

# **HIGHLANDS ELEMENTARY SCHOOL PORTABLES REPLACEMENT PROJECT, INCREMENT 1**

**VOLUME 2 - TECHNICAL SPECIFICATIONS**

**PROJECT NUMBER: 26-003**

**DSA # 01-122869**

**PTN # 61788-127**

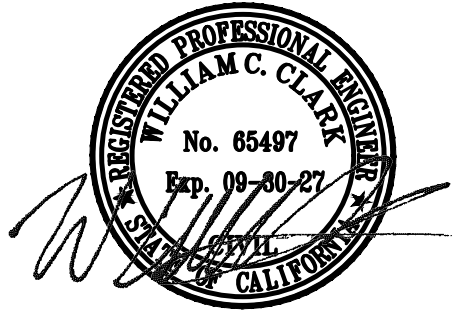
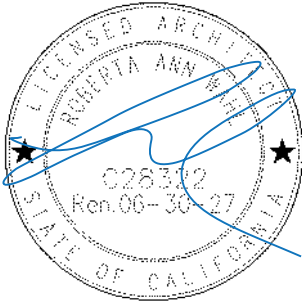
**PITTSBURG UNIFIED SCHOOL DISTRICT**

**January 22, 2026**

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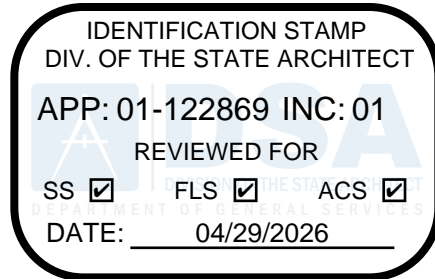
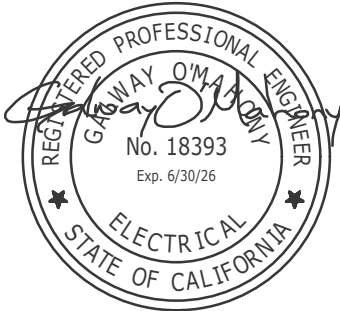
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END OF SECTION

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SECTION 02 31 13

SELECTIVE SITE DEMOLITION

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PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Demolition and removal of existing selected site elements.
2. Demolition and removal of existing portable buildings inclusive concrete ramps & foundations, wood & steel framed ramps and foundations and prep of the area for new sitework, modular building and shade canopies.
3. Demolition and removal of existing steel shade canopy structure inclusive concrete foundations & slab and prep of the area for new sitework.
4. Disconnecting, capping or sealing and abandoning or removing utilities and equipment including those at existing roofs.

1.2 MATERIALS OWNERSHIP

- A. Demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.3 SUBMITTALS

- A. Proposed dust-control & noise-control measures.
- B. Schedule of demolition activities indicating the following:
1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
  2. Interruption of utility services.
  3. Coordination for shutoff and capping of utility services.
  4. Detailed sequence of demolition and removal work to ensure uninterrupted progress of the Owner's on-site operations.
- C. Locations of temporary partitions and means of egress.
- D. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.
- E. Record drawings at Project closeout.
1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Demolition Firm: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.

- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Pre-demolition Conference: Conduct conference at Project site.

1.5 SUBMITTALS

- A. Schedule indicating proposed sequence of operations for selective demolition work prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
  - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted use of the existing completed phases.
  - 2. Coordinate with Owner's use and occupancy of the existing facilities.
- B. Take photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with the Architect prior to start of work.

1.6 JOB CONDITIONS

- A. Occupancy: Site improvements to be demolished will be vacated and their use discontinued before start of Work. The Owner will occupy adjacent rooms and buildings. Conduct selective demolition work in manner that will minimize need for disruption of normal operations. Provide minimum of 72-hours advance notice to the Owner of demolition activities that will affect normal operations.
- B. Condition of Demolition Items: The Owner assumes no responsibility for actual condition of items to be demolished.
  - 1. Conditions existing at time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
  - 1. Storage or sale of removed items on site will not be permitted.
- D. Protections: Provide temporary barricades and other forms of protection to protect buildings from damage and to protect building occupants from injury due to selective demolition work.
  - 1. Provide protective measures as required to provide secure passage of building occupants to occupied portions of the building.
  - 2. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of element to be demolished and adjacent facilities or work to remain.
  - 3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

4. Protect adjacent paving and planting areas with suitable coverings when necessary.
  5. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing buildings.
  6. Remove protections at completion of work.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.
- F. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from the Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- G. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. Maintain portable fire suppression devices during flame-cutting operations.
- H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by the Owner. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
  2. Maintain fire protection services during selective demolition operations.
- I. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
1. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.
- J. Inspections:
1. Prior to starting demolition, make inspection and report observable defects and structural weaknesses of construction designated for demolition, of adjacent structures, and of other improvements to remain. If unsatisfactory conditions exist, do not commence demolition until appropriate determinations have been made.
  2. As demolition progresses, periodically inspect structures for adverse conditions and for damage. Immediately notify the Owner's Representative if damage is noticed, and stop operations at that location until appropriate determinations have been made.
- K. Hazardous materials: It is expected that asbestos will be encountered in the Work. Hazardous materials will be removed as directed by the Owner before start of Work per the Hazardous Materials Report and Procedures.

PART 2 – PRODUCTS - Not Applicable

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- C. Survey the condition of the site improvements to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
- D. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.2 UTILITY SERVICES

- A. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving site improvements to be selectively demolished.
- B. Arrange to shut off, disconnect, remove and seal or cap all utilities within demolition area with utility companies.
- C. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
- B. Employ a certified, licensed exterminator to treat site improvements and to control rodents and vermin before and during demolition operations.
- C. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the City and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- D. Conduct demolition operations to prevent injury to people and damage to adjacent site improvements and facilities to remain. Ensure safe passage of people around selective demolition area.
  - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

- E. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of site improvements to be demolished.

- 1. Strengthen or add new supports when required during progress of demolition.

### 3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

- 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

- 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of demolition.

### 3.5 DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations.

- B. Completely remove below-grade construction, including foundation walls, basements and footings.

- C. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of site improvements and pavements with soil materials according to requirements specified in Section 31 20 00 "EARTHWORK".

- D. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools. Sawcut in neat straight lines. Do not overcut.

- E. Break up and remove concrete slabs on grade, unless otherwise shown to remain.

- F. Remove air-conditioning equipment without releasing refrigerants.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

- B. Burning: Do not burn demolished materials.

- C. Disposal: Transport demolished materials off the Owner's property and legally dispose of them.

**END OF SECTION**

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**SECTION 03 20 00**

**CONCRETE REINFORCING**

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PART 1 – GENERAL

1.1 SUMMARY:

- A. Section includes: Reinforcing steel for cast-in-place concrete.

1.2 DESCRIPTION:

- 1. Concrete curbs, and curb and gutter.
- 2. Concrete pavement, sidewalks, ramps and drives.
- 3. Concrete retaining walls less than 48" height from bottom of footing to top of wall.
- 4. Storm drain catch basins and manhole bases.
- 5. Thrust blocks for water systems
- 6. Equipment bases: See Mechanical and Electrical Systems.
- 7. Post bases for galvanized chain link fencing and gates.

1.3 REFERENCES:

A. ASTM International:

- 8. ANSI/ASTM A185 – Welded Steel Wire Fabric or Concrete Reinforcement.
- 9. ASTM A615 – Deformed and Plain Billet-Steel for Concrete Reinforcement.
- 10. ASTM C33 – Standard Specification for Concrete Aggregates.
- 11. ASTM C150 – Standard Specification for Portland Cement.
- 12. ASTM C31 – Standard Practice for Making and Curing Test Specimens in the Field.
- 13. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- 14. ASTM C94 – Standard Specifications for Ready-Mixed Concrete.
- 15. ASTM C138 – Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of concrete.
- 16. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.
- 17. ASTM C172 – Standard Method for Sampling Freshly Mixed Concrete.
- 18. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- 19. ASTM C260 – Air Entraining Admixtures for Concrete.
- 20. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.
- 21. ASTM C494 – Chemical Admixtures for Concrete.
- 22. ANSI/ASTM D1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

B. American Concrete Institute:

- 1. ACI 318 – Building Code Requirements for Structural Concrete.
- 2. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
- 3. ACI 305R – Hot Weather Concreting.
- 4. ACI 306R – Cold Weather Concreting.

B. California Building Code, current edition.

C. Federal Specification:

1. FS TT-C-800 – Curing Compound, Concrete, for New and Existing Surfaces.

1.4 SUBMITTALS:

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

1.5 JOB CONDITIONS:

- A. Weather Limitations: Construct concrete surface course only when atmospheric temperature is above 40 degrees F, when the underlying base is dry, and when weather is not rainy.
- B. Grade Control: Establish and maintain the required lines and grades, including cross-slope during construction operations.

1.6 QUALITY CONTROL:

- A. Standard Specifications: The American Concrete Institute (ACI) "Specifications for Structural Concrete", ACI 301, shall be used as standard specification. All cast-in-place concrete shall conform to this standard specification except as modified by the requirements specified herein and/or detailed on the Drawings.
- B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is saturated or frozen.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Poured-in-Place Concrete: Concrete sidewalks, curbs, curb and gutter, retaining walls less than 48" from bottom of footing to top of wall, ramps, drives, manhole bases and thrust blocks for water systems and fire systems shall be Class A conforming to Section 90 of State Specifications with a minimum 28-day compressive strength of 3000 psi.
  1. Cement – Type II modified conforming to ASTM C150, Portland cement.
  2. Aggregate – Maximum size ¾-inch diameter.
- B. Extruded Curbs, and Curb and Gutter: 3000-lb. Concrete: special no slump design mix.
- C. Expansion Joints: Joint fill shall be a performed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal and as detailed on the Drawings.

**2.2 REINFORCEMENT:**

- A. Reinforcing Steel and Wire Fabric: Type specified in Section 03 20 00 – Concrete Reinforcing.
- B. Welded Steel Wire Fabric: 6 x 6 – w1.4 x w1.4 wwf flat sheets, unfinished.
- C. Dowels: ASTM A615, smooth plain steel, unfinished.
- D. Expansion Joints: Jint fill shall be a pre-formed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751.
  - 1. Burke: Fiber Expansion Joint
  - 2. W.R. Meadows: Fibrated Expansion Joint Filler
  - 3. Approved equal.

**PART 3 – EXECUTION**

**3.1 EXAMINATION:**

- A. Verify gradients and elevations of substrate are correct.
- B. Verify that substrate is level, smooth, and capable of supporting curbs, and curb and gutter sections.
- C. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

**3.2 INSTALLATION – REINFORCING:**

- A. Reinforcing is to be held firmly in place during concrete placement.
- B. Place reinforcement at mid-height of slabs-on-grade.
- C. Interrupt reinforcement at expansion joints.

**3.3 INSTALLATION – CONCRETE:**

- A. Space expansion joints as shown on the drawings for flatwork for adjacent curbs, curb and gutters, and valley gutters. Align expansion joints
- B. Exterior Walks:
  - 1. Place expansion joints at maximum of 20 foot intervals where not otherwise indicated on Drawings. Align curb, gutter and sidewalk joints.
  - 2. Place joint filler between components and building or other appurtenances. Recess top of filler ¼" for sealer placement per manufacturer specifications.
  - 3. Provide minimum ¼' deep score joints (unless otherwise indicated on Drawings) in sidewalks at 5 foot intervals.
- C. Do not sawcut score lines.

**3.4 FINISHES**

- A. After trowel finishing, draw a fine hair push broom over the surface at the time when such broom marks shall produce a uniform texture on the surface.
- B. Walks with inadequate amounts of texture shall be rejected.
- C. Areas of poor workmanship, as determined by the Architect, shall be removed and redone at Contractor's expense.
- D. Positive drainage shall be achieved; areas of ponding shall be redone/repared at Contractor's expense. Contractor shall have method of repair approved by Architect/Engineer prior to repair.

**3.5 FIELD QUALITY CONTROL:**

- A. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with Caltrans and the DSA Testing and Inspection Form. A set of test cylinders shall be taken for each individual pour or placement of concrete and, in no case, shall a set of cylinders represent more than 200 cubic yards of concrete placed.

**3.6 PROTECTION:**

- A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

3/23/26

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**SECTION 03 30 01**

**SITE CONCRETE**

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The General Conditions, Supplementary Conditions and General Requirements are hereby a part of this Section as fully as if repeated herein.

PART 1 – GENERAL

1.1 DESCRIPTION:

- A. Concrete curbs, and curb and gutter.
- B. Concrete retaining walls less than 48" in height from bottom of footing to top of wall.
- C. Concrete pavement, sidewalks, ramps and drives.
- D. Storm drain catch basins and manhole bases.
- E. Thrust blocks for water systems.
- F. Equipment bases – See Mechanical and Electrical Systems.
- G. Galvanized chain link fencing and gates. Post bases, gates and fence post footings.

1.2 REFERENCES:

A. ASTM International:

- 1. ANSI/ASTM A185 – Welded Steel Wire Fabric or Concrete Reinforcement.
- 2. ASTM A615 – Deformed and Plain Billet-Steel for Concrete Reinforcement.
- 3. ASTM C33 – Standard Specification for Concrete Aggregates.
- 4. ASTM C150 – Standard Specification for Portland Cement.
- 5. ASTM C31 – Standard Practice for Making and Curing Test Specimens in the Field.
- 6. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- 7. ASTM C94 – Standard Specifications for Ready-Mixed Concrete.
- 8. ASTM C138 – Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of concrete.
- 9. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete.
- 10. ASTM C172 – Standard Method for Sampling Freshly Mixed Concrete.
- 11. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- 12. ASTM C260 – Air Entraining Admixtures for Concrete.
- 13. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.
- 14. ASTM C494 – Chemical Admixtures for Concrete.
- 15. ANSI/ASTM D1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

B. American Concrete Institute:

1. ACI 318 – Building Code Requirements for Structural Concrete.
  2. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
  3. ACI 305R – Hot Weather Concreting.
  4. ACI 306R – Cold Weather Concreting.
- B. California Building Code, current edition.
- C. Federal Specification:
1. FS TT-C-800 – Curing Compound, Concrete, for New and Existing Surfaces.
- 1.3 SUBMITTALS:
- A. Product Data: For each type of product indicated.
  - B. Design Mixtures: For each site concrete mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- 1.4 JOB CONDITIONS:
- A. Weather Limitations: Construct concrete surface course only when atmospheric temperature is above 40 degrees F, when the underlying base is dry, and when weather is not rainy.
  - B. Grade Control: Establish and maintain the required lines and grades, including cross-slope during construction operations.
- 1.5 QUALITY CONTROL:
- A. Standard Specifications: The American Concrete Institute (ACI) “Specifications for Structural Concrete”, ACI 301, shall be used as standard specification. All cast-in-place concrete shall conform to this standard specification except as modified by the requirements specified herein and/or detailed on the Drawings.
  - B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is saturated or frozen.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Poured-in-Place Concrete: Concrete sidewalks, curbs, curb and gutter, retaining walls less than 48” in height from bottom of footing to top of wall, ramps, drives, manhole bases and thrust blocks for water systems and fire systems shall be Class A conforming to Section 90 of State Specifications with a minimum 28-day compressive strength of 3000 psi.
  1. Cement – Type II modified conforming to ASTM C150, Portland cement.
  2. Aggregate – Maximum size ¾-inch diameter.

- B. Extruded Curbs, and Curb and Gutter: 3000-lb. Concrete: special no slump design mix.
- C. Expansion Joints: Joint fill shall be a performed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal and as detailed on the Drawings.

## 2.2 REINFORCEMENT:

- A. Reinforcing Steel and Wire Fabric: Type specified in Section 03 20 00 – Concrete Reinforcing.
- B. Welded Steel Wire Fabric: 6 x 6 – w1.4 x w1.4 wwf flat sheets, unfinished.
- C. Dowels: ASTM A615, smooth plain steel, unfinished.
- D. Expansion Joints: Joint fill shall be a pre-formed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751.
  - 1. Burke: Fiber Expansion Joint
  - 2. W.R. Meadows: Fibrated Expansion Joint Filler
  - 3. Approved equal.

## 2.3 SUB-GRADE:

- A. Unless otherwise noted on the Drawings, provide minimum 6" AB with 90% relative compaction over 8" non-expansive material with 90% relative compaction.

## PART 3 – EXECUTION

### 3.1 EXAMINATION:

- A. Verify gradients and elevations of substrate are correct.
- B. Verify that substrate is level, smooth, and capable of supporting curbs, and curb and gutter sections.
- C. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

### 3.2 INSTALLATION – REINFORCING:

- A. Reinforcing is to be held firmly in place during concrete placement.
- B. Place reinforcement at mid-height of slabs-on-grade.
- C. Interrupt reinforcement at expansion joints.

