smooth steel dowels 14 inches long, one end of dowel lubricated and set in capped sleeve to allow for longitudinal movement, spaced at 24 inches on center maximum, 6 inches from edges.
  - 2. Monolithic Curb and Gutter: No expansion joints required between gutter and curb face.
- G. Expansion Joints: Locate maximum 24 feet centers and as patterned on drawings. Install vertically, full depth of concrete, install preformed joint filler recessed for plastic cap at 1/2 inch depth at top for sealant application.
  - 1. Monolithic Curb and Gutter: No expansion joints required between gutter and curb face.
- H. Contraction/Crack Control Joints: At 8 feet each way at concrete paved areas, and 5 feet at sidewalks, tool joint with 1/2 inch radius, depth 1/4 the thickness of slab but not less than 1 inch deep. Refer to drawings for required design patterns.
- I. Curb Ramps: Form grooves, flush to finished surfaces, 12" wide border. Grooves at 1/4" deep, 1/4" wide and at 3/4" on centers, at 3 sides on level surface of the sidewalk. Provide patterns as indicated in drawings. Detectable Warnings at Curb Ramps per IR 11B-2 and 11B-3, 11B-4 CBC 1127B.5.7.
  - 1. Detectable warning required at ramps (non-curb) less than 1:15 (6.7% slope).
  - 2. Detectable Warnings at ramp surface and all Curb Ramps – Truncated Domes
    - a. Set Paver Truncated Dome products in full mortar bed per Section 32 14 13 Unit Pavers and as indicated on drawings.
    - a. Plastics/Composites: Cast in place plastic tiles per manufacturer's instructions and in accordance with CBC.
    - b. Form bottom edge flush and free of abrupt changes, DSA IR 11B-2.
- J. Finish:
  - 1. Screed concrete to required grade, float to a smooth, flat, uniform surface. Edge all headers to 1/2 inch radius. Edge expansion joints to 1/4 inch radius. Steel trowel to hard surface.
  - 2. Grades less than 6 percent: shall conform to Section 1133B.7.1.1. After final troweling, apply a medium broom finish transverse to centerline or direction of traffic.
  - 3. Grades exceeding 6 percent: shall conform to Section 1133B.7.1.2. After final troweling, apply a heavy broom finish transverse to centerline or direction of traffic
  - 4. Walkway grades in excess of 5 percent shall conform to requirements of Section 1133B.7.3, California Building Code.
- K. Curing: Cure surfaces utilizing one of the following methods:
  - 1. Spraying: Spray water over slab areas and maintain wet for 7 days, use burlap mats.
  - 2. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
  - 3. Apply liquid curing compound at rate of 200 SF per gallon, using power sprayer equipped with agitator. Do not apply liquid curing compound to surfaces scheduled to receive paving units of any kind.
- L. Remove expansion joint plastic caps. Prime both sides of joint and apply self-leveling sealant per Section 079200. Provide smooth concave surface.

**3.5 LIGHT STANDARD BASES, FENCE POST BASES, FLAGPOLE BASES, MISCELLANEOUS SURFACES, UTILITY PADS AND SIMILAR SITE STRUCTURES.**

- A. Forms: Suitable material and type, size, shape, quality and strength to insure construction as designed, true to line and sufficiently rigid to resist deflection during placing of concrete. Clean forms of all dirt, mortar and foreign matter before use.
- B. Reinforcement: Place accurately and hold in position, using metal chairs, spacers, metal hangers, supporting wires and other devices of sufficient strength to resist crushing under full load. Clean reinforcing steel of mortar, oil, dirt, loose mill scale loose or thick rust and coatings.
- C. Coordinate installation of conduits, cast in place items and other inserts.
- D. Finish: Grind or sack as required as determined by the Architect to produce a smooth, straight, plumb and acceptable finish without burrs or form marks. For horizontal surfaces: provide float finish.
- E. Curing: Cure surfaces utilizing one of the following methods:
  - 1. Spraying: Spray water over slab areas and maintain wet for 7 days.
  - 2. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
  - 3. Apply liquid curing compound at rate of 200 square feet per gallon, using power sprayer equipped with agitator. Do not apply liquid curing compound to surfaces scheduled to receive paving units or finish of any kind.
- F. Flagpole bases: refer to Section 107500, Flagpoles for size of footings and cast in place items supplied by that section.