### 3.3 INSTALLATION – CONCRETE:

- A. Space expansion joints as shown on the drawings for flatwork for adjacent curbs, curb and gutters, and valley gutters. Align expansion joints

B. Exterior Walks:

1. Place expansion joints at maximum of 20 foot intervals where not otherwise indicated on Drawings. Align curb, gutter and sidewalk joints.
2. Place joint filler between components and building or other appurtenances. Recess top of filler  $\frac{1}{4}$ " for sealer placement per Section 07 92 00 – Joint Sealant
3. Provide minimum  $\frac{1}{4}$ ' deep score joints in sidewalks at 5 foot intervals (unless otherwise indicated on Drawings).

C. Do not sawcut score lines.

3.4 FINISHES

- A. After trowel finishing, draw a fine hair push broom over the surface at the time when such broom marks shall produce a uniform texture on the surface.
- B. Walks with inadequate amounts of texture shall be rejected.
- C. Areas of poor workmanship, as determined by the Architect, shall be removed and redone at Contractor's expense.
- D. Positive drainage shall be achieved; areas of ponding shall be redone/repared at Contractor's expense. Contractor shall have method of repair approved by Architect/Engineer prior to repair.

3.5 FIELD QUALITY CONTROL:

- A. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with Caltrans and the DSA Testing and Inspection Form. A set of test cylinders shall be taken for each individual pour or placement of concrete and, in no case, shall a set of cylinders represent more than 200 cubic yards of concrete placed.

3.6 PROTECTION:

- A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

3/23/26

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**SECTION 10 14 00**

**IDENTIFYING DEVICES**

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PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior site signs

1.02 SUBMITTALS

- A. Shop Drawings: Drawings showing typical elevations, profiles and dimensions, types and thicknesses of materials, details of construction, and details and methods of mounting or anchoring for each type of sign. A schedule showing the location of each sign shall be included.
- B. Manufacturer's Information: Manufacturer's descriptive data describing materials, graphic and text application methods, letter styles, and finishes, for each type of sign. Include manufacturer's maintenance and cleaning instructions.

1.04 REGULATORY REQUIREMENTS

- A. Requirements for Physically Disabled: Provide identifying devices meeting the 2025 California Building Code (CBC) Title 24 Part 2; Section 11B and sections as follows:
1. Size: Section 11B-502.6.1 & 11B-502.8.1
  2. Proportions of Letters and Numbers: Section 703.5.4
  3. Character Height: Section 11B-502.8.2 & 11B-703.5.5
  4. Contrast and Finish of Characters: Section 11B-703.5.1
  5. Information Posted: Section 11B-502.8.2
  6. Mounting Location and Height (Where permanent identification is provided or where signage is required for rooms and spaces): Section 11B-502.8 & 11B-703.5.6

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

- A. Aluminum, Extruded: ASTM B221, alloy 6063-T5, applicable as material.
- B. Aluminum, Sheet and Plate: ASTM B209
- C. Aluminum, Extrusions and Tubing: ASTM B221
- D. Zinc-Molybdate Primer: Fed. Spec. TT-P-645.
- E. Aluminum Signage: Engineering grade reflective aluminum shall be minimum 80ml thick with pre-punched holes. Drilled holes will not be acceptable.
- F. Size: As indicated on Drawings
- G. Characters: Characters on signs shall be minimum 1 inch high and shall be sans serif uppercase characters. The characters shall be selected from fonts where the width of the uppercase letter O is 60 percent minimum and 110 percent maximum of the height of the uppercase T. Stroke thickness of the uppercase letter I shall be 15 percent maximum of the

height of the character. After choosing a typestyle to test, begin by printing the letters I, X, and O at 1 inch high. Place the template's 1:1 square over the X or O, whichever is narrower. If the character is not wider than 1 inch, nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the I is too broad, and the 1:10 rectangle to see if it is too narrow. If all the tests are passed, the typestyle is compliant with proportion code.

- H. Message: As indicated on the Drawings.
- I. Type Face: As indicated on the Drawings.
- J. Colors: Custom color as selected by the Architect.
- K. Mounting: The signs are to be fabricated with countersunk mounting holes for vandal resistant mechanical fasteners. Where signs are mounted to window glazing provide blank signage back plate.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrate to receive mechanically applied identification devices before start of work to ensure that they are free of grease, oil, paint, wax, dust, dirt, or other foreign.
- B. Do not start work until deficiencies have been corrected. Start of work of this section constitutes acceptance of the surfaces.

#### 3.02 INSTALLATION

- A. Exterior Plaque Signs: Install signs at locations indicated. Ensure that signs are installed plumb and true, at mounting heights indicated and by method specified.
- B. Anchorage: Provide anchorage where necessary for fastening signs securely in place. Anchorage not otherwise specified or indicated shall include expansion anchors for concrete and masonry.

#### 3.03 ADJUST AND CLEAN:

- A. Repair damage to signs incurred during installation. Replace signs that cannot be repaired to new condition. Clean glass, frames, and other sign surfaces, adjust hardware for proper operation.

END OF SECTION

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**SECTION 26 05 00**

**BASIC ELECTRICAL REQUIREMENTS**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to provide and install the Electrical Work as shown on the drawings and as specified hereinafter, including, but not limited to the following:
1. Electrical and telecommunications service provisions as outlined on the drawings, including temporary power for construction.
  2. Main switchboard, distribution switchboards, distribution panels, panels, transformers, circuit breakers, and feeders.
  3. Branch circuit wiring, wiring devices and connections to all equipment requiring electrical service.
  4. Lighting fixtures completely lamped, including switches, raceways and wiring.
  5. Emergency egress/exit illumination system.
  6. Low voltage lighting control system and programming.
  7. All required incidental work, such as roof flashing, electrical testing, title 24 acceptance testing, and temporary power.
  8. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the the drawings.
  9. It is the intent of the drawings and specifications that systems be complete and, except as otherwise noted, be ready for operation.

**1.02 RELATED WORK**

- A. Not used.

**1.03 INCORPORATED DOCUMENTS**

- A. Requirements of the General Conditions, and Supplementary Conditions apply to all work in this Section, unless modified herein.
- B. Published specifications, standard tests or recommended methods of trade, industry or government organizations apply to work of this Section where cited by abbreviations noted below, unless modified herein.
1. 2025 California Code of Regulations.
  2. 2025 California Building Standards Administrative Code, Part 1, Title 24, C.C.R.

3. 2025 California Building Code (CBC), Part 2, Title 24, C.C.R. (Based on 2024 International Building Code with 2025 California Amendments).
4. 2025 California Electrical Code (CEC), Part 3, Title 24, C.C.R. (Based on 2017 National Electrical Code with 2025 California Amendments).
5. California Energy Code, Part 6, Title 24, C.C.R.
6. 2025 California Fire Code (CFC), Part 9, Title 24, C.C.R. (Based on 2024 International Fire Code with 2025 California Amendments).
7. 2025 California Green Building Standards (CALGreen) Code, Part 11.
8. American Society of Civil Engineers 7-22 (ASCE/SEI), Minimum Design Loads for Buildings and Other Structures.
9. Underwriters' Laboratories, Inc. (UL).
10. Local Utility Company regulations.

C. All State and Municipal Codes and Ordinances.

#### 1.04 CONDITIONS AT SITE:

- A. Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.
- B. Lines of other services that are damaged as a result of this work shall promptly be repaired at no expense to the Owner to the complete satisfaction of the Owner.

#### 1.05 QUALITY ASSURANCE

- A. Conformance:
  1. All work shall conform to the applicable requirements of Article 1.3 above.
  2. The Contractor shall notify the Architect, prior to submission of bid, about any part of the design, which fails to comply with abovementioned requirements.
  3. If after contract is awarded, minor changes and additions are required by aforementioned authorities, even though such work is not shown on the drawings or covered in the specifications, they shall be included at Contractor's expense.
- B. Coordination:
  1. The Contractor shall become familiar with the conditions at the job site, and with the drawings and specifications and plan the installation of the electrical work to conform with the existing conditions and that shown and specified so as to provide the best possible assembly of the combined work of all trades.

2. The Contractor shall work out in advance all "tight" conditions, involving all trades and if found necessary, supplementary drawings shall be prepared by this Contractor, for the Architect's approval, before work proceeds in these areas. No additional costs will be considered for work, which must be relocated due to conflicts with the work of other trades.
3. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.

#### 1.06 SUBMITTALS

A. Product Data:

1. Within 15 days after award of the Contract, submit:
  - a. Complete electrical, lighting, and signal systems material list of all items proposed to be furnished and installed under this Division. Provide manufacturers data sheets for all devices, raceways, fixtures, equipment, and related products to be used for the Division 26 work.
  - b. Manufacturers' specifications and other data required demonstrating compliance with the specified requirements.
  - c. Manufacturers' recommended installation procedures which, when approved by the Architect, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.
2. Shop Drawings: Furnish shop drawings and/or equipment cuts for the following:
  - a. Light fixtures including lamps and ballasts
  - b. Main Switchboard, distribution switchboards, distribution panels, panel boards, and transformers. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents.
  - c. Scaled drawings of equipment layout in all the electrical and telecom rooms.
  - d. Disconnect switches
  - e. Low voltage lighting control system
3. Test Reports:
  - a. Factory Tests: As specified for specific equipment.
  - b. Field Tests: Performance tests as specified for specific equipment.
  - c. Megger Tests: As specified under TESTING.
  - d. When series rated circuit breakers are used, provide a letter from the manufacturer of the equipment confirming that U.L. series rating exists for all protective devices. State the

available fault current from the Utility Company and indicate that the overcurrent devices exceed the available fault current at the respective point of protection.

- e. Special Seismic Certification documentation as per CBC Section 1616A and ASCE/SEI 7-22 requirements for all equipment defined as 'critical' with an importance factor of 1.5 in Paragraph 1.10.M.3 of this Section.
  - f. Manufacturer's Seismic Certification or Project-Specific Design of Supports and Attachments for all other equipment and fixtures as per CBC Section 1616A and ASCE/SEI 7-22 requirements.
4. Maintenance and Operating Manuals:
- a. Systems Description: Description of operating procedures.
  - b. Controls: Diagrams and description of operation of each system.
  - c. Equipment: Manufacturer's brochures, ratings, certified shop drawings, maintenance data, and parts lists with part numbers. Mark each sheet with equipment identification number and actual installed condition.
  - d. Materials and Accessories: Manufacturer's brochures, parts lists with part numbers, and maintenance data where applicable. Mark each sheet with identification number of system and location of installation.
  - e. The Maintenance and Operation Manual shall be presented in a bookmarked PDF file with tabbed sections as stated below. Provide all information in each section as stated below.
    - 1) 26 2400:
      - (a) Insert the approved submittals for the main switchboard and panelboards, and for medium voltage switchgear and transformers if specified herein and/or indicated on the drawings.
      - (b) Provide the names, addresses and telephone numbers of the manufacturer and the two closest manufacturer's representatives of the equipment.
    - 2) 26 2400:
      - (a) Insert the approved submittals for the transient voltage surge suppression equipment.
      - (b) Insert all operating instructions.
      - (c) Provide the names, address and telephone numbers of the manufacturer and the closest manufacturer's representative of the equipment.
      - (d) Include the manufacturer's recommended maintenance of the equipment.
    - 3) 26 5101:

- (a) Insert the approved submittals for the light fixtures.
  - (b) Highlight the lamp type that was installed for each light fixture.
  - (c) Provide the names, address and telephone numbers of the manufacturer and the closest manufacturer's representative for each light fixture.
- 4) 26 5101:
- (a) Insert the approved submittals for the motion sensing light control equipment.
  - (b) Insert all operating instructions.
  - (c) Provide the names, address and telephone number of the manufacturer and the closest manufacturer's representative of the equipment.
  - (d) Include the manufacturer's recommended maintenance of the equipment.
- 5) 26 5700:
- (a) Insert the approved submittals for the low voltage lighting control equipment.
  - (b) Insert all operating instructions.
  - (c) Provide the names, address and telephone number of the manufacturer and the closest manufacturer's representative of the equipment.
  - (d) Include the manufacturer's recommended maintenance of the equipment.
- 6) 26 0800:
- (a) Insert all systems testing results.
5. Record Documents: "As-builts": As specified under Paragraph 3.2 of this Section.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all trades.
- B. Delivery and Storage: Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with approved manufacturers' recommendations.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.
- D. This Contractor shall personally, or through an authorized representative, check all materials upon receipt at jobsite for conformance with approved shop drawings and/or plans and specifications.

#### **1.08 SCHEDULING/SEQUENCING**

- A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet the construction schedule, together with any special handling charges, shall be borne by this Contractor.
- B. The Contractor shall coordinate production and delivery schedule for all Owner-supplied equipment with the equipment suppliers to ensure that all Owner-supplied equipment is delivered to site in coordination with the construction schedule and in such a manner as to cause no delays in completion of the Contract as scheduled.

#### 1.09 REQUIREMENTS

- A. The contract drawings indicate the extent and general arrangements of the conduit wiring systems, etc. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable, and within thirty-five (35) days after award of the electrical contract.
- B. Unless material list and data is received as a complete and all-inclusive submittal within the stipulated time all items shall be provided as specified, with no deviations permitted.
- C. Any and all additional costs incurred by the substitution of electrical material or equipment, or installation thereof, whether architectural, structural, plumbing, mechanical or electrical, shall be borne by the Contractor under this Section.
- D. Burden of proof of equality of any substitution for a specified product is the responsibility of this Contractor.
- E. Where required by Architect to ascertain equality of substitute product, Contractor may be requested to provide the specified item and the submitted substitution for comparison, at no additional cost to the Owner.

#### 1.10 SEISMIC CERTIFICATION AND INSTALLATION OF EQUIPMENT

- A. See Architectural and Structural Drawings and Specifications for description of Occupancy Group and Seismic Design Category applicable to this project.
- B. Provide Special Seismic Certification per CBC Section 1616A and ASCE/SEI 7-22 for all equipment and components defined as critical with an importance factor 1.5 in Paragraph 1.10.M.3 of this Section.
- C. Special Seismic Certification shall require either certification through approved analytical method or approved shake table testing in accordance with Section 13.2.5 of ASCE/SEI 7-22 or experience data in accordance with Section 13.2.6 of ASCE/SEI 7-22.
- D. Manufacturer's Seismic Certification or Project-Specific Design of Supports and Attachments for all other equipment and fixtures as per CBC Section 1616A and ASCE/SEI 7-22 requirements.
- E. Provide seismic restraints per applicable code and as specified or indicated. Design restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.
- F. Rigidly Supported Equipment, Conduits, and Raceways.

G. Lighting:

1. Fasten lighting fixtures in suspended ceilings to ceiling grid system or otherwise support from the structures as specified herein and as per details indicated on the Drawings. Comply with National Electric Code (NEC) Article 410.
2. Suspension systems for light fixtures shall allow fixtures to swing a minimum of 45 degrees from the vertical in all directions without contacting obstructions.
3. Free-swinging suspension systems shall have a safety wire or cable attached to the fixture and structure at each support. The wire shall be capable of supporting four times the weight of the lights.
4. Point-source fixtures: provide slack wires to structure at two diagonal corners.
5. Troffer fixtures: provide hold-down clip at each fixture corner, and slack wires to structure at two diagonal corners.
6. Supports for pendants: Provide diagonal seismic wire restraints per Code.

H. Components supported by chains or simply suspended from above are not required to meet lateral seismic force requirements and seismic relative displacement requirements provided that they cannot be damaged or cannot damage any other component when subject to seismic motion. They must have ductile or articulating connections to the structure at the point of attachment.

I. Electrical Cabinets:

1. Electrical cabinet design shall conform to National Electrical Manufacturers Association (NEMA) 250 and NEMA ICS6 standards. Cutouts in the lower shear panel that do not appear to have been made by the manufacturer and significantly reduce the strength of the cabinet are not permitted unless analysis demonstrates that the remaining strength is sufficient.
2. Single freestanding cabinets shall have a minimum of four anchor bolts designed and specified with one anchor located at each corner.
3. Multiple sections of cabinets or enclosures located adjacent to each other shall be bolted together. Minimum acceptable bolting is three bolts in the front and back along the adjacent vertical faces - 6 bolts total.
4. Multiple cabinets bolted together to form a section or line-up shall have at a minimum two anchors specified for each cabinet, one at the front and one at the rear.
5. Base anchorage shall be installed through anchor points designated by the Manufacturer. The largest bolt diameter for the anchor hole provided in the equipment shall be provided.
6. A latch or fastener to prevent opening during an earthquake event and damaging the cabinet and internal components shall secure all doors.
7. Slide-out components in electrical control panels, etc., shall have a latching mechanism to hold contents in place.

8. Attached cabling shall have adequate slack or flexibility between the cabinets and surrounding structure supporting the conduit to preclude severing of the cabling due to differential seismic displacements.
- J. The design load shall include the effects of loading on the equipment imposed by attached utility or service lines that are also attached to separate structures.
- K. The attachment of additional external items is not permitted unless such items have either been provided by the Manufacturer, or analysis shows that their effects are supported by design.
- L. Conduit and their connections shall be constructed of ductile materials unless otherwise approved by the Architect. Conduits and their connections constructed of non-ductile materials (e.g., cast iron, no-hub pipe and plastic) shall have brace lengths reduced to one-half that allowed for ductile material.
  1. All trapeze assemblies supporting conduit shall be braced to resist CBC design forces considering the total weight of the elements on the trapeze.
  2. Seismic restraint spacing shall be in accordance with hanger spacing.
- M. Critical Equipment:
  1. Design with importance factor of 1.5.
  2. Provide Special Seismic Certification for all equipment and components and their installation per CBC and ASCE/SEI requirements.
  3. Critical Equipment shall include the following:
    - a. Low Voltage Relay Panels on Emergency Power
    - b. Other Signal Systems equipment.
- N. Seismic Design Submittals: For all Critical Equipment included in paragraph 26 05 00.1.10.M.3.
  1. The Manufacturer of each item of critical equipment shall arrange for the testing or analysis by an approved agency of each component and assembly and its mounting system or anchorage.
  2. The Manufacturer shall submit a Certificate of Compliance for each item for approval by the Architect and by the Authority Having Jurisdiction.
  3. Based on Manufacturer's approved submittal, Contractor shall retain the services of a State of California registered Structural Engineer to prepare final installation details and drawings for equipment supports and attachments.
  4. Submit drawings of the equipment showing dimensions, support equipment, connections, and the proper anchorage locations.
  5. Equipment weight and weight distribution (e.g., center of gravity in elevation and plan).
  6. Thickness of sheet metal bases.

7. Seismic Vibration Isolation Devices: Manufacturer's product information indicating class and type. Indicate load ratings as published manufacturer's data or shop drawings. Indicate proper orientation of devices on plan.
  8. Inertia bases and support frames.
  9. Specific details of restraints including anchor bolts and welds and maximum load at each location.
- O. Independent Supports: An independent means of secure support shall be provided for all wiring methods in non-fire-rated assemblies. Where independent support support wires are used, they shall be distinguishable by color, tagging, or other effective means.

#### **1.11 DESCRIPTION OF DEMOLITION AND REPLACEMENT WORK**

- A. This project includes the demolition and replacement, modification, or enhancement of existing facilities. As such, the project scope for this contractor shall include all associated electrical, lighting, and signal system upgrades and demolition/removal work at the existing buildings(s) and/or site. The intent is that all systems will be complete and functional at the completion of this contract and that all old systems, equipment, feeders, circuits, wiring, and related devices (no longer used) be completely and neatly removed. Where discrepancies between the drawings and existing conditions are noted, the Architect or Owner shall be notified immediately for resolution.
- B. As with every renovation project, the electrical work will include (and require) exploration and other field work on a daily basis to complete the new designed equipment and connections within the constraints of the existing building and existing site conditions.
- C. The contractor shall include as part of the base bid, sufficient labor hours to provide such exploration and field work throughout the duration of the project. Change orders for miscellaneous coordination of existing conditions will not be approved unless specific and latent conditions are uncovered that warrant such additional compensation or require additional work not shown on the drawings or included in the specifications, or implied by the designed conditions.
- D. New raceways and wiring to new and renovated equipment are to be installed unless otherwise noted. Where raceways are installed in accessible concealed locations (i.e. unfinished spaces or electrical / mechanical / attic spaces), EMT with wire shall be used. Where new wiring is required to be routed through existing walls and ceilings that cannot readily be accessible for new conduit, MC cable or flex conduit and wiring may be installed, fished through and secured in each space as required by Code. Non-metallic sheathed cable shall not be utilized on this project.
- E. All new raceways shall be installed concealed and all new equipment installed flush, unless otherwise noted on the drawings or in these specifications.

#### **1.12 GUARANTEE**

- A. This Contractor shall guarantee that all work executed under this Section will be free from defects of materials and workmanship for a period of one (1) year or as per the General Conditions of this project, whichever is longer. Dates shall be from the date of final acceptance of the building. The contractor shall further guarantee that he will, at his own expense, repair and replace all such defective work, and all

other work damaged thereby, which becomes defective during the term of the guarantee. Such repair or replacement shall be guaranteed for one (1) year from the date of repair or replacement.

### 1.13 PERMITS AND INSPECTIONS

- A. This Contractor shall arrange for and obtain all required permits and inspections.
- B. Do not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

### 1.14 IDENTIFICATION

- A. Switchgear, switchboards, distribution panels, and feeder circuit breakers therein, panels, disconnect switches, motor starters, transformers, motor disconnect switches, cabinets, switches for any motorized or electric powered equipment and other apparatus used for the operation of, or control of circuits, appliances or equipment, shall be properly identified by means of engraved laminated plastic descriptive nameplates mounted on apparatus using stainless steel screws. Nameplates shall have white letters with black background and be submitted to the Architect for approval. Cardholders in any form are not acceptable.
- B. Provide p-touch style labeling of circuit designations for all receptacles on the project.
- C. Each branch circuit of panel boards to have a permanently fixed number with load directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of equipment supplied by breakers. Where changes are made to existing panelboards, newly typewritten circuit directories shall be prepared to replace existing directories.
- D. Provide label on all motors: "Caution. Automatic equipment. May start at any time."
- E. Provide silk-screened or engraved identification labels on all switch box covers identifying specific loads that are not readily apparent to the user, including electroshades, projection screens, exhaust fans, audio-visual controls, etc.. Submit proposed labels to Architect for approval prior to manufacture of labels.
- F. Provide identification of all pull boxes, junction boxes, and conduit stub-ups on the project as outlined below:
  - 1. For Power Feeders:
    - a. Stencil cover with identifying circuit number.
    - b. Lettering 1" high.
    - c. Color of lettering black.
    - d. Place lettering on cover in neat manner; run parallel to long sides of box.
  - 2. For branch circuits, grounding, communication, signal, and control systems boxes and blank conduit stub-outs:
    - a. Paint inside back of each j-box, front of each cover, and ends of each blank conduit stub-out with identifying system color as listed below:

- 1) 277/480-volt Orange
- 2) 120/208-volt Blue
- 3) Telephone/Data Grey
- 4) Ground system Green
- 5) Fire Alarm Red
- 6) Lighting control Orange/White
- 7) Clock/Speaker Brown
- 8) Audio/Visual Yellow
- 9) Security White
- 10) Emergency Power 277V Orange/Red
- 11) Emergency Power 120V Blue/Red

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Refer to applicable Division 26 Sections for complete products specifications.

### **2.02 MATERIALS**

- A. Materials of the same type or classification, used for the same purpose, shall be the product of the same manufacturer.

### **2.03 ACCEPTABLE MANUFACTURERS**

- A. Materials shall be of make mentioned elsewhere in this specification. All materials shall be the best of their several kinds, perfectly new and approved by the Underwriters' Laboratories.
- B. Where material, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of desired quality, style and utility and shall be the basis of the bid. Materials so specified shall be furnished under the contract unless changed by written approval of the Architect. Where two or more designations are listed, choice shall be optional with this Contractor, but this Contractor must submit his choice for final approval.

### **2.04 POSTED OPERATING INSTRUCTIONS**

- A. Furnish approved operating instructions for systems and equipment where indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment

including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instruction exposed to the weather. Operating instruction shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

## **2.05 CATALOGED PRODUCTS/SERVICE AVAILABILITY**

- A. Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonable convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

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

### **3.02 PREPARATION**

- A. Drawings:
  - 1. The general arrangement and location of wiring and equipment is shown on the electrical drawings and shall be installed in accordance therewith, except for minor changes required by conflict with the work of other trades.
  - 2. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.
  - 3. Drawings indicate the circuit and panel which supplies each device or fixture. Provide and install conduit and conductors to make all connections from panel to nearest device and from first device to additional devices on same circuit. Conduit size and fill shall satisfy NEC requirements. Two or three different phases supplied by a 3-phase panel may share a single neutral only if circuit positions are adjacent in the panel. Do not exceed 4 #12 or 3 #10 conductors in a 1/2" conduit, 7 #12 or 5 #10 in a 3/4" conduit, and 11 #12 or 9 #10 in a 1" conduit, unless otherwise noted. Provide common handle-tie on breakers for multi-wire branch circuits (with common neutral), per NEC. If more than three current carrying conductors are installed in one conduit, conductor size shall be increased as required per NEC. Do not share neutrals for branch circuit runs to electronic equipment or where noted on the drawings.

4. Drawings indicate the location of all light switches. Where fixtures in a room are controlled by more than one switch, the same lower case letter is drawn adjacent to a switch and each fixture controlled by that switch. Where no lower case letter is adjacent to a switch, all fixtures in the room are controlled by that switch. Provide and install conduit and wire from fixture to switch and between fixtures as required to accomplish switching shown. Do not route branch circuit wiring for light fixtures through switch boxes. Where dimming controls are specified, provide required dimming control wiring in addition to power wiring from control device to all controlled light fixtures. Provide separate conduit for dimming control wiring unless otherwise indicated on the drawings.
  5. Drawings indicate location of all signal outlet boxes. Provide and install conduit system as required and complete system wiring, unless otherwise noted.
  6. Control wiring is generally not shown on the plans. Contractor shall refer to control diagrams and provide and install all wiring and raceways required to make all interconnections.
  7. All branch circuit wiring No. 12 or No. 10 as noted, all control wiring No. 14, except as noted next to "slash marks" on the drawings, or as noted under "Wire," as specified herein.
  8. All dimensions, together with locations of doors, partitions, etc. are to be taken from the Architectural Drawings, verified at site by this Contractor.
  9. Maintain "as-built" records at all times, showing the exact location of concealed conduits and feeders installed under this contract, and actual numbering of each circuit. Upon completion of work and before acceptance can be considered, this Contractor must forward to the Architect, updated CAD plans, corrected to show the electrical work as actually installed.
  10. All standard 20A branch circuit conductors shall be #12 minimum for up to 75 linear circuit feet, #10 minimum for up to 150 linear circuit feet, and #8 for runs longer than 150 feet.
- B. Measurements: Before ordering any material or closing in any work, verify all measurements on the job. Any differences found between dimensions on the drawings and actual measurements shall be brought to the Architect's attention for consideration before proceeding.

### **3.03 FIELD QUALITY CONTROL**

- A. All workmanship shall be first class and carried out in a manner satisfactory to and approved by the Architect.
- B. This Contractor shall personally, or through an authorized and competent representative, constantly supervise the work and so far as possible keep the same foreman and workmen on the job throughout.

### **3.04 COORDINATION**

- A. In electrical rooms, where electrical equipment is located at walls with brace framing, provide and install steel channel supports for mounting of electrical equipment away from wall to avoid conflict with brace framing. Steel channel supports shall be unistrut or equal, and shall include all channels, bases, fittings, etc., as required for a complete installation.

- B. In electrical rooms, Contractor is responsible for installation of electrical equipment within the space provided. Contractor shall provide ¼" scale plans of electrical room layouts, and elevations of steel channel supports (where used or required) of electrical equipment for review and approval prior to any installation or rough-in

### **3.05 INSTALLATION/APPLICATION/ERECTION**

- A. All electrical raceways and devices shall be installed concealed (for raceways) and/or flush mounted (for devices), unless otherwise noted. Provide cut-in boxes and "fish" flexible MC or flex conduit and wire through existing walls to remain, unless shown otherwise on plans. Cut and patch to facilitate such installation to match adjacent and original finish.
- B. All cutting, repairing and structural reinforcing for the installation of this work shall be done by the General Contractor in conformance with the Architect's requirements.

### **3.06 EMERGENCY POWER SOURCES**

- A. All emergency source circuits shall be installed in separate raceways (from normal power), per 2017 NEC 700.10(B), or the applicable code at the time of permitting.

### **3.07 TEMPORARY LIGHTING AND POWER**

- A. Provide and install temporary lighting and power systems for the duration of construction, of adequate size to accommodate the required lighting and power loads. Coordinate with other trades to insure adequate sizing.
- B. Provide distribution equipment as required to support all construction activities.

### **3.08 FIRE STOPPING AND FIRE RATED PENETRATIONS**

- A. All electrical equipment mounted in, on, or through fire rated construction shall be installed to maintain the fire rating of the construction.
- B. Provide fire rated pads (or other suitable assembly) around all electrical junction boxes in fire rated walls/ceilings/floors to maintain the fire rating.
- C. Provide fire rated construction around all recessed light fixtures and/or panel board / cabinets mounted flush in fire rated walls to maintain the fire rating. Coordinate depth of construction with other trades to avoid conflicts.
- D. Conduit sleeves shall be provided as a means of routing cables through fire-rated walls or floors. Openings in sleeves and conduits used for system cables and those which remain (empty) spare shall be sealed with an approved fireproof, removable sagging material. Sleeves which pass vertically from floor to floor shall be sealed in a similar manner using an approved re-enterable system. Additional penetrations through rated assemblies necessary for passage of tel/data wiring shall be made using an approved method and permanently sealed after installation of cables.

### **3.09 ADJUSTING AND CLEANING**

- A. All electrical equipment, including existing equipment not "finish painted" under other sections, shall be touched up where finished surface is marred or damaged.
- B. All equipment, lighting fixtures, etc., shall be left in clean condition, with all shipping and otherwise unnecessary labels removed there from.

**3.10 SCHEDULES**

- A. Coordination: Coordinate installation of electrical items with the schedule for other work to prevent unnecessary delays in the total Work.

**3.11 WARNING SIGN MOUNTING**

- A. Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

**3.12 PAINTING OF EQUIPMENT**

- A. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.
- B. Field Applied: Paint electrical equipment as required to match finish or meet safety criteria. Painting shall be as specified in the respective equipment section.

**3.13 TESTS**

- A. Testing and inspection: See Section 26 08 00 - Testing.

**END OF SECTION**

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SECTION 26 08 00

TESTING

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Work Included in This Section: All materials, labor, equipment, services, and incidentals necessary to perform the testing and inspection of the electrical work, including but not limited to the general systems noted below:
1. Grounding system.
  2. Lighting system.
  3. Distribution system.
  4. Fire Alarm system.
  5. Lighting control system.
  6. Lighting emergency inverter system.
  7. Telecommunications system.
  8. Title 24 Acceptance Testing.
  9. Test additional work where specified in other Sections of these specifications or where indicated on the drawings (provide all materials, labor, equipment, services, and incidentals necessary to perform the testing and inspection of this Electrical Work):
    - a. Medium voltage switchgear, transformers, and distribution system.
    - b. Emergency Generator and Automatic Transfer Switches.
    - c. UPS system.
    - d. Photovoltaic system.
    - e. Clock/Speaker system.
    - f. Classroom Audio Visual system.
    - g. Security system.
    - h. Assisted Listening system.
    - i. Two-way communications system for areas of refuge.
    - j. Kitchen controls.

- k. Data Center controls.
- l. Close-out photographs.
- 10. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- 11. All work shall comply with Sections 26 05 00 and 26 27 00.
- 12. In addition to the general system tests and inspections indicated above, the Contractor shall perform the following inspections and tests. The Contractor shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections:
  - a. System Grounding.
  - b. Switchgear, Switchboards, Distribution Panels, Panelboards.
  - c. Feeders.
- 13. The purpose of these tests is to assure that all tested electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.

#### **1.02 APPLICABLE CODES, STANDARDS, AND REFERENCES**

- A. All inspections and tests shall be in accordance with the International Electrical Testing Association - Acceptance Testing Specifications ATS-2021 (referred to herein as NETA ATS-2021).

#### **1.03 QUALIFICATIONS**

- A. Qualifications of the Testing Firm shall be as listed in NETA ATS-2021.

### **PART 2 - PRODUCTS**

#### **2.01 THIS ARTICLE DOES NOT APPLY TO TESTING.**

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Final test and inspection to be conducted in presence of the Authority having Jurisdiction (AHJ) or Inspector of Record (IOR). Test shall be conducted at the expense of, and managed by, the Contractor, at a mutually agreed time. Submit written test report of all tests, with test result values and overall outcome.
- B. All portions of the electrical installation shall be inspected and tested to ensure safety to building occupants, operating personnel, conformity to code authorities and Contract Documents, and for proper system operation.

#### **3.02 INSPECTIONS AND TESTS**

- A. Tests: Field tests shall be performed and reports submitted, as per Section 26 05 00, Part 1.