### **3.6 CURB AND GUTTER, CONCRETE CURB, CONCRETE DRAINAGE STRUCTURES, AND CONCRETE SWALES.**

- A. Subgrade Preparation: Subgrade material, base material and compaction requirements as approved by the Geotechnical Engineer.
- B. Forms: Single face type required, cut to conform exactly with face batter and radius, sufficiently rigid to resist springing or deflection from concrete placement. Clean forms of all loose dirt, mortar or similar materials and apply a light coating of oil or other suitable material prior to concrete placement.
  - 1. Slip Forms: Contractor's option upon approval of the Architect.
- C. Reinforcement: Refer to drawings for size and spacing. Interrupt reinforcement at expansion joints.
- D. Concrete Placement: Dampen subgrade to retain moisture in concrete mix. Tamp and spade to consolidate concrete to entire length of pour. Strike off upper surface to specified grades. Cut drain pipes to conform to curb batter.
- E. Expansion Joints: Locate joint filler at maximum 20 foot centers. Trim off excess filler material flush to finish surface. No sealant application required.
- F. Control Joints: at 8 feet on center, tooled joints, 1/2 inch radius.
- G. Finish: Apply thin layer of mortar of 1 part portland cement to 1-1/2 parts sand to exposed faces. Trowel to a smooth and even finish with a fine hair broom applied parallel with the line of the work. Round all edges to 1/2 inch radius. No Contractor identification permitted.
- H. Curing: Cure surfaces utilizing one of the following methods:
  - 1. Spraying: Spray water over curb and gutter and maintain wet for 7 days.

2. Spread polyethylene film over areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
3. Apply liquid-curing compound at rate of 200 SF per gallon, using power sprayer equipped with agitator.

### **3.7 CONCRETE THRUST BLOCKS**

- A. Refer to Section 328423 Landscape Irrigation and drawings for locations.
- B. Installed where the irrigation main changes direction as at ells and tees and where the irrigation main terminates. Pressure tests shall not be made for a period of 36 hours following the completion of pouring of the thrust blocks. Concrete thrust blocks for supply mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.

### **3.8 TOLERANCES**

- A. Construction tolerances shall not violate dimensions, grades, slopes required by CBC for accessibility requirements. Adjust work accordingly to comply with requirements.
- B. Comply with tolerances of ACI 117 and as follows:
  1. Maximum deviation of 1/8 inch in 10 feet.
  2. Elevation: 1/4 inch (6 mm).
  3. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
  4. Surface: Gap below 10-foot- (3-m-) long, unlevelled straightedge not to exceed 1/8 inch (3 mm).
  5. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
  6. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
  7. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
  8. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
  9. Joint Spacing: 3 inches (75 mm).
  10. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
  11. Joint Width: Plus 1/8 inch (3 mm), no minus.

**END OF SECTION**



## **SECTION 321216 ASPHALT PAVING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Hot-mix asphalt paving.
  - 2. Aggregate base course.
  - 3. Pavement-marking paint.
- B. Related Sections:
  - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
  - 2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

#### **1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
  - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- B. Material Certificates: For each paving material, from manufacturer.

#### **1.3 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of City of Palmdale for asphalt paving work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.
- C. Pre-installation Conference: Conduct conference at Project site.

#### **1.4 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Tack Coat: Minimum surface temperature of 60 deg F.
  - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 55 deg F for water-based materials, and not exceeding 95 deg F.

## **PART 2 PRODUCTS**

### **2.1 AGGREGATES**

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Crushed Miscellaneous Base (CMB): Crushed miscellaneous base shall consist of broken and crushed asphalt concrete or Portland cement concrete and may contain crushed aggregate base or other rock materials, 3/4 inch maximum grading, conforming to requirements of Section 200-2.4, SSPWC.

### **2.2 ASPHALT MATERIALS**

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 70-10.
- B. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

### **2.3 AUXILIARY MATERIALS**

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
  - 1. Color: As indicated.
- C. Wheel Stops: Precast, air-entrained concrete, 2,500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
  - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

### **2.4 MIXES**

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  - 2. Base Course: Class B PG 64-10.
  - 3. Surface Course: Class C2 PG 64-10.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

### **3.2 BASE COURSE**

- A. Place and compact aggregate base upon finished subgrade in conformance with Section 301-2 SSPWC. Compaction: 95 percent.
- B. Thickness of Base After Compaction: As indicated on Drawings but not less than 4 inches if not indicated.

### **3.3 SURFACE PREPARATION**

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### **3.4 HOT-MIX ASPHALT PLACING**

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Spread mix at minimum temperature of 250 deg F.
  - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### **3.5 JOINTS**

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

### **3.6 COMPACTION**

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### **3.7 INSTALLATION TOLERANCES**

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  1. Base Course: Plus or minus 1/2 inch.
  2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  1. Base Course: 1/4 inch.
  2. Surface Course: 1/8 inch.