1. Final Inspection Certificates: Prior to final payment approval, deliver to the Owner, with a copy to the Architect, signed certificates of final inspection by the appropriate local authority having jurisdiction.
2. Grounding System:
  - a. All ground connections shall be checked and the entire system shall be checked for continuity. The resistance of grounding electrodes in the system shall be measured using a 3 point fall-of-potential method. The maximum ground resistance shall be three ohms. If the measured ground resistance exceeds three ohms, install (1) additional ground rod, bonded and interconnected with the grounding electrode system.
  - b. Ground tests shall meet or exceed the requirements of the National Electric Code.
3. Lighting Systems:
  - a. The interior and exterior lighting systems shall be checked for proper local controls and operation of entire installation, including the operation of the low voltage lighting control system.
4. Power Distribution System:
  - a. Test main switchboard, distribution boards, panel boards, and transformers for grounds and shorts with mains disconnected from feeders, branch circuits connected and circuit breakers closed, all fixtures in place and permanently connected and grounding jumper to neutral lifted and with all wall switches closed.
  - b. Test each individual circuit at each panelboard with equipment connected for proper operation. Inspect the interior of each panel.
  - c. Check verification of color coding, tagging, numbering, and splice make-up.
  - d. Verify that all conductors associated with each circuit are in same conduit.
  - e. Demonstrate that all lights, jacks, switches, outlets, and equipment operate satisfactorily and as called for.
  - f. Perform megger tests of all new distribution system feeders prior to energizing. All Cables failing megger tests or with evidence of damage shall be removed and replaced in their entirety (no splices), at no cost to the Owner. Damaged cables may not be field repaired without specific approval of the Architect.
5. Lighting Control System: Verify that all equipment, components, and devices function as specified. Refer to Section 26 5101 for additional testing requirements.
6. Where the following systems are specified herein and/or indicated on the drawings, verify that all equipment, components, and devices function as specified and meet all additional testing as described in related individual Sections of this specification:
  - a. Medium voltage switchgear, transformers, and distribution system.

- b. Emergency Generator and Automatic Transfer Switches.
  - c. UPS system.
  - d. Photovoltaic system.
  - e. Clock/Speaker system.
  - f. Classroom Audio Visual system.
  - g. Security system.
  - h. Assisted Listening System.
  - i. Two-way Emergency Communications System: Verify and test all equipment, components, and devices for proper operation and function.
  - j. Kitchen Controls: Verify and test all equipment, components, and devices for proper operation and function.
  - k. Data Center Controls: Verify and test all equipment, components, and devices for proper operation and function.
- B. Title 24 Acceptance Testing: Contractor shall complete the requirements for Title 24 Acceptance Testing, as per CA Title 24, Part 6.
- 1. Perform testing requirements as per Title 24 Lighting Acceptance requirements. Testing shall include construction inspection of installed controls, occupancy / motion sensor testing, manual daylighting controls testing, automatic time switch controls testing, and demand response system interface, as applicable.
  - 2. Complete and submit all required forms for complete Acceptance Testing.
  - 3. Acceptance tests must be performed or overseen by certified Acceptance Test Technicians.
  - 4. Obtain required review and approval of Acceptance Forms to allow final certificate of occupancy to be granted.
- C. Close-Out Photography:
- 1. Photographs and/or video documentation shall be taken before, during, and after project construction. Project areas to be documented shall include, but not limited to the following:
    - a. Underground applications to facilitate minimizing damage to underground utilities, etc..
    - b. Behind the wall applications to facilitate minimizing damage to piping, cabling, etc..
    - c. Above ceiling applications, especially where not visible or limited accessibility.
    - d. Other areas for overall assistance with the progress of the various installations that may or may not be recorded or seen before, during, and/or after field-walk.

- e. Photographic documentation shall assist in case of incomplete, incorrect, and/or missing as-built information.
- f. Photographic and video documentation shall be provided as part of the closing/ close-out documentation package to the District.

**END OF SECTION**

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**SECTION 26 24 00**

**SERVICE AND DISTRIBUTION SYSTEM**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Work Included in This Section: All materials, labor, equipment, services and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below.
- B. Temporary power for construction.
- C. Main switchboard, Motor Control Centers, Distribution Switchboards, Distribution Panels, Transformers, Distribution System, Panel Boards, Grounding, and Overcurrent Protective Devices.
- D. All required incidental work, such as excavating, backfilling, testing, and temporary power.
- E. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- F. All work shall comply with Sections 26 05 00 and 26 27 00.

**1.02 RELATED WORK**

- A. Division 09 - Finishes
- B. Division 23 - Heating, Ventilating, and Air Conditioning

**1.03 SUBMITTALS**

- A. Comply with the provisions of Section 26 05 00 - Submittals.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Refer to Section 26 05 00, Part 2 - Products
- B. All new equipment shall match existing.
- C. List of Equipment Manufacturers:
  - D. Switchboards and Motor Control Centers
    - 1. Eaton, Schneider-Square D, ABB, Siemens, Industrial Electric Manufacturing (IEM).
  - E. Panelboards and Distribution Panel
    - 1. Same manufacturer as Main Switchboard.

F. Dry-type Transformers

1. Eaton, Schneider-Square D, ABB, Siemens, Maddox, MGM.

**2.02 MATERIALS**

A. Grounding:

1. Provide and install grounding system as noted on the drawings.
2. Grounding electrode conductor: bare stranded copper type, #4/0 minimum.
3. Install ground wires in rigid conduit.
4. All grounding electrode conductor connections "thermite" or "cad-weld" welded.
5. Use approved pressure type solderless connector or use fusion welding for all connections to and bonding of grounding electrode system. All connections shall be visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment: Minimum #4/0.
6. Furnish and install solid copper or copper-clad 5/8" x 10'-0" ground rod(s). Where multiple ground rods are shown, install a minimum of 20'-0" apart. Install ground rods in accessible boxes with covers. Furnish and install 2-#4/0 bare copper cables between multiple ground rods and main switchboard ground bus.
7. Terminate grounding conduits at equipment with ground bushing, with ground wire connected through bushing.
8. Provide No. 12 stranded (green) THHN conductor from outlet box to ground screw of every receptacle.
9. Ground all isolated sections of metallic raceways.
10. Provide #12 minimum stranded (green) THHN conductor sized per NEC, or as noted, connected continuously throughout branch circuit for all circuits, bonded to panel ground bus, and to all electrical devices and equipment enclosures.
11. Grounding electrode installed as follows:
  - a. Place #4/0 bare copper cable in foundation trench; tensioned, supported in such a manner that it cannot be less than two (2) inches from bottom or side of concrete when foundation concrete is poured; not less than one hundred feet of conductor. Embed in foundation with a loop at approximate center, brought out at top of foundation at location of building service equipment for connection to service equipment and for bonding to other parts of the grounding electrode system.
  - b. Use approved pressure type solderless connector or use fusion welding for all connections to grounding electrode. Connection visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment: Minimum #4/0.

- c. Connect grounding electrode system to metallic water service entry metallic cold water pipe (if available) with nonferrous clamp and bare copper cable (sized as required) in conduit. Connection shall be accessible for inspection.
- d. Connect grounding electrode system to effectively grounded building steel as indicated on the drawings. Use exothermic weld, connection shall be accessible for inspection.
- e. After installation, test system using the three-point fall of potential method only. Record results and submit to Architect for approval. If resistance to ground exceeds three ohms, install an additional ground rod, bonded and interconnected to the grounding electrode system.
- f. Connect ground bar of separately derived systems (e.g all dry-type transformers) to effectively grounded building steel at the closest possible accessible location, or if building is concrete, or the steel is not effectively grounded, to the main switchboard ground bus: Use #4/0 copper conductor for all connections.

B. Panelboards:

- 1. Surface (or flush where indicated on the drawings) mounted, with branch circuits as indicated on the drawings.
- 2. Enclosures: code gauge galvanized sheet steel with welded full flange end pieces, stretcher-leveled steel trim, backpan and door.
- 3. Bussing of copper with silver-plated contact surfaces.
- 4. Provide a 200% rated neutral bus for panels supplied with 200% rated feeders (incoming or outgoing). Refer to single line riser diagram for feeder ratings.
- 5. Properly identify the "high leg" of 4-wire delta connected systems as required by NEC 384-3(e).
- 6. Trims on surface-mounted cabinets secured with nickel-plated screws with cup washers, bottom of all trims to have lugs for resting on cabinet flange.
- 7. Panels shall be 20 inches minimum in width, provided with approved gutter space, barriers and adjustable supports. Doors mounted with concealed hinges provided with combination spring latch and lock. Doors and trims and surface mounted cabinets primed and finished with one coat baked on gray enamel. All visible panel enclosures and covers in finished (occupied) areas shall be painted to match adjacent wall finish.
- 8. Breakers on same phase to be aligned horizontally. Each panel provided with quantity (5) spare handle locks. Install handle locks on all breakers serving fire alarm equipment.
- 9. Each branch circuit of panelboards to have a permanently fixed number with one word directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of outlets controlled by breakers. Color code mains and each breaker terminal, same as conductor insulation.
- 10. Each panel shall be equipped with a copper ground bus.

11. All panels shall be fully bussed to accept future circuit breakers, with breaker hardware provided where indicated on the drawings.
12. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents - no deviations permitted.
13. Room names and numbers on the panel schedules shall be based on the actual or final room names as approved by the Owner.

C. Circuit Breakers:

1. General: Circuit breakers shall be molded case rated for 480 or 240 volts, multiple or single pole and amperage rating as shown on the drawings, bolt on, manually operated with "de-ion" arc chutes.
2. For all circuit breakers rated 1,200 Amps or higher, provide an arc energy reduction measure in compliance with NEC 240.87(B), to reduce arc clearing time.
3. Main circuit breaker shall be rated to interrupt the available short circuit current - 65,000 amps RMS unless otherwise indicated on the drawings.
4. Distribution circuit breakers shall be rated for the amps interrupting capacity noted on the drawings or U.L. series rated with the main circuit breaker.
5. Branch circuit breakers shall be rated for the amps interrupting capacity or U.L. series rated with the distribution and main circuit breakers, General Electric type THQB or equal, minimum 10,000 A.I.C for 120/208 volt; type TEY or equal, minimum 14,000 A.I.C for 277/480 volt.
6. Where mechanical equipment is U.L. listed for overcurrent protection with fuses or HACR type circuit breakers, provide fuses where a fused switch is shown. Where the overcurrent protection is a circuit breaker provide HACR, (Heating, Air-Conditioning and Refrigeration) type.
7. Provide switch rated type "SWD" circuit breakers where the circuit breaker is used as a switching device in a panelboard.

**PART 3 - EXECUTION**

**3.01 REFER TO SECTION 26 05 00 FOR DETAILS OF WORK UNDER THIS SECTION.**

**3.02 INSTALLATION/APPLICATION/ERECTION**

- A. Excavate and trench as necessary for the electrical installation, and when the work has been installed, inspected and approved, backfill all excavations with clean earth from excavation, or imported sandy soil in maximum 8" (eight-inch) layers, moisten and machine tamp to 95% compaction, and restore the ground and/or paving or floor surfaces to their original condition.
- B. Switchboards and Distribution Panels Installation: Mount as detailed on the drawings.

**3.03 TESTS**

**O'Mahony & Myer**

**Highlands Elementary School**  
Portable Replacement Project  
PUSD Project No.: 26-003  
Pittsburg Unified School District

A. Testing and Inspection: See Section 26 08 00 - Testing.

**END OF SECTION**

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**SECTION 26 27 00**

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**BASIC ELECTRICAL MATERIALS AND METHODS**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below:
  - 1. Raceways, feeders, branch circuit wiring, wiring devices, safety switches and connections to all equipment requiring electric service.
- B. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- C. All work shall comply with Section 26 05 00.

**1.02 RELATED WORK**

- A. Division 09 - Finishes
- B. Division 23 - Motors and Mechanical Equipment Installation

**1.03 SUBMITTALS**

- A. Comply with the provisions of Section 26 05 00.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Refer to Section 26 05 00, Basic Electrical Requirements, Part 2 - Products.
- B. List of Equipment Manufacturers:
- C. Conduit and Conduit Fittings
  - 1. Allied Tube and Conduit, Wester Tube and Conduit, LTV Steel Tubular, National Electric Products, AFC, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, Killark Electric Manufacturing Company, Raco, VAW Aluminum Company, Bridgeport, Steel City, Thomas & Betts, Carlon, O.Z. Gedney, Appleton, Regal.
- D. Wire and Cable (600V)
  - 1. American Wire Company, General Wire and Cable Corporation, Okonite Company, Rome Cable Corporation, Cerrowire, American Insulated Wire, AFC Cable Systems, Essex, Simplex Wire and Cable Company, Southwire.

- E. Solderless Lugs and Grounding Connections
  - 1. Burndy Engineering Company Inc, O.Z. Gedney Company Inc, Penn Union Electric Corporation, Thomas and Betts Company Inc.
- F. Pull Boxes, Gutters, Special Cabinets
  - 1. Schneider-Square D, Columbia Electric Manufacturing Company, ABB, Eaton, Siemens, Circle AW.
- G. Outlet Boxes
  - 1. Appleton Electric Company, Killark Electric Manufacturing Company, Lew Electric Fittings Company, National Electric Products Corporation, Raco, Steel City Electric Company, Carlon, Bowers.
- H. Wiring Devices
  - 1. Leviton, Arrow-Hart, Cooper, Hubbell, Lutron, Bryant.
- I. Conduit Racks, Hangers
  - 1. Killark Electric Manufacturing Company, Caddy, National Electric Products Corporation, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, VAW Aluminum Company, Superstrut, B-Line.
- J. Safety Switches (Disconnect and Fusible)
  - 1. Schneider-Square D, Eaton, ABB, Siemens.
- K. Fuses
  - 1. Bussman Manufacturing Company, Chase-Shawmut Company.
- L. Firestopping
  - 1. 3M, Nelson.

## 2.02 MATERIALS

- A. Raceways: Only the raceways specified below shall be utilized on this project. Substitutions shall be pre-approved in writing. All bare conduit ends (stub-ups or stub-outs) shall be provided with bushed ends or manufactured insulated throat connectors:
  - 1. Rigid Type - hot dip galvanized or sherardized steel, use on all exterior locations, below grade or in concrete slab, and to 18" on either side of structural expansion joints in floor slabs, with completely watertight, threaded fittings throughout. Compression fittings are not acceptable.
    - a. All rigid steel conduit couplings and elbows in soil or concrete or under membrane to be ½ lap wrapped with Scotch #50 tape and threaded ends coated with T&B #S.C.40 rust inhibitor prior to installation of couplings.

- b.  $\frac{1}{2}$  lap wrap all rigid steel conduit stub-ups from slab or grade to 6" above finished grade level with Scotch #50 tape.
  2. In lieu of rigid steel conduit for power and control raceways and branch circuit conduits in soil or concrete slabs, "Schedule 40" PVC with Schedule 80 PVC conduit elbows and stub-ups may be used with code size (minimum No. 12) ground wire. A "stub-up" is considered to terminate 6" above the finished surface.
    - a. Schedule 80 PVC conduit shall be used in all concrete footings or foundations and to 18" of either side of footings or foundation walls.
    - b. Schedule 80 PVC conduit shall be used in all concrete masonry unit (CMU) walls or columns.
    - c. All conduit runs in concrete floor slabs (where allowed) shall be installed to comply with all applicable CBC and structural codes to maintain the structural integrity of the floor slab. Where conflicts occur, alternate routing shall be provided at no additional cost to the Owner.
    - d. Where schedule 80 PVC is coupled to schedule 40 or other raceways with differing interior dimensions, each end shall be reamed with a reaming tool to reduce the edge profile for protection of the passing conductors during the pull.
  3. Intermediate metal conduit may be used in all exposed interior locations, except that electrical metallic tubing may be used in some locations as noted below. Utilize steel compression type fittings for all exposed conduit runs, unless otherwise noted. Die-cast zinc fittings are unacceptable.
  4. Electrical metallic tubing shall be used exposed in interior electrical and mechanical rooms, in interior unfinished spaces, and in interior concealed and furred spaces, made up with steel watertight or steel set screw type fittings and couplings. EMT shall not be used in under-building crawl spaces or other areas subject to moisture. Set screws shall have hardened points. Die-cast zinc fittings are unacceptable.
  5. Surface mounted rectangular steel raceways and boxes: use for all surface mounted installations, unless otherwise noted (all catalog numbers listed are Wiremold - equals allowed) - color Ivory, unless otherwise noted;
    - a. #V500 for branch power runs on ceilings and walls (used with V500 series straps, elbows, connectors and V5000 series low profile boxes and covers).
    - b. #2000 or 2400 low profile for larger power run requirements on ceiling or walls (used with V2000 series straps, elbows, connectors and low profile boxes and covers).
    - c. #2400D for dual service power and tel/data run requirements (used with divided V2400 boxes and covers).
  6. Surface mounted rectangular non-metallic dual service raceways; Wiremold #5400 (Ivory) or equal with all required compatible activation covers, bezels, inserts, and blank plates for a complete installation. Refer to drawings for outlet quantities in raceway and feed points. All raceway fed flush from rear with horizontal j-boxes, unless otherwise noted.

7. Use flexible conduit for all motor, transformer and recessed fixture connections, minimum ½"; "Seal tite" type used outdoors and in all wet locations, provide with code size (minimum No. 12) bare ground wire in all flexible conduit.
8. All conduit cuts (factory or field cut) shall be perfectly square to the length of the conduit and cut ends shall be reamed with a reaming tool to provide a smooth edge to the passing conductors and to remove all burs and scrapes. Use of a hand file is not acceptable.
9. All electrical raceways shall be installed concealed, unless otherwise noted. Cut and patch to facilitate such installation to match adjacent and original finish. All exposed conduits, where required, shall be installed parallel to building members.
10. All emergency source circuits shall be installed in separate raceways (from normal power), per 2017 NEC 700.10(B), or the applicable code at the time of permitting.
11. Where existing conditions preclude the installation of EMT in existing walls to remain, provide and install cut-in type boxes and "fish" flexible MC or flex conduit and wire through existing walls to remain, unless shown otherwise on plans.
12. Fasten conduits securely to boxes with locknuts and bushings to provide good electrical continuity.
13. Provide chrome escutcheon plates at all exposed wall, ceiling and floor conduit penetrations.
14. Support individual suspended conduits with heavy malleable strap or rod hangers; supports for ½ inch or ¾ inch conduit placed on maximum 7-foot centers; maximum 10-foot centers on conduits 1 inch or larger.
15. Support multiple conduit runs from Kindorf B907 channels with C-105 and C-106 straps.
16. Conduit bends - long radius.
17. Flash conduits through roof, using approved roof jack; coordinate with General Contractor.
18. To facilitate pulling of feeder conductors, install junction boxes as shown or required.
19. All empty conduits on the project shall be provided with a nylon pull rope to allow pulling of future conductors intended for the specific raceway. Provide plastic wire-tie style nameplate tags on each end of pull rope with printed identification of conduit use and the location of the opposite end of the rope. Pull ropes for telecommunications service conduits shall meet the utility company requirements.
20. Where conduits pass through structural expansion joints in floor slab, rigid galvanized conduit shall be used 18" on either side of joint, complete with Appleton expansion couplings and bonding jumpers, or equal. All above grade expansion joint crossings shall also utilize expansion joint couplings or flex conduit transitions as required for each particular installation. Installed condition shall allow for a minimum deflection of raceway and wire (in any direction) equal to the structural expansion joint dimension (building to building). No solid conduits shall be allowed to cross expansion joints without proper provisions for building and seismic movement.
21. Minimum cover of conduits in ground outside of building - 36 inches, unless otherwise noted.

22. Provide and install exterior wall conduit seals and cable seals in the locations listed below. Coordinate installation and scheduling with other trades:
  - a. Conduit seals through exterior wall or slab (below grade): O.Z. Gedney series "FSK" in new cast in concrete locations, series "CSM" in cored locations.
  - b. Conduit seals through exterior wall or slab (above grade): O.Z. Gedney series "CSMI."
  - c. Cable seals at first interior conduit termination after entry through exterior wall or slab: O.Z. Gedney series "CSBI." Coordinate quantity of conductors at each location.
- B. Outlet Boxes and Junction Boxes. Verify all backbox requirements with devices to be installed prior to rough-in.
  1. One piece steel knockout type drawn boxes, unless otherwise noted, sized as required for conditions at each outlet or as noted.
  2. Flush-mounted boxes equipped with galvanized steel raised covers for device mounting flush with finished surface. Provide extension rings as required on all acoustical or additional wall treatment areas to bring top of cover flush with finished surface (coordinate with architectural drawings). Devices shall be capable of being tightly mounted to boxes without distorting or bending device or mounting hardware.
  3. Boxes for fixture outlets: 4-inch octagon or larger as required, or as noted.
  4. Switch and receptacle outlets - not smaller than 4-inch-square in furred walls, with raised cover for single device; ganged where required.
  5. Outlet and switch boxes for wet locations, cast aluminum FS or FD type with cast aluminum gasketed spring lid cover. Weatherproof "Bell" type boxes are not acceptable.
  6. All connectors from conduit to junction or outlet boxes shall have insulated throats. Connectors shall be manufactured with insulated throats as integral part. Insertable insulated throats are unacceptable.
  7. Outlet boxes for telecommunications, 4" square or larger as required or noted, multi-ganged for voice, data, and other services where indicated on the drawings.
  8. Conduit Bodies: Malleable iron type, with lubricated spring steel clips over edge of conduit body, O-Z/Gedney type EW, or equal.
  9. Pull boxes: All site pull boxes shall be flush in-ground concrete, with engraved covers identifying service use (i.e. electrical, communications, etc.). Boxes shall be Nema 250, Type 6, outside flanged, with recessed cover for flush mounting, by Christy or equal, with required depth to provide box and conduit depths shown or required.
    - a. Provide concrete covers for all boxes in planted or paved areas (up to available concrete cover size).

- b. Provide galvanized steel covers for all larger boxes (when concrete is not available), or in traffic areas. No cast iron covers.
  - c. Provide bolted covers and slab bottoms (with grouted perimeter) or vault type boxes for all electrical distribution and signal system pull boxes used for site distribution, to prevent rodent entry. No collar type boxes with dirt or gravel bottoms
  - d. Provide drain hole at bottom of all vault type boxes, with loose aggregate base below, for proper drainage.
  - e. All covers to be completely flush with finished adjacent surfaces.
  - f. Provide galvanized steel H20 rated covers and installation of box rated for H20 in all traffic areas.
  - g. Provide pullboxes per utility company specifications for all electrical primary and secondary services and for telecommunications service runs. Verify exact size and type prior to order with each utility company.
- C. Wire and Cable (line voltage and signal systems):
- 1. 600-volt class where used for or run with line voltage power wiring, insulation color coded, minimum No. 12 AWG for power branch circuits, No. 14 for power control circuits, and wiring size and type as directed by signal system manufacturer for each signal system.
  - 2. All conductors shall be copper.
  - 3. Size and insulation type:
    - a. Standard locations: #12 to #1 AWG: THWN for wet locations and THHN for dry locations. #1/0 through #4/0 AWG: XHHW (55 Mils). 250MCM and larger: XHHW (65 Mils). All wire sizes used shall be based on a 75 degree insulation rating, unless specifically used with 90 degree rated breakers and devices.
    - b. All wiring (power and signal) installed underground between buildings, or in wet or damp locations, shall be outside listed and rated for wet locations.
    - c. High temperature and non-standard locations: Provide wire type and insulation category suitable for area of use as defined in NEC table 310-13.
  - 4. Conductors No. 8 and larger and as otherwise noted on drawings shall be stranded. Power conductors No. 12 and No. 10 shall be solid or stranded. Power conductors No. 14 or smaller shall be solid.
  - 5. Provide signal system wiring for each system to meet the system manufacturers requirements and recommendations for each device or equipment type. Signal wiring systems shall be provided with shielding and/or insulation type and cable quantities as directed by the manufacturer, and meet all NEC requirements for locations used.

6. Install all wiring branch circuits and feeders (low voltage and line voltage) in conduit unless noted otherwise on the drawings. Contractor shall mandrel all feeders and pass a "sock" (or utilize other suitable means) through each raceway prior to pull to remove all water and construction debris. All raceways shall be completely clear of any obstructions or debris and all cut ends shall be reamed, prior to pull. Utilize pulling compound on all runs to insure minimum friction and pulling tension.
7. Megger test all feeders prior to energizing. See section 26 08 00 for additional information.
8. Approximately balance branch circuits about the neutral conductors in panels.
9. Connections to devices from "thru-feed" branch circuit conductors to be made with pigtails, with no interruption of the branch circuit conductors.
10. Neutral conductor identified by white outer braid, with different tracers of "EZ" numbering tags used where more than one neutral conductor is contained in a single raceway.
11. Neatly arrange and "marlin" wires in panels and distribution panelboards with "T and B Ty-rap" or approved equal plastic type strapping.
12. All wire and cable shall bear the Underwriters' Label, brought to the job in unbroken packages; wire color-coded as follows:
 

a.	Voltage	Phasing	A	B	C	N
b.	120/208	3PH4W	Black	Red	Blue	White
c.	2083PH	3W	Black	Red	Blue	--
d.	277/480	3PH4W	Brown	Orange	Yellow	White
e.	4803PH	3W	Brown	Orange	Yellow	--
f.	120/240	3PH4W	Black	Red	Blue	White
g.	2403PH	3W	Black	Red	Blue	--
13. The equipment grounding conductor shall be insulated copper; where it is insulated, the insulation shall be colored green.
14. Label each wire of each electrical system in each pull box, junction box, outlet box, terminal cabinet, and panelboard in which it appears with "EZ" numbering tags indicating the connected circuit numbers.
15. Properly identify the "high leg" of 4-wire delta connected systems (in each accessible location) as required by NEC 110.15 and 230-56.
16. Provide permanently affixed adhesive labels with machine printed lettering (min. 1/8" high) at junction boxes serving fixtures that are supplied by (2) electrical sources (i.e. normal and emergency lighting). Label to read "CAUTION - This light fixture is powered by (2) separate

sources. The normal power source breaker and the emergency power source breaker must be turned off before servicing this light fixture."

17. Install feeder cables in one continuous section unless splices are approved by Architect. Exercise care in pulling to avoid damage or disarrangement of conductors, using approved grips. No cable shall be bent to smaller radius than the spool on which it was delivered from the manufacturer. Color code feeder cables at terminals. Provide identifying linen tags in each pullbox.
- D. Switches: Model numbers are Hubbell, color to be selected by architect, unless otherwise noted. All switches to utilize screw terminals for wire connections - no plug-in terminations:
1. Single Pole - No. HBL1221
  2. Two Pole - No. HBL1222
  3. Three Way - No. HBL1223
  4. Momentary contact - No. HBL1557
  5. Momentary contact Keyed - No. HBL1556L
  6. Keyed, - No. HBL1221L
  7. Pilot Light (on with load on) - Hubbell No. 1221-PLC
  8. Motor Rated Double Pole (30A) - Hubbell No. 7832
  9. Motor Rated Three Pole (30A) - Hubbell No. 7810.
  10. Low voltage Data line switches - Refer to lighting control system (for compatibility)
- E. Plates: Leviton, or equal, except as noted:
1. The color of all faceplates shall match the color of the devices installed under/in the faceplate, except as specifically noted otherwise.
  2. For flush outlet boxes, for switches, and receptacles: nylon, color to be selected by architect, unless otherwise noted.
  3. Plates for surface-mounted outlets: galvanized steel unless otherwise noted.
  4. Weatherproof duplex receptacle plates for exterior locations with ground fault interrupter receptacles in type FS or FD boxes - Hubbell #WPFS26 or compatible equal. Verify cover compatibility with box type and device installed.
  5. Weatherproof "in-use" cover, vertical or horizontal mount, for exterior with GFCI receptacles. Die-cast metal alloy, TayMac MX series or equal with openings to match installed devices.

6. Locking plates for duplex receptacles where noted; Pass & Seymour #WP26-L (non- weather proof).
  7. Locking plates for duplex exterior GFCI receptacles (or in wet or damp locations); Heavy duty cast aluminum flush cover with locking latch and key, Pass & Seymour #4600 with appropriate mounting plate for type of device installed. Coordinate backbox requirements and finished wall trim-out with wall installer prior to rough-in to insure an adequate and neat trim appearance upon completion.
- F. Equipment Disconnects: All disconnects shall be located to allow proper code required clearance in each area. Locations shown on drawings are diagrammatic only. The contractor shall coordinate exact locations in the field (with other trades) prior to rough-in to insure proper clearances.
1. Motor Disconnect Switches and Safety Switches: General Electric Company Heavy Duty Type "THD", cover interlocked with operating handle so that cover cannot be opened with switch in closed position and switch cannot be closed with cover in open position. 240V or 480V rating, single or multi-pole as required or as noted on drawings, in Nema 1 enclosure indoors or Nema 3R enclosure outdoors unless otherwise noted. Provide dual element motor circuit fuses sized as recommended by equipment manufacturer (for final equipment actually installed).
  2. Code required disconnects: Provide a local disconnect in addition to the branch circuit protection device for all equipment as required by code (whether shown or not). Disconnects shall consist of a motor rated switch (or disconnect) for all motor loads less than 3/4HP or other suitable disconnect sized to match branch circuit conductors and load current of equipment, with number of poles as required.
- G. Lugs and Connectors: Thomas and Betts "lock-tite", for No. 4 and larger wire; 3M "Scotchlock" fixed spring screw-on type wire connectors with insulator for No. 6 and smaller wire.
1. All splices shall be made up with screw-on type connectors - no plug-in or push-in style connectors acceptable. Wires shall be solidly twisted together with electricians pliers before screw-on connector is installed to ensure a proper connection in the event of wire nut failure. No exceptions.
  2. Connectors listed or labeled for "no wire twisting required" are not an acceptable substitute for actual wire twisting.
  3. Utilize porcelain type connectors in all high temperature environments (above 105 degrees Celsius).
- H. Splice Insulation: "Scotch" electrical tape with vinyl plastic backing or rubber tape with protective friction tape for interior work.
1. Splices in electrical cables of 600 volt insulation class in underground system duct shall be made only in accessible locations such as pullboxes, light pole handholes, etc., using a compression connector on the conductor and by insulating and waterproofing (for exterior and underground locations) by one of the following methods:
    - a. Cast type splice insulation shall be provided by means of a molded casting process employing a thermosetting epoxy resin insulating material which shall be applied by a gravity poured

method or by a pressure injected method. The component materials of the resin insulation shall be in a packaged form ready for convenient mixing after removing from the package. Do not allow the cables to be removed until after the splicing material has completely set.

- b. Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be applied. When the mold is in place around the joined conductors, the resin mix shall be prepared and poured into the mold. Do not allow cables to be moved until after the splicing materials have completely set.

I. Identification: Refer to Section 26 05 00.

J. Firestopping: as manufactured by 3M Fire Protection Products or equal.

1. Fire-rated and smoke barrier construction: Maintain barrier and structural floor fire and smoke resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound vibration absorption, and at other construction gaps.
2. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall penetrations. Systems or devices must be asbestos free.

### **PART 3 - EXECUTION**

#### **3.01 REFER TO BASIC ELECTRICAL REQUIREMENTS - SECTION 26 05 00 FOR WORK UNDER THIS SECTION.**

#### **3.02 TESTS**

A. Testing and Inspection: See Section 26 08 00 - Testing.

**END OF SECTION**



- » Built to UL 508A standards
- » Rated for 120 to 480 volts
- » Small, low-profile and attractive with no exposed fasteners
- » Self-contained
- » Meets EUSERC Requirements (Electric Utility Service Equipment Requirements Committee)

TESCOFLEX<sup>®</sup> low-profile, unmetered underground service distribution and control pedestals are used for a wide variety of municipal applications. The 27-000 Unmetered TESCOFLEX<sup>®</sup> low-profile, slimline pedestal provides power distribution rated for 120 to 480 volts; single phase or three phase applications; and 1, 2 or 3 pole main breakers. The 27-000 model is also available in a metered pedestal.

TESCOFLEX<sup>®</sup> pedestals are constructed of the highest grade of materials using hot-dipped galvanized steel, stainless steel, or aluminum. Our coatings will withstand the most stringent testing applied to outdoor enclosures and meet or exceed state specifications. The wide range of options we can provide will allow for maximum utilization of your space.

Call us and see for yourself how Tesco Controls can make a difference on your next project.