### **3.8 PAVEMENT MARKING**

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect/Engineer.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

### **3.9 WHEEL STOPS**

- A. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

**3.10 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Replace and compact hot-mix asphalt where core tests were taken.
- C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

**3.11 DISPOSAL**

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

**END OF SECTION**



## **SECTION 321313 CONCRETE PAVING**

### **PART 1 GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Truck dock.
  - 2. Curbs and gutters.
  - 3. Walks.
  - 4. Aggregate base course.
- B. Related Sections include the following:
  - 1. Division 31 Section 312000 "Earthmoving" for subgrade preparation, grading, and subbase course.
  - 2. Division 32 Section 320523 "Cement and Concrete for Exterior Improvements".
  - 3. Division 32 Section 321373 "Concrete Paving Joint Sealants".

#### **1.2 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Other Action Submittals:
  - 1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

#### **1.3 QUALITY ASSURANCE**

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301 unless otherwise indicated.

### **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 other devices 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" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

#### **2.2 CONCRETE MATERIALS**

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, gray portland cement Type II. Supplement with the following:

- a. Fly Ash: ASTM C 618, Class C or Class F.
- B. Normal-Weight Aggregates: ASTM C 131, Grade C, uniformly graded. Provide aggregates from a single source.
- C. Water: Potable and complying with ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

### **2.3 CURING MATERIALS**

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

### **2.4 RELATED MATERIALS**

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed 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. Crushed Aggregate Base (CAB): 3/4 inch maximum grading, crushed rock and rock dust conforming to requirements of Section 200-1.2, SSPWC, with 3/8 inch sieve requirement waived, or Class 2 Aggregate Base as defined in Section 26, CSS.

### **2.5 PAVEMENT MARKINGS**

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
  - 1. Color: As indicated.

### **2.6 WHEEL STOPS**

- A. Wheel Stops: Precast, air-entrained concrete.
  - 1. Dowels: Galvanized steel, 3/4 inch in diameter, 10-inch minimum length.

### **2.7 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: 0.50.



3. Slump Limit: 4 inches, plus or minus 1 inch.
  4. Air Content: 5 percent plus or minus 1.5 percent.
- B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
  - C. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
  - D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

## **2.8 CONCRETE MIXING**

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

## **PART 3 EXECUTION**

### **3.1 EXAMINATION AND PREPARATION**

- A. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Place and compact aggregate base upon finished subgrade in conformance with Section 301-2 SSPWC. Compaction: 95 percent.

### **3.2 EDGE FORMS AND SCREED CONSTRUCTION**

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides 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**

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

### **3.4 JOINTS**

- A. General: Form construction, isolation, and contraction joints and tool edges 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 paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete paving:
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-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, placing, and consolidating 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 paving surface 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.

### **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.

### **3.8 PAVING TOLERANCES**

- A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/2 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 PAVEMENT MARKING**

- A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.
- B. Sweep and clean surface to eliminate loose material and dust.
- C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

### **3.10 WHEEL STOPS**

- A. Securely attach wheel stops to paving with not less than two galvanized-steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

### **3.11 REPAIRS AND PROTECTION**

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect/Engineer.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

**END OF SECTION**



**SECTION 321373  
CONCRETE PAVING JOINT SEALANTS**

**PART 1 GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Expansion and contraction joints within cement concrete pavement.
  - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
  - 1. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
  - 2. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

**1.3 SUBMITTALS**

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

**1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the Notice to Proceed with the Work.

**1.5 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 multi-component materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## **1.6 PROJECT CONDITIONS**

- A. 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.
  - 2. When joint substrates are wet or covered with frost.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

### **2.2 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

### **2.3 COLD-APPLIED JOINT SEALANTS**

- A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, non-sag silicone sealant complying with ASTM D 5893 for Type NS.
- B. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- C. Multi-component Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

### **2.4 HOT-APPLIED JOINT SEALANTS**

- A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.
- B. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.

### **2.5 JOINT-SEALANT BACKER MATERIALS**

- A. General: Provide joint-sealant backer materials that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

## **2.6 PRIMERS**

- A. Primers: Product 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.

## **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.
  - 1. 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.
- B. Joint Priming: Prime joint substrates where indicated or 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.