## Applications

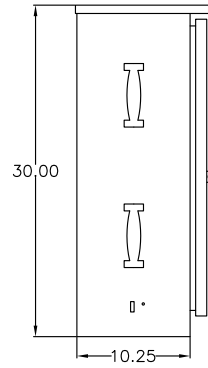
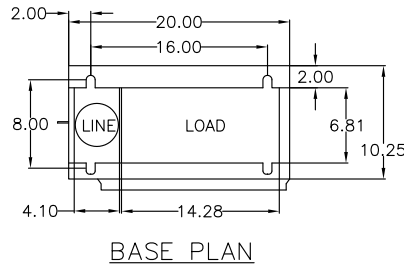
- » Airport Beacon Systems
- » Athletic Field/Stadium Lighting
- » CATV Termination
- » Cellular
- » Flashing Beacon Controls
- » Landscape Irrigation
- » Parking Lot Lighting
- » Residential Applications
- » Sign Lighting
- » Street Lighting
- » Storm Water Lift Stations
- » Tennis Court Lighting & Control
- » Traffic Signals
- » Waste Water Lift Stations
- » Water Pumping Plants

## Features

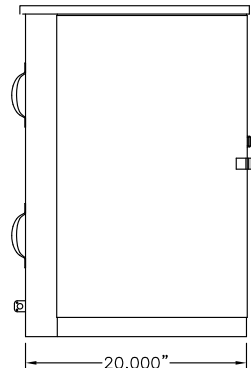
- » Low Profile, Slimline
- » No exposed fasteners
- » Hot-dipped galvanized, aluminum, or stainless steel
- » Durable all-welded construction
- » UL approved copper cable bussing and control wiring
- » Circuit breakers cable-in cable-out type
- » Factory wired and tested before shipment
- » Meets EUSERC requirements (Electric Utility Service Equipment Requirements Committee)
- » Built to UL 508A Standards
- » Vandal-resistant doors with hasp, stress rated to 2,000 lbs

## Component Options

- » Breakers
- » Contactors
- » Switches
- » Relays
- » Photo cells
- » Time clocks
- » Time delays
- » Transformers
- » Motor controls
- » Fans
- » Heaters
- » Thermostats
- » Terminal blocks
- » Flasher controls
- » Receptacles
- » Generator Receptacles
- » Transfer Switches



LEFT SIDE



FRONT VIEW

## Enclosure Options

- » May also be metered
- » Custom colors available
- » Additional sections may be added to house more components
- » Additional options for vandalism protection available

## Specifications

- » Main breakers shall be 1, 2 or 3 pole
- » May be rated 120 volt up to 480 volt
- » Single or three phase
- » Continuous welded seams
- » Fully framed side hinged outer door for flush fit with top drip lip & closed cell neoprene flange compressed gaskets
- » Separate pull section
- » Service enclosure interior is fabricated from cold rolled steel & powder coated white
- » Full length deadfront with stainless steel hinge and ¼ turn latch & knurled knobs
- » Deadfront hinged on same side as the front door and opens up to 120 degrees
- » Completely prewired in the factory
- » Wiring will be to NEMA IIB standards showing external connections & external equipment

*Custom options are available. Contact Tesco Controls, Inc. for more information:*

916-395-8800 | sales@tescocontrols.com | www.tescocontrols.com | 8440 Florin Road, Sacramento, CA 95828

## 27-000 UNMETERED TESCOFLEX SERVICE PEDESTAL

### OPTIONS

Enclosure Catalog Number	Description	Enclosure Size W x H x D inch	*Millimeter
27-000 UM	Unmetered Service Pedestal	20 x 30 x 10.25	508 x 762 x 260

\*Millimeter dimensions are approximate and for reference only; do not convert metric dimensions to inch.

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**SECTION 26 51 01**

**LIGHTING**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Luminaires (i.e., lighting fixtures): Refer to the Luminaire Schedule and provide a complete and working facility Lighting System. Catalog numbers in the Luminaire Schedule are design series references and may not represent the exact catalog number as specified or as required for particular installations. Provide complete luminaires to correspond with the number of LEDs, power supply, wattage, mounting hardware, ceiling type, trim, size, and special requirements as specified in the Luminaire Schedule for each luminaire type. Additional features, accessories, and options specified, described, scheduled, or necessary for installation shall be included.
- B. LEDs and power supplies.
- C. Lighting controls, including occupancy sensors. See Section 26 57 00 for Low Voltage Lighting Control System.
- D. Exit and Emergency Egress lighting where indicated and where required.

**1.02 INCORPORATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this section.
- B. Section 26 05 00 and 26 27 00 apply to all work in this section.
- C. Division 03: Concrete (Bases for pole-mounted luminaires as noted in Luminaire Schedule).

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 26 05 00.
- B. Submit (6) six sets of submittals for review by the project team unless otherwise noted in these specifications. The submittals shall include the following information:
  - 1. Product Index: The following information shall be included in the product index.
    - a. Luminaire Type. The index shall list, in alphabetical order, each luminaire type per the Luminaire Schedule.
    - b. Manufacturer's Catalog Number. Outstanding information required to make a complete catalog number shall be clearly identified in the index.
    - c. Where a pole is included with the luminaire, include the catalog number of the pole in addition to that of the luminaire.

- d. LED Data. Provide the Manufacturer's name for each LED array including wattage, color temperature, lumen output, and color rendering index.
2. Manufacturer's literature for every luminaire listed on the Luminaire Schedule.
  - a. Catalog Information:
    - 1) Luminaire Data Sheet: The manufacturer's cut sheet shall include the following:
      - (a) Photometrics: Candlepower distribution curve or table with horizontal readings at 0, 22.5, 45, and 90 degrees and vertical readings from 0 to 180 degrees in 5 degree increments in accordance with the Illuminating Engineering Society published test procedures.
      - (b) Catalog Number Nomenclature
      - (c) Coefficient of Utilization Tables
      - (d) Luminaire Line Drawing
- C. For Any Luminaires Substituted For Those Specified:
  1. Provide Independent Testing Laboratories, Inc., or equal, photometric test report for each Luminaire type and lamp combination listed on the Luminaire Schedule. Test reports shall be based on Illuminating Engineering Society published test procedures and shall contain polar coordinate candlepower distribution curves in five lateral planes for luminaires with asymmetric distributions and luminaire luminance data for vertical angles above 45 degrees from nadir. Test results shall indicate luminaire efficiency for the lamp and aperture assembly specified. luminaires with efficiencies more than 2% below the values of specified luminaires are not acceptable and will be rejected.
  2. Provide photometric calculations for each room or area where a substituted luminaire is proposed. Such calculations shall be made using comprehensive lighting software, such as AGi32, and include point-by-point illuminance values at IES recommended heights, average illuminance, and maximum-to-minimum and average-to-minimum uniformity ratios. Room dimensions, configurations (including sloping ceilings), room surface reflectances, light loss factors, and heights of suspended luminaires shall match the heights specified in the contract documents.
  3. Due to the variety of lumen outputs and light distributions of LED Luminaires, substitutions will require additional review on the part of the Engineer or Architect to ascertain the equivalency of the substituted luminaires. Substitutions will be reviewed to determine their aesthetic, construction, and photometric equivalency to maintain similar design impact and performance in their intended environment. The Engineer and Architect have not included such unknown and unquantifiable review time in their scope of work and are not compensated by the Owner for such services. The Contractor shall reimburse the Engineer and Architect for labor costs to review substitutions.
  4. Prior approval does not guarantee final approval by the Engineer. The Contractor shall be responsible for providing luminaires that meet or exceed the quality and performance of the

specified products in their entirety. All deviations in quality and performance from the specified products must be listed and individually signed off by the engineer.

5. The Owner reserves the right to reject a proposed substitution based on their agent's professional judgment as to the utility, quality, performance, visual appropriateness, or finish of substitutions.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site and store in unopened cartons in protected location. Inspect products immediately and report all damage accordingly.

#### **1.05 GUARANTEE AND WARRANTIES**

- A. All work performed under this section must be guaranteed to be free of defects in products or workmanship for one year after date of acceptance by Owner, unless noted otherwise in General Conditions.
- B. Warranties:
  1. Electronic power supplies must be warranted against failure for at least five years after date of substantial completion.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. Provide luminaires as indicated in Luminaire Schedule; if conflict exists between Luminaire Schedule and Specifications, the more stringent requirement shall take precedence.
- B. Provide luminaires new and complete with mounting accessories, junction boxes, trims, and lamps.
- C. Provide products with UL labels appropriate to intended installation conditions, or with labels from other testing laboratories whose results are acceptable to local inspector, showing compliance with UL standards. Labels must be concealed from normal viewing angles.
- D. All products of same type by same manufacturer.

#### **2.02 SOLID STATE LUMINAIRES**

- A. Finish:
  1. Baked enamel finish (except when otherwise specified).
    - a. Concealed interior surfaces (this applies to interior hardware, circuit boards, etc.) matte black.
    - b. Concealed exterior surfaces: matte black.
    - c. Visible surfaces: color and texture as specified below for each luminaire type or as selected.
- B. Light Emitting Diode (LED) requirements:

1. Correlated color temperature (CCT) for phosphor-coated white LEDs must have one of the following designated CCTs, as specified on the Luminaire Schedule, and fall within the following binning standards.
  - a. 2300K or 2400K defined as 2345 +/- 175K or 2305 +/- 175K
- C. Luminaire Efficacy:
  1. Luminaire efficiency shall be measured using IESNA LM-79-08 standard for electrical and photometric measurements of solid state lighting products.
  2. Manufacturer shall provide published luminaire efficacy, which is defined as luminaire light output divided by luminaire input power measured in a 25 degree Celsius environment. Efficacy shall include power supply, thermal, optical, and luminaire losses.
- D. Thermal Management:
  1. Solid state luminaire shall not exceed LED manufacturer's maximum junction temperature requirements when operated in-situ at luminaire manufacturer's maximum ambient operating temperature and 100% light output.
  2. Solid state luminaires shall be thermally protected using one or more of the following thermal management techniques:
    - a. Metal core board
    - b. Gap pad
    - c. Internal monitoring firmware
  3. Solid state luminaire housing shall be designed to transfer heat from the LED board to the outside environment.
- E. Power Supplies (LED Drivers) requirements:
  1. Power factor of 0.90 or greater for primary application
  2. Input current shall have Total Harmonic Distortion (THD) of less than 20%.
  3. Minimum operating temperature of minus 20 degrees Celsius or below when used in luminaires intended for outdoor applications.
  4. Operating frequency equal to or greater than 120 Hz.
  5. Operate with sustained input variations of +/- 10% (voltage and frequency) with no damage to the driver.
  6. Tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.
  7. Output shall be regulated to +/- 5% across published load range.

8. Class A sound rating.
9. Outputs shall have current limiting protection.
10. Operate LEDs at constant and regulated current levels. LEDs shall not be overdriven beyond the diode manufacturer's specified nominal voltage and current.
11. Inrush currents not exceeding peak currents specified in NEMA 410.

F. System Installation

1. Hardwired connections to solid state luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
2. All solid state luminaires (100% of each lot) shall undergo a minimum eight-hour burn-in test during manufacturing. Solid state lighting installations shall be UL Listed as a low-voltage lighting system including, but not limited to, luminaire, power supply, controller, keypad, and wiring.

G. Warranty

1. Luminaires, drivers, and controllers for solid state lighting systems shall be covered by a five-year warranty against defects in workmanship or material. Warranty shall include in-warranty service program providing for payment of authorized labor charges incurred in replacement of inoperative in-warranty equipment.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. If obstructions are encountered which prevent installation of luminaires according to drawings, notify Architect immediately and do not proceed until conflict has been resolved.
- B. Coordinate the location of any exposed conduit used to feed luminaires with the Architect prior to installation.

**3.02 INSTALLATION**

A. General:

1. 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 Stds. 486 A and B, and the National Electrical Code.
2. Clean luminaires of dirt and construction debris upon completion of installation. Clean fingerprints and smudges from lenses.
3. Remove and replace luminaires that may have been damaged during construction at no additional cost to the Owner.
4. Protect installed luminaires from damage during remainder of construction period.

5. Provide equipment grounding connections for luminaires as indicated. Tighten connections to comply with tightening torques specified in UL 486 A to assure permanent and effective grounds.
6. All junction box cover plates for the lighting branch circuit system shall be clearly marked with a permanent ink felt pen identifying the branch circuit and control relay (panel number, circuit number, lighting control cabinet designation and control relay number) contained in the box.
7. Provide permanently affixed adhesive labels with machine printed lettering (min. 1/8" high) at junction boxes serving luminaires that are supplied by (2) electrical sources (i.e. normal and emergency lighting). Label to read "CAUTION - This luminaire is powered by (2) separate sources. The normal power source breaker and the emergency power source breaker must be turned off before servicing this luminaire."

**3.03 DELIVERY, STORAGE, & HANDLING:**

- A. Deliver luminaires in factory-fabricated containers or wrappings, which properly protect luminaires from damage. Inspect luminaires immediately upon delivery to ensure correct shipment without damage.
- B. Store luminaires in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, laid flat and blocked off ground.
- C. Handle luminaires carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new. Protection wrapping on louvered (parabolic) luminaires shall not be removed until luminaires are ready for operation.

**3.04 SEQUENCING AND SCHEDULING:**

- A. General:
  1. Coordinate with other work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of luminaires with other work.
  2. Sequence lighting installation with other work to minimize possibility of damage and soiling during remainder of construction.

**3.05 PROJECT CLOSEOUT**

- A. Clean luminaires and remove plaster and paint spatters.
- B. Clean fingerprints and dust from downlight reflectors. Refer to manufacturer's instructions.
- C. Verify that luminaires and controls are working at time of final acceptance by Owner.
  1. Repair or replace lighting control devices that are inoperable.
  2. Repair or replace LED modules or entire LED luminaires that are inoperable.
  3. Repairs and/or replacements shall be at no additional cost to the Owner.

- D. Test emergency lighting system for 90 minutes in presence of Owner's representative, check each luminaire for proper operation at end of 90-minute test, then recharge for 24 hours and briefly test each luminaire again for proper operation.
- E. Install and aim adjustable lighting as directed by Architect.
  - 1. Provide personnel, lifts, ladders, and walkie-talkies as required.
  - 2. Aiming will occur at night, outside of normal working hours, at times as approved by the Architect.
- F. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hardcover binder. Deliver to Architect. After review, Architect will deliver one copy to Owner.
  - 1. One complete set of approved submittals, including product data and shop drawings.
  - 2. Luminaire cleaning instructions, including chemicals to be used or avoided.
  - 3. Instructions for code-required testing and maintenance of emergency lighting system.

**END OF SECTION**

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**SECTION 26 56 01**

**SITE LIGHTING**

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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Luminaires
- B. LEDs
- C. Power Supplies/Drivers
- D. Poles
- E. Pole bases
- F. Controls and wiring

**1.02 SYSTEM DESCRIPTION**

- A. Furnish all labor, materials, apparatus, tools, equipment transportation, temporary construction and special or occasional services as indicated on the Drawings or described in these Specifications and as required to make a complete working site lighting system.
- B. Illumination levels shall be in accordance with recommendations by the Illuminating Engineering Society (IES).

**1.03 INCORPORATED DOCUMENTS**

- A. Section 26 05 00 and Section 26 51 01 apply to all work in this Section.

**1.04 SUBMITTALS**

- A. Catalog Information:
  - 1. Luminaire (each type) with photometric pattern.
  - 2. Contactors.
  - 3. Ballast or Driver (each type)
  - 4. Poles.
  - 5. Brackets.
- B. Shop Drawings.
- C. Manufacturer's Recommendations: Provide two copies before material is used.
  - 1. PVC conduit joints and junctions.

2. Solvent welding directions.
  3. Pole bases.
- D. Laboratory Test: Determine soil density relationships for compaction of backfill material in accordance with ASTM D1557, Method D.

## **PART 2 - PRODUCTS**

### **2.01 MATERIAL AND EQUIPMENT**

- A. Provide new materials and equipment unless otherwise specifically indicated or specified. Materials shall be listed by Underwriter's laboratories, Inc. (U.L.) and bear evidence of such approval where applicable.
- B. Luminaires: Site luminaires shall be weatherproof. Reflectors and refractors shall provide the light configuration indicated and conforming to IES recommendations.
- C. Luminaires and poles shall be finished in epoxy enamel designed to withstand the effects of salt spray. Lens shall be securely attached to the lens frame for security during maintenance and relamping.
- D. Lighting Contactors: NEMA ICS 2. Electrically operated, magnetically held unit in NEMA enclosure, rated poles and ratings as indicated on Drawings. Units shall have silver alloy double breaker contacts and coil clearing contacts and shall require no arcing contacts. On-off selector switch.
- E. Poles, Brackets, Pole Bases and Attachments: Shall be rated for service with wind velocities of 100 mph considering the force exerted by the wind on the maximum exposure of the fixture luminaire selected.
- F. Poles shall be anchor base type round, height and style as indicated, finished to match luminaire, complete with handhole and gasketed cover, anchor bolts with leveling and locking screws, grounding connection, and matching base cover.
- G. Concrete pole bases shall be cast-in-place reinforced concrete as indicated with anchor bolts and conduit entries as per manufacturer. Concrete shall be rated 3,000 PSI at 28 day test.
- H. Concrete:
  1. Concrete for electrical requirements shall be at least 3,000 psi concrete with 1-inch maximum aggregate conforming to the requirements of Division 3 for Cast-In-Place concrete.

### **2.02 SOLID STATE LUMINAIRES**

- A. Housing, where applicable:
  1. Steel bonderized or equal rust protected, or aluminum, rigid construction. Minimum gauge thickness shall be as follows:
    - a. Interior locations: No. 20-gauge steel, No. 16-gauge aluminum.
- B. Finish:

1. Baked enamel finish (except when otherwise specified).
  - a. Concealed interior surfaces (this applies to interior hardware, circuit boards, etc.) matte black.
  - b. Concealed exterior surfaces: matte black.
  - c. Visible surfaces: color and texture as specified below for each luminaire type or as selected.
  - d. Exterior luminaire finish: refer to Luminaire Schedule.
  
- C. Light Emitting Diode (LED) requirements:
  1. Correlated color temperature (CCT) for phosphor-coated white LEDs must have one of the following designated CCT's and fall within the following binning standards.
    - a. Amber 2300K or 2400K defined as 23045 +/- 175K, or 24045 +/- 175K
  2. Color spatial uniformity shall be limited to variations in chromaticity for different directions (i.e. changes in viewing angle) within 0.004 from the weighted average point on the CIE 1976 (u',v') diagram.
  3. Color maintenance shall be limited to a maximum change in chromaticity of 0.007 on the CIE 1976 (u',v') diagram over the lifetime of the product.
    - a. Color rendering index: Color rendering index to be determined using ANSI C78.377-2008 and applicable IESNA standards.
    - b. Laboratory tests must be produced using specific module(s)/array(s) and power supply combination that will be used in production.
    - c. Manufacturers must provide a test report from a laboratory accredited by NVLAP or one of its MRA signatories
  4. Lumen depreciation
    - a. Lumen depreciation to be measured using IESNA LM-80-08 standard for IES approved method of measuring lumen maintenance of LED light sources.
    - b. Phosphor coated white LED module(s)/array(s) shall deliver at least 70% of initial lumens for a minimum of 50,000 hours when installed in-situ and operated at 100% output and the maximum specified operating temperature.
    - c. Colored LED module(s)/array(s) shall deliver at least 50% of initial lumens for a minimum of 50,000 hours when installed in-situ and operated at 100% output and the maximum specified operating temperature.
  5. Acceptable LED manufacturers:
    - a. Cree
    - b. Nichia

- c. Osram Opto Semiconductors
- d. Philips Lumileds

D. Luminaire Efficacy:

1. Luminaire efficiency shall be measured using IESNA LM-79-08 standard for electrical and photometric measurements of solid state lighting products.
2. Manufacturer shall provide published luminaire efficacy, which is defined as luminaire light output divided by luminaire input power measured in a 25 degree Celsius environment. Efficacy shall include power supply, thermal, optical, and luminaire losses.

E. Thermal Management:

1. Solid state luminaire shall not exceed LED manufacturer's maximum junction temperature requirements when operated in-situ at luminaire manufacturer's maximum ambient operating temperature and 100% light output.
2. Solid state luminaires shall be thermally protected using one of more of the following thermal management techniques:
  - a. Metal core board
  - b. Gap pad
  - c. Internal monitoring firmware
3. Solid state luminaire housing shall be designed to transfer heat from the LED board to the outside environment.

F. Power Supply/Driver requirements:

1. Power factor of 0.90 or greater for primary application
2. Input current shall have Total Harmonic Distortion (THD) of less than 20%.
3. Minimum operating temperature of minus 20 degrees Celsius or below when used in luminaires intended for outdoor applications.
4. Output operating frequency to be equal to or greater than 120 Hz.
5. Operate with sustained input variations of +/- 10% (voltage and frequency) with no damage to the driver.
6. Tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.
7. Output shall be regulated to +/- 5% across published load range.
8. Class A sound rating.

9. Outputs shall have current limiting protection.
  10. Operate LEDs at constant and regulated current levels. LEDs shall not be overdriven beyond the diode manufacturer's specified nominal voltage and current.
  11. Inrush currents not exceeding peak currents specified in NEMA 410.
- G. Solid State Lighting Controls:
1. Control interface to dimmable power supplies shall consist of one of the following:
    - a. Line Voltage Dimming. Controls to be rated for magnetic or electronic low voltage transformer operation.
    - b. Low voltage (0-10V) control. Controls to be compatible with either current sink or current source operation.
    - c. DMX control
  2. Dimmable LED power supplies shall use pulse width modulation (PWM) to regulate power to LEDs
    - a. Dimmable power supplies shall have 12-bit or greater resolution to obtain flicker-free operation throughout the dimming range.
- H. System Installation
1. Hardwired connections to solid state luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
  2. All solid state luminaires (100% of each lot) shall undergo a minimum eight-hour burn-in test during manufacturing. Solid state lighting installations shall be UL Listed as a low-voltage lighting system including, but not limited to, luminaire, power supply, controller, keypad, and wiring.
- I. Warranty
1. Luminaires, drivers, and controllers for solid state lighting systems shall be covered by a minimum five-year warranty against defects in workmanship or material. Warranty shall include in-warranty service program providing for payment of authorized labor charges incurred in replacement of inoperative in-warranty equipment.

### 2.03 LUMINAIRE CONSTRUCTION

- A. Sheet metal: materials and thicknesses shall be 20 gauge (0.7 mm or 0.027") min., free of dents, scratches, oil-can, or other defects.
- B. Painted luminaires: exposed weld marks, joints, and seams shall be filled and sanded smooth before finishing.
- C. All edges cleaned and dressed to remove sharp edges or burrs.

- D. Extrusions: 1/10" min. wall thickness, smooth and free of tooling lines, with cast end plates that exactly match extrusion profiles.
- E. Castings: smooth, free of pits, scales, gate marks, or blemishes.
- F. Spinings shall have 1/32" min. thickness, smooth, free of spinning lines or blow-back, with clean edges.
- G. Welds: Follow recommendations of American Welding Society. All welds continuous and free of spatter, residue, or warping.
- H. No light leaks visible. Field paint exterior of housing with high temperature paint if necessary.
- I. Exposed end plates and joiners, with concealed fasteners.
- J. Hardware:
  - 1. Steel or aluminum exterior luminaires: stainless steel hardware.
  - 2. Stainless steel luminaires: stainless steel hardware.
  - 3. Copper alloy luminaires: brass hardware.
- K. Raceways: Where used for through wiring, luminaires must be approved for use as raceways.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION:**

- A. Refer to Section 26 27 00, Part 2.2, for wiring and splicing requirements.
- B. Underground cable installation shall conform to National Electrical Code except as otherwise specified or indicated.
- C. Contractor Damage: The Contractor shall promptly cause repairs to be made to any indicated utility lines or systems damaged by his operation.
- D. Under roads and paved areas, ducts shall be EPC-80-PVC polyvinyl chloride conduit.
- E. Cables shall be in one piece without splices between connections except where the distance exceeds the lengths in which the cable is furnished.
- F. Bends in cables shall have an inner radius of not less than 12 times the cable diameter.
- G. Horizontal slack of approximately 3 feet shall be left in the ground on each end of cable runs, on each side of connection and at all points where connections are to be made above ground level.
- H. Earthwork: Earthwork for electrical requirements shall conform to the requirements of Division 31.
- I. Coordinate work with other trades. Pre-ship anchor bolts and templates for use in preparing bases for installation. After leveling luminaires, pack grout between mounting plate and concrete footing. Provide weep holes to prevent accumulation of moisture inside pole base.

**3.02 TESTS**

- A. Test under provisions of Section 26 08 00 and Section 26 51 01.
- B. The Owner shall be notified at least three working days in advance of the Contractor's proposed date of the tests to permit scheduling, and to permit witnessing of the tests. The Contractor shall furnish the Owner with three copies of the results of the tests.
- C. Circuits: The Contractor shall test each circuit, all controllers, and components of the system for proper operation. The Contractor shall furnish the Owner with three copies of the test results.
- D. Compaction Tests: Backfill shall be tested for compaction in accordance with ASTM D1556.
- E. Operating Test: Contractor shall operate the system in the presence of the Owner proving the proper operation.

**END OF SECTION**

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**SECTION 26 57 00**

**LOW VOLTAGE LIGHTING CONTROL SYSTEM**

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**PART 1 - GENERAL**

**1.01 SYSTEM DESCRIPTION**

- A. Furnish all labor, materials, apparatus, tools, equipment transportation, temporary construction and commissioning services as indicated on the Drawings or described in these Specifications and as required to make a complete working facility lighting control system.
- B. Integrated Low Voltage Lighting Control System:
  - 1. The low voltage lighting control system shall consist of relay panels and LMCS system configuration software.
  - 2. The system shall accept program changes from the LMCS system configuration software for date and time, location, holidays, event scheduling, button binding and group programming.
- C. Requirements are indicated in Section 26 27 00 for raceways and electrical boxes and fittings required for installation of control equipment and wiring.
- D. Provide CBC 2025 compliant seismic installation. See Section 26 05 00 for all certification and submittal requirements.

**1.02 INCORPORATED DOCUMENTS**

- A. Sections 26 05 00, 26 27 00, 26 51 01 and 26 56 01 apply to all Work in this Section.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

**1.03 QUALITY ASSURANCE**

- A. Manufacturers: Firms regularly engaged in manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer Qualifications: Installer shall be one who is experienced in performing the Work of this Section, and who has specialized in installation of Work similar to that required for this project.
- C. Component Pre-testing: All components and assemblies are to be factory pre-tested prior to installation.
- D. System Support: Factory applications engineers shall be available for telephone support.
- E. NEC Compliance: Comply with NEC as applicable to electrical wiring Work.
- F. NEMA Compliance: Comply with applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

- G. UL Approvals: Remote panels are to be UL listed under UL 916 Energy Management Equipment and/or UL 508 Industrial Control Equipment.
- H. CSA Approvals: Remote panels are to be CSA listed.
- I. FCC Emissions: All assemblies are to be in compliance with FCC emissions Standards specified in Part 15 Subpart J for commercial and residential application.
- J. All System components shall be California Title 24 compliant, where applicable.

#### 1.04 SUBMITTALS

- A. Submit under provisions of Section 26 05 00.
- B. Submit under provisions of Sections 26 05 00.
  - 1. Bill of Materials: Complete list of all parts needed to fully install selected System components.
  - 2. Shop Drawings: Submit dimensional Drawings of all lighting control system components and accessories.
  - 3. One Line Diagram: Submit a one-line diagram of the system configuration.
  - 4. Typical Wiring Diagrams: Submit typical wiring diagrams for all components including, but not limited to, relay panels, relays, room controllers, digital low voltage switches, digital occupancy sensors, digital daylighting controls, and border routers.

#### 1.05 MANUFACTURERS

- A. Integrated Low Voltage Lighting Control System:
  - 1. The basis of the specified system is the Watt Stopper Digital Lighting Management (DLM) or an equal. Any other system to be considered must submit descriptive information 10 days prior to bid.
- B. Prior approval does not guarantee final approval by the electrical engineer. The contractor shall be completely responsible for providing a system meeting this specification in its entirety. All deviations from this specification must be listed and individually signed off by the engineer.
- C. The Owner reserves the right to reject a proposed substitution based on his agent's professional judgment as to the utility, visual appropriateness, or finish of substitutions.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in Manufacturer's original, unopened, undamaged packages with intact identification labels.
- B. Storage and Protection: Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation

#### 1.07 GUARANTEE AND WARRANTIES

- A. All Work performed under this Section must be guaranteed to be free of defects in products or workmanship for one year after date of acceptance by Owner, unless noted otherwise in General Conditions.
- B. Products Warranty: Manufacturer shall provide a 5 year limited warranty on products within this installation, except where otherwise noted, and consisting of a one for one device replacement.

**PART 2 - PRODUCTS**

**2.01 DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM**

- A. Equipment Required: Lighting Control and Automation system as defined under this section covers the following equipment.
  - 1. Digital Lighting Management (DLM) local network: Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
  - 2. Programming and Configuration Software: Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.

**2.02 LMCP LIGHTING CONTROL PANELS AND LMZC ZONE CONTROLLER**

- A. Hardware: Provide LMCP lighting control panels in the locations and capacities as indicated on the Drawing and schedules. Each panel shall be of modular construction and consist of the following components:
  - 1. Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 - 8 relays, 1 - 24 relays and 6 four-pole contactors, or 1 - 48 relays and 6 four-pole contactors.
  - 2. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. LMCP panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
  - 3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. Interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. Interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. Panel interiors shall include the following features:
    - a. Removable, plug-in terminal blocks with connections for all low voltage terminations.
    - b. Individual terminal block, override pushbutton, and LED status light for each relay.
    - c. Direct wired switch inputs associated with each relay shall support 2-wire momentary switches only.
    - d. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches; digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs; digital IO

modules capable of receiving momentary or maintained contact closure inputs or analog sensor inputs; digital daylighting sensors; and digital occupancy sensors. Inputs are divided into two separate digital networks, each capable of supplying 250mA to connected devices.

- e. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet.
  - f. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
  - g. Group and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any set of relays can be associated with a group for direct on/off control or pattern (scene) control via a simple programming sequence using the relay override pushbuttons and LED displays for groups 1-8 or a handheld IR programmer for groups 1-99.
  - h. Relay group status for shall be provided through LED indicators for groups 1-8 and via BACnet for groups 1-99. A solid LED indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.
4. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
- a. Electrical:
    - 1) 30 amp ballast at 277V
    - 2) 20 amp ballast at 347V
    - 3) 20amp tungsten at 120V
    - 4) 30 amp resistive at 347V
    - 5) 1.5 HP motor at 120V
    - 6) 14,000 amp short circuit current rating (SCCR) at 347V
    - 7) Relays shall be specifically UL 20 listed for control of plug-loads
  - b. Mechanical:
    - 1) Replaceable, 1/2 inch KO mounting with removable Class 2 wire harness.
    - 2) Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
    - 3) Dual line and load terminals each support two #14 - #12 solid or stranded conductors.
    - 4) Tested to 300,000 mechanical on/off cycles.

5. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.
6. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.
7. Where indicated, lighting control panels designated for control of emergency lighting shall be provided with factory installed provision for automatic by pass of relays controlling emergency circuits upon loss of normal power. Panels shall be properly listed and labeled for use on emergency lighting circuits and shall meet the requirements of UL924 and NFPA 70 - Article 700.
8. Integral system clock shall provide scheduling capabilities for panel-only projects without DLM segment networks or BAS control.
  - a. Each panel shall include digital clock capability able to issue system wide automation commands to up to 11 other panels for a total of 12 networked lighting control panels. Clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine system wide channel groups.
  - b. Clock capability of each panel shall support the time-based energy saving requirements of applicable local energy codes.
  - c. Clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for clock function and program retention in non-volatile FLASH memory. Clocks that require multiple events to meet local code lighting shut off requirements shall not be allowed.
  - d. Clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:
    - 1) Scheduled ON / OFF
    - 2) Manual ON / Scheduled OFF
    - 3) Astro ON / OFF (or Photo ON / OFF)
    - 4) Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)
  - e. User interface shall be a portable IR handheld remote control capable of programming any panel in the system (LMCT-100)
  - f. Clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of 10 years.
  - g. Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that panel in the event that global network communication is lost. Lighting control panels that are not capable of executing events independently of the global network shall not be acceptable.

9. Lighting control panel can operate as a stand-alone system, or can support schedule, group, and photocell control functions, as configured in a Segment Manager controller, via a segment network connection.
10. Lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 MS/TP-based using the BACnet protocol.
  - a. Panel shall have provision for an individual BACnet device ID and shall support the full 222 range (0 - 4,193,304). The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network.
  - b. Panel shall support MS/TP MAC addresses in the range of 0 - 127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second.
  - c. Lighting control relays shall be controllable as binary output objects in the instance range of 1 - 64. The state of each relay shall be readable and writable by the BAS via the object present value property.
  - d. Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 - 64.
  - e. The 99 group Normal Hours/After Hours control objects associated with the panel shall be represented by binary value objects in the instance range of 201 - 299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode.
  - f. Setup and commissioning of panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:
    - 1) Binary output objects in the instance range of 1 - 64 (one per relay) for on/off control of relays.
    - 2) Binary value objects in the instance range of 1 - 99 (one per channel) for normal hours/after hours schedule control.
    - 3) Binary input objects in the instance range of 1 - 64 (one per relay) for reading true on/off state of the relays.
    - 4) Analog value objects in the instance range of 101 - 199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace-time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches.

- g. Description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel.
  - h. BO and BV 1 - 99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel object described in addendum aa. (<http://www.bacnet.org/Addenda/Add-135-2010aa.pdf>)
  - i. Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object.
  - j. Lockout of all digital switch buttons connected to a given panel shall be command-able via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196.
11. In addition to the LMCP Relay Panels, an LMZC Zone Controller panel shall be available for zero-relay applications. The panel is designed for applications where LMFC-011 Fixture Controllers or other distributed load controllers are used to switch and/or dim the controlled loads. Key similarities to and differences from the LMCP panel design shall include:
- a. Use the same intelligence board as the LMCP relay panel.
  - b. Shall not include relay driver boards or relays.
  - c. Have a removable interior section to facilitate installation, and a Tub/Cover. Cover is for surface mounting applications only.
  - d. Tub shall have two interior KOs to allow installation of LMPB-100 Power Boosters. Each installed Power Booster can provide an additional 150 mA for either of the two available DLM local networks provided by the LMZC.
  - e. All programming and networking (whether DLM Local Network and/or Segment Network) capabilities in the LMZC Zone Controller shall be similar to capabilities for LMCP relay panels, except for functions designed for panel-mounted HDR relays.
12. To aid in project start up, if LMFC Fixture Controllers are connected to an LMZC Zone Controller, Plug n' Go automatic configuration will establish a unique sequence of operation so that all LMFC-controlled fixtures will turn on to 50 percent output when any digital occupancy sensor detects motion.
13. WattStopper Product Number: Relay Panels: LMCP8, LMCP24 or LMCP48, Zone Controller: LMZC-301.