### **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 in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials 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 backer materials.
  - 2. Do not stretch, twist, puncture, or tear backer materials.
  - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that 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.
- E. Tooling of Non-sag 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 joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

#### **3.4 CLEANING**

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

#### **3.5 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 and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

**END OF SECTION**



## **SECTION 321601 CONCRETE FORMWORK**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The provisions of the "Standard Specifications for Public Works Construction," latest edition, Section 302-6, shall apply except as modified herein.

#### **1.2 SCOPE OF WORK**

- A. Work of this Section includes all materials, labor and equipment necessary for and incidental to completing the Concrete Form work, as shown on the Drawings, as reasonably implied, or as specified herein, including, but not limited to, the following:
  - 1. Forms for all concrete.
  - 2. Shoring and bracing.
  - 3. Setting of embedded items.
  - 4. Removal of forms.

#### **1.3 RELATED WORK SPECIFIED ELSEWHERE**

- A. Concrete Paving: Section 321313
- B. Concrete Reinforcement: Section 323214

#### **1.4 STANDARDS**

- A. Materials and workmanship shall conform to the requirements of all applicable building codes, except that requirements specified herein shall govern where they exceed those in the Building Code. Refer and comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified:
  - 1. American Concrete Institute, ACT 347, "Recommended Practice for Concrete Form work."

#### **1.5 QUALITY ASSURANCE**

- A. Provide all openings in concrete Form work to accommodate work of other trades; accurately determine size and location of openings, recesses, etc., from trades providing or requiring such items; place items required for incorporating into concrete accurately and securely supported on forms.
- B. Base form and false work design on required values of live and dead loads, weight of moving equipment on Form work, height of concrete drop, foundation pressures, stresses, lateral stability and other safety factors required during construction.
- C. Materials used in Form work may not be reused except for use in other forms, without the Landscape Architect's recommended approval.
- D. Contractor shall verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Landscape Architect all conditions which prevent proper execution of this work.
- E. Use various form types as specified below. Refer to Concrete Section 03300 and use form materials for best results. All forms shall have a smooth straight upper edge and shall be free of any warping.

## **PART 2 - MATERIALS**

All materials shall conform with Section 204 of the Standard Specifications except as modified herein.

### **2.1 FORM COATINGS**

- A. Non-grain-rising and non-staining type that will not leave residue on surface of concrete or adversely affect bonding to concrete of paint, plaster, mortar or other applied materials. Coatings containing mineral oils or other non-drying ingredients will not be permitted. Submit manufacturer's data.

### **2.2 LUMBER**

- A. Lumber shall be "Construction Grade" Douglas Fir.

### **2.3 PLYWOOD**

- A. Plywood shall be of grade Exterior B-B. All plywood shall be at least 5/8" thick, and edge sealed. Plywood for forming exposed concrete shall be Plyform.

### **2.4 METAL FORMS**

- A. Removable metal forms shall be of proper gauges and sizes, carefully aligned and fitted. Removable metal forms shall be properly reconditioned for use, clean, free from dents, bends, rust, oil or other coatings, and shall receive the recommended approval of the Landscape Architect prior to installation.

### **2.5 FORM TIES**

- A. Prefabricated rod, flat band or wire type, or threaded internal disconnecting type of sufficient tensile strength to resist all imposed loads of fresh concrete and with external holding devices of adequate bearing area. Ties shall permit tightening and spreading of forms and leave no metal closer than one and one-half inches (1-1/2") from surfaces.

### **2.6 FORM TYPES**

- A. Use Plywood or Metal Forms as specified above for exposed surfaces.
- B. Use Boards or Plywood as specified above for concealed surfaces.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Build forms to exact shapes, sizes, lines and dimensions as required to obtain accurate alignment, locations and grades, and level and plumb work. Provide for openings, offsets, keyways, recesses, chamfers, blocking, joint screeds, anchorages and other required features.
- B. Use metal spreaders to provide accurate spreading of forms and positive tying of forms together.
- C. Provide for recesses, rebates, drips and profiles as detailed.
- D. Forms shall be of materials and construction adequate to safely support all loads, so that no sagging, leakage or displacement occurs during and after pouring of concrete.
- E. Form joints shall not show in exposed concrete.
- F. Clean-outs and Cleaning - Provide temporary openings in wall and column forms for cleaning and inspection. Prior to pouring, clean all forms and surfaces to receive concrete.