### 2.03 CONFIGURATION TOOLS

- A. A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface.
- B. Features and functionality of the wireless configuration tool shall include but not be limited to:

1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
  2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
  3. Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number.
  4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.
  5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
  6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
  7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
  8. Verify status of building level network devices.
- C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100
- D. 650.

#### **2.04 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE**

- A. PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.
- B. Additional parameters exposed through this method include but are not limited to:
1. Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.
  2. Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.
  3. Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.
  4. Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.

5. Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.
  6. Load control polarity reversal so that on events turn loads off and vice versa.
  7. Per-load DR (demand response) shed level in units of percent.
  8. Load output pulse mode in increments of 1second.
  9. Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.
- C. Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
1. Device list report: All devices in a project listed by type.
  2. Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
  3. BACnet points report: Per room Device ID report of the valid BACnet points for a given site's BOM.
  4. Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
  5. Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.
- D. Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations:
1. Set, copy/paste an entire project site of sensor time delays.
  2. Set, copy/paste an entire project site of sensor sensitivity settings.
  3. Search based on room name and text labels.
  4. Filter by product type (i.e. LMRC-212) to allow parameter set by product.
  5. Filter by parameter value to search for product with specific configurations.
- E. Network-wide firmware upgrading remotely via the BACnet/IP network.
1. Mass firmware update of entire rooms.
  2. Mass firmware update of specifically selected rooms or areas.
  3. Mass firmware upgrade of specific products.
- F. WattStopper Product Number: LMCS-100, LMCI-100

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Do not begin installation until measurements have been verified and work areas have been properly prepared.
- B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### **3.02 PRE-INSTALLATION MEETING**

- A. Manufacturer shall provide a factory authorized representative to provide a functional overview of the lighting control system prior to products being installed.
  - 1. Discuss functionality and integration of all products per design requirements.
  - 2. Confirm location of occupancy sensors and photocells as required.
  - 3. Confirm low voltage control wires meet specification.
  - 4. Explain adjustment options and verify specification requirements for each device.

#### **3.03 INSTALLATION**

- A. Install system in accordance with the approved system shop drawings and manufacturer's instructions.
- B. All line voltage connections shall be tagged to indicate circuit and switched legs.
- C. Test all devices to ensure proper communication.
- D. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
  - 1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
  - 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
  - 3. Load Parameters (e.g. blink warning, etc.)
- E. Post start-up tuning - Adjust sensor time delays and sensitivities to meet the Owner's requirements 30 days from beneficial occupancy. Provide a detailed report to the Architect / Owner of post start-up activity.
- F. Tighten all panel Class I conductors from both circuit breaker and to loads to torque ratings as marked on enclosure UL label.
- G. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.

- H. Verify all non-panel-based lighting loads to be free from short circuits prior to connection to room controllers.
- I. Lighting Control Relay Panels:
  - 1. The relay panels shall be mounted in electrical closets as indicated on the Drawings. The numbered relays in the panel shall be wired to control the power to each load as indicated on the Panel Wiring Schedules included in the Drawings. All power wiring shall be identified with the circuit breaker number controlling the load. If multiple circuit breaker panels are feeding into a relay panel, wires shall clearly indicate the originating panel's designation.

### 3.04 PROGRAMMING

- A. Perform the following inspections and prepare reports.
  - 1. Verify Class I and II wiring connections are terminated properly by validating system performance.
  - 2. Set IP addresses and other network settings of system front end hardware per facilities IT instructions.
  - 3. Verify / complete task programming for all switches, dimmers, time clocks, and sensors.
  - 4. Verify that the control of each space complies with the Sequence of Operation.
  - 5. Correct any system issues and retest..

### 3.05 SYSTEM STARTUP

- A. The Manufacturer shall provide a factory authorized technician to commission and confirm proper installation and operation of all system components.
- B. Contractor shall provide system documentation after the equipment has been installed:
  - 1. Lighting control operational summary sheet.
  - 2. Programming record sheet.
  - 3. System Installation and Operation Manual shall be provided to the owner.

### 3.06 TRAINING

- A. Manufacturer shall provide factory authorized application engineer to train Owner personnel in the operation and programming of the lighting control system for the first (1) one day of occupancy.

### 3.07 PRODUCT SUPPORT AND SERVICE

- A. Factory telephone support shall be available at no cost to the Owner following acceptance. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

### 3.08 TESTS

- A. Test under provisions of Section 26 05 00 and 26 08 00.
- B. The Owner shall be notified at least three working days in advance of the Contractor's proposed date of the tests to permit scheduling, and to permit witnessing of the tests. The Contractor shall furnish the Owner with three copies of the results of the tests.
- C. Circuits: The Contractor shall test each circuit, all controllers, and components of the system for proper operation. The Contractor shall furnish the Owner with three copies of the test results.
- D. Operating Test: Contractor shall operate the system in the presence of the Owner proving the proper operation of the system and all components.

**END OF SECTION**

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SECTION 31 10 00

SITE PREPARATION AND PLANT PROTECTION

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Protecting improvements and vegetation to remain.
- B. Clearing and grubbing.
- C. Removal of existing site improvements including but not limited to concrete, asphalt, site walls, utilities, curbs, fencing, landscaping, and irrigation system.
- D. Preserve and protect adjoining properties during removal work, site preparation work and construction.
- E. Generally, this project includes expansion of parking and drop-off, site preparation for new modular building, shade canopy structures, play equipment and associated improvements for all including but not limited to: protection of existing improvements, demolition, staking, site preparation, storm drainage, sewer, water, electrical utilities with new connection to city services, earthwork, concrete work, asphalt work, site furnishings, landscaping, irrigation, and all reasonably incidental and related work as shown on plans and as specified.

1.2 QUALITY ASSURANCE

- A. Stipulations – Site Preparation and Demolition:
  - 1. Work is in accordance with the Drawings and specifications and includes but is not necessarily limited to the following:
    - a. Clearing and grubbing.
    - b. Identification and protection of vegetation indicated to remain.
    - c. Removal of existing site improvements, such as, paving and bases, concrete curbs, fences, footings, foundations, irrigation system, underground pipes and utilities and structures.
  - 2. Locate and identify existing utility services and protect or disconnect, remove and cap as required for new work.
  - 3. Remove, clean, store and protect all items designated and directed to be salvaged to Owner.
  - 4. Remove, store and protect all items designated and directed to be reinstalled.
  - 5. Obtain and pay for permits required for execution of this work.

1.3 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of adjacent streets, adjacent parking areas, trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site demolition.

- B. The Contractor is to submit a letter with the relevant material submittals certifying that the products used by the Contractor are consistent with the Environmental Safety Policy of the School District.

1.4 PROJECT CONDITIONS:

- A. Coordination: Coordinate this work with the work of other Sections to avoid delay and interference with other work. Refer to the Demolition Plan for site work requirements.
- B. Nuisances: Keep dirt, dust, noise and other objectionable nuisance to a minimum. Use temporary enclosures, coverings and sprinkling, and combinations thereof, as necessary to limit dust to lowest practicable level, except do not use water to the extent that it causes or contaminated run-off.
- C. Traffic: Conduct work to ensure minimum interference with vehicular and pedestrian traffic, and to permit unencumbered access to the school property located outside of the project areas including the track and field.
  - 1. Do not close or obstruct streets, sidewalks, or other public passageway without permission from authorities having jurisdiction.
  - 2. If required, by governing authorities, provide alternate routes around closed and obstructed traffic ways.
  - 3. Do not drive any type of vehicle or store products on asphalt that is curing unless the area has been protected. Vehicles and storage areas are limited to the areas of thickened asphalt pavement section as shown on the drawings or as designated by the District Representative. Submit a protection plan to the District for approval prior to start of demolition work.
- D. Dispose of cleared, grubbed, and removed material that will not be salvaged or recycled on Site.
- E. Salvable Improvements: Carefully remove items indicated to be salvaged and store where designed by the District Representative. Avoid damaging salvage material.
- F. Protections:
  - 1. Prevent movement and settlement of adjacent structures. Install temporary barriers, fences, guard rails, enclosures, shoring, bracing, planking, warning signs and other protections required to protect structures, utilities, landscaping and other items that are to remain in place.
  - 2. Protect benchmarks, monuments and reference points from displacement and damage; and if displaced or damaged, replace at no cost to the Owner.
  - 3. Install and maintain required bracing, shoring and supports when removing structural elements and be responsible for safety and support of structure. If safety of structure appears to be endangered, cease operations and immediately notify the District Representative. Do not resume operations until safety is restored.

**PART 2 – PRODUCTS**

**2.1 SOILS MATERIALS**

- A. Satisfactory Soil Materials. See Section 31 20 00, Earthwork for satisfactory soil material for backfilling excavations and depressions resulting from site clearing.

**PART 3 – EXECUTION**

**3.1 EXAMINATION**

- A. Examine areas in which work is to be performed. Report in writing to the District's Representative all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting work constitutes acceptance of the existing conditions and the Contractor shall then, at his expense, be responsible for correcting unsatisfactory and defective work encountered.
- C. For the duration the project, provide a construction fence at the perimeter of project(s) as required to secure the project from trespass and provide a safe construction site. Field verify the perimeter and gate locations with the Construction Manager. The fence location may be adjusted as the project progresses based on the approval of the District's Representative.

**3.2 CLEARING**

- A. Remove designated trees, stumps, rubbish, undergrowth and deadwood as well as fences and incidental structures that interfere with the construction as shown on the Drawings and as specified. Obtain verification from project inspector prior to removal.

**3.3 GRUBBING**

- A. Remove all stumps and roots in their entirety, brush, organic materials and debris. When indicated, such materials as topsoil and leaf mold, or other organic materials above the ground surface suitable for use as mulch or topsoil, shall be salvaged and stockpiled.
- B. Remove grasses and weeds. Apply systemic weed killer and confirm weed kill prior to removal.

**3.4 TOPSOIL STRIPPING – As required**

- A. Coordinate with Section 31 20 00, Earthwork, and Drawings. Strip topsoil to required depths in a manner to prevent intermingling with underlying subsoil or other waste materials.

**3.5 UTILITIES**

- A. Contract local utility companies 48 hours minimum prior to start of demolition work. Confirm verbal notices and written notices. Verify locations of all utilities entering site and their locations on site.

- B. Cooperate with the District's Representative, utility companies, adjacent property owners, and other building trades in maintaining, protecting, re-routing or extending utilities passing through work areas which serve structures located on project site and on adjacent properties.
- C. Verify that utilities that are to be removed, capped or abandoned are turned off, or are disconnected, or are re-routed to new locations before starting demolition.

### 3.6 REMOVAL

- A. General:
  - 1. Remove materials in an orderly and careful manner.
  - 2. Repair or replace all removal work performed in excess to that required at no cost to the District. Repair or replacement shall match and equal construction, condition and finish existing at time of award of Contract.
- B. Remove the following from locations to the extent required or directed for new construction.
  - 1. Fencing, shade structures & benches, including posts, fabric and footings. Backfill voids if required from removed footings with clean fill as defined in Section 31 20 00, Earthwork. Be careful of soil caving due to presence of groundwater intrusion.
  - 2. Electric underground wires and conduits occurring within removal areas except those shown as reused on Electrical Drawings. Refer to Utility Drawings and Specifications.
  - 3. Miscellaneous structural elements that interfere with the new construction as directed.
  - 4. Paving: remove asphalt and concrete paving including aggregate base rock completely to the minimum depth required for subgrade of new improvements. Dispose of demolished concrete, asphalt and base rock at a material recycling facility. Existing aggregate base may be reused on site if it meets requirements of 31 20 00 fill and the approval of the Geotechnical Engineer.
  - 5. Underground pipes and utilities.
  - 6. Other items noted on the drawings and required to be removed to install the new improvements.
- C. Cutting asphalt, concrete curbs and concrete pavement:
  - 1. All lines shall be marked and accepted by District's Representative before the cutting operation.
  - 2. Cut edges of pavement at 90-degree angle to the surface in a true and straight line in accordance with dimensions shown on the Drawings. Make cuts with a concrete saw, to a 1-1/2" minimum depth.
- D. Backfill and compact areas excavated and open pits and holes resulting from removal operations. Comply with requirements specified for backfill materials, compaction and installation methods.
- E. Rough grade site within removal areas to meet adjacent contours and to provide positive drainage. Leave site in clean condition acceptable for performance of subsequent construction operations.

### 3.7 CLEANUP AND DISPOSAL

- A. Transport trash, rubbish and debris daily from site and legally dispose of:
  - 1. Demolish and waste materials encountered.

2. Remove and promptly dispose of contaminated, vermin-infested and dangerous materials encountered.
  3. Do not burn or bury materials on site.
- B. Clean excess soil may be distributed on site as accepted by the Project Inspector, if it does not adversely affect specified finish grades. Coordinate with Section 31 20 00 Earthwork, Drawings and, Subgrade Preparation & Base Material.
- C. Excess soil may need to be legally disposed of off-site. Refer Existing Conditions. Coordinate with Section 31 20 00, Earthwork, Drawings.
- D. Upon completion of work under this Section, remove all tools, equipment and temporary enclosures and structures.

END OF SECTION

10/8/25

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**SECTION 31 20 00**

**EARTHWORK**

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PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide earthwork complete, including removal work and clearing, grading, excavating and fill and dewatering.

1.2 REFERENCES

- A. Perform work in compliance with the rules and regulations of the Division of Industrial Safety and other local State agencies having jurisdiction. Nothing contained herein shall be constructed as permitting work that is contrary to such rules, regulations, and codes.
- B. Perform all work in accordance with all applicable laws, codes and regulations required by the State of California.
- C. Comply with State Water Resources Control Board.
- D. Work shall conform to local codes and regulations.
- E. References to “Standard Specifications” shall mean the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, Cal Trans.
- F. ASTM Standards.
- G. Relative compaction refers to the in-place dry density of the same soil expressed as a percentage of the maximum dry density of the same soil determined by ASTM D1557 laboratory test procedure. Optimum Moisture Content is the water content that corresponds to the maximum dry density as determined by the same procedure.

1.3 SUBMITTALS

- A. Submit a list of grading equipment to be used.
- B. Submit an analysis of physical and chemical properties and certificate of compliance of environmental clearance for import soil.
- C. Before the grading operation is underway, submit a letter identifying the approximate quantities and type of soil required to be imported and exported in order to accomplish a balance of the earthwork materials without additional compensation.
- D. The Contractor is to submit a letter with the relevant material submittals certifying that the products used by the Contractor are consistent with the Environmental Safety Policy of the School District.

1.4 CLOSEOUT SUBMITTALS

- A. The Contractor shall engage a California Registered Civil Engineer or licensed Land Surveyor to perform a conformance survey at completion of the project and provide a hard copy of the survey and an AutoCAD copy of the survey as part of the closeout documents.

1.5 SOILS BORINGS

- A. Subsurface soils investigations have been made at the site and logs of the test holes are available in the Soils Report. Such investigations have been made for the purposes of design only, and neither the Architect, the Owner, nor the Soils Engineers guarantee adequacy or accuracy of the data, or that data are representative of all conditions to be encountered. Such information is made available for general information only and shall not relieve the Contractor of the responsibility for making his own investigations.

1.6 PROJECT CONDITIONS

- A. Coordination: Coordinate this work with the work of other sections to avoid delay and interference with other work.
- B. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.
- C. Underpin adjacent structure(s), including utility service lines, which may be damaged by excavation operations.
- D. Promptly repair damage to adjacent facilities caused by earthwork operations. Cost of repair is at Contractor's expense.
- E. Promptly notify the Inspector of unexpected subsurface conditions.
- F. If during the course of the earthwork operations, an area of pumping or otherwise unstable soil is encountered, the contractor shall immediately modify his operations in such a way as to limit the frequency and weight of vehicles traveling over the area and promptly notify the Inspection who will contact the Geotechnical Engineer for an evaluation.

1.7 EXISTING CONDITIONS

- A. A topographic survey of the property has been included in the drawings for reference only. Upon the beginning of the earthwork, Contractor represents that he has inspected the site and satisfied himself as to actual grades and levels and the true conditions under which tie work is to be performed.

1.8 PROTECTION

- A. Furnish, place and maintain all supports, shoring and sheet piling which may be required for the earthwork operations.
- B. Maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.

- C