- G. Provide 3/8" x 3/8" chamfer strips for exposed corners unless otherwise indicated. Use eight feet (8') long plywood for exposed surfaces.
- H. Fabricate form for easy removal without hammering or prying against the concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
- I. Forms shall be set with the upper edge of the board true to line and grade and shall be staked rigidly in place with stakes set not more than four feet (4') apart.
- J. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and all other debris just before concrete is placed. Re-tighten forms during and after concrete placement if required to eliminate mortar leaks.
- K. Clean and repair surfaces for forms to be reused in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form-coating compound material to concrete contact form surfaces.
- L. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove pins and tighten form to close joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces. Forms are to be inspected prior to pouring concrete.

### **3.2 FORM COATINGS**

- A. Coat the contact surfaces of forms with a form-coating compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compound.
- B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of the form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

### **3.3 REGRETS AND REBATES**

- A. Each affected trade required to fasten work to the structure, or to insert therein any piping, conduit, duct, box bolt, anchor, insert or other rough hardware, shall set such items securely and accurately in the forms. Be responsible for any and all changes in such piping, box, bolt, anchor, inserts and other rough hardware after they have been set in the forms.
- B. Conduits and pipes in concrete slabs will be permitted to be embedded therein under the following conditions:
  - 1. Conduit or pipe diameter shall not exceed one-third (1/3) of the slab thickness, minimum spacing of conduit or pipe shall be three (3) diameters; there shall be a minimum separation of one inch (1") from parallel reinforcing steel and conduit. Minimum concrete coverage over conduits and pipes shall be one inch (1"). No crossovers will be permitted except as specifically detailed. No reinforcing steel shall be bent or displaced to permit passage of conduit or pipe. No conduit or pipe shall be placed in slabs four and one-half inches (4-1/2") and less in thickness, unless specifically detailed or specifically authorized by the Landscape Architect.
- C. Build into forms special features as the character and requirements of work dictate.
- D. Place pouring strips in the forms wherever horizontal construction joints are made in exposed concrete. Place pouring strips level and place concrete flush with the top of the pouring strip. After cleaning concrete surfaces and just ahead of placing of subsequent concrete, tighten form ties to conceal shrinkage.

- E. Carefully check with other trades before completing forms and placing concrete to determine all embedded items are in place in the forms. Set miscellaneous anchors, bolts, ties, dowels, plates, etc. necessary to complete the work as detailed. Embed no wood blocks other than treated built-in blocks or nailing blocks in concrete.

**3.4 FORM REMOVAL**

- A. Remove forms only when concrete has developed sufficient strength to sustain its own weight and super-imposed loads.

**3.5 PAYMENT TERMS**

- A. Payment for concrete formwork will be at the lump sum price bid for concrete. Payment shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work in concrete formwork as herein specified. A 10% retention shall apply to all concrete work.

**END OF SECTION**

## **SECTION 321723 PAVEMENT MARKING**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Parking-stall line and curb painting.
- B. Traffic symbols, directional arrows, lettering and safety zones, loading zone.
- C. Accessibility signage.
- D. Fire lanes.
- E. Paint for Traffic Striping.
- F. Raised Pavement Markers.

#### **1.2 REFERENCES**

- A. SSPWC - Standard Specifications for Public Works Construction, 2007 Edition.
- B. AQMD - Air Quality Management District.
- C. Fed. Std. 595B - Colors Listed in Government Procurement.
- D. CACRM - California Access Compliance Reference Manual, updated on July 1, 2008 based on 2007 California Building Code.
- E. MUTCD - Department of Transportation, Manual for Uniform Traffic Control Devices.
- F. CSS - Caltrans Standard Specifications, Latest Edition.
- G. IR 11B-7 – Requirements for Accessible Parking Spaces.

#### **1.3 SUBMITTALS**

- A. Product data.
- B. Shop drawing layout of complete parking lot, indicating stalls, lettering, safety zones, directional arrows, widths of lines and colors.

#### **1.4 QUALITY ASSURANCE**

- A. Product Manufacturer: Company specializing in manufacturing quality traffic line paint products with ten years experience.
- B. Applicator: Company specializing in commercial pavement painting with five years experience.
- C. Regulatory Requirements
  - 1. Conform to Federal Regulations concerning lead content of paints.
  - 2. Conform to AQMD, Local Regulations. Copy of regulation is on file at Architect's office.
- D. Field Samples
  - 1. Provide field sample in form of one parking lot stall, illustrating coating color, width of stroke, thickness of application and dimensioning.
  - 2. Locate where approved.

3. Accepted sample may remain as part of Work.
4. Do not proceed with pavement marking until sample markings has been approved.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to site in sealed and labeled containers.
- B. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation and instructions for mixing and reducing.
- C. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, unless otherwise recommended by manufacturer.

### **1.6 REGULATORY REQUIREMENTS**

- A. Paint products shall produce a coated finish as slip resistant as surrounding pavement.

### **1.7 EXTRA STOCK**

- A. Provide one gallon unopened container of each color to Owner.
- B. Label each container with color in addition to manufacturer's label.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Products of following manufacturers form basis for design and quality intended.
  1. Dunn-Edwards Corporation, Los Angeles, CA.
  2. ICI/Sinclair Paint, Commerce, CA.
  3. Frazee Paint and Wallcovering, Inc., Anaheim, CA.
- B. Or equal as approved in accordance with Division 01, General Requirements for Substitutions.

### **2.2 MATERIALS**

- A. Traffic Line Paint: Waterbourne emulsion type, lead and chromate free, ready mixed, complying with Fed. Spec. TT-P-1952 drying time less than 45 minutes. Color as shown. Paint shall be in containers of at least 18 L (5 gallons). A certificate shall accompany each.
  1. Dunn-Edwards: VIN-L-STRIPE TRAFFIC PAINT, VINYL EPOXY EMULSION, W801.
  2. ICI/Sinclair: NO. 160 VINYL TRAFFIC PAINT.
  3. Frazee: No. 506 TRAFFIC LINE PAINT.
- B. Striping, pavement markings, and curb markings in accordance with Sections 210-1.6 and 310-5.6 SSPWC.
- C. Raised Pavement Markers: In accordance with Caltrans Section 85, Rectangular "Highway" Raised pavement markers, beveled edges, prismatic, dual reflective lenses, White and blue for fire hydrant location, 4" x 4" x 3/4". High-impact plastic, ASTM D788, Grade 8. Cal Trans Type D or G.
  1. Hy-Viz, Lodi, NJ. Or equal.
  2. Adhesive: Epoxy type, rapid set, CalTrans Sections 85-1.055, 95-2.04, ASTM C881, Type IV Grade, 3, Class B.
- D. Substrate: Asphalt.

## **2.3 COLORS**

- A. Accessible Stalls and Signage: Blue, conforming to No. 15090 Fed. Std. 595B and California Building Code Section 1129B.4.
- B. Parking stalls, lettering, arrows, passenger loading zones and traffic signage: White.
  - 1. Accessible Parking spaces: Border (perimeter) shall be blue, hatching shall be blue. Markings and lettering according to CBC Section 1129B.4 and IR 11B-7.
- C. Stalls: Single line, 4 inches wide unless double lines are noted on drawings.
- D. Fire Lanes: Red; paint curbs or paint 6 inch red strip if no curb. Paint 4-inch high stenciled white letters on curbs and strip indicating, "Fire Lane - No Parking" at 20 feet on center.
- E. Temporary Parking: Green painted curbs, with 4-inch high stenciled white letters, indicating, "Temporary Parking 20 Minutes", at designated stalls.
- F. Loading Zone: White, paint curbs, with 4-inch high stenciled black letters, indicating, "Loading Zone - No Parking", at 30 feet on center.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

- A. Verify that surfaces are ready to receive Work as instructed by product manufacturer.

### **3.2 APPLICATION**

- A. Surfaces to be painted shall be clean and free of dust, dirt, grease, oil, water or other contaminants.
  - 1. Existing lines to be removed shall be sandblasted clean.
- B. Traffic paint shall not be applied until seal coat has been in place minimum of 10 days.
- C. Apply material by machine spray, airless sprayer, roller or brush to provide a minimum thickness of 15 mils average. Precise edges required, no overspray allowed.
- D. Perform Work in accordance with approved Shop Drawings. Conform to Section 310-5.6.8, SSPWC and CACRM.
- E. Mark parking spaces for disabled according to CBC Section 1129B.4.
- F. Painted lines and markings on pavement shall be 4 inches minimum wide and blue in color equal to color No. 15090 per Federal Standard 595B.
- G. Raised Pavement Markers: Install in accordance with Caltrans Section 85-1.06 with rapid set epoxy adhesive.

### **3.3 DEFECTIVE WORK**

- A. Remove any paint that demonstrates evidence of checking, cracking, peeling, discoloration, lack of bonding or poor coverage. Misplaced lines shall be completely removed by paint remover or wet sandblasting per Section 310.5.6.3, SSPWC. Painting over misplaced lines will not be permitted.

**END OF SECTION 321723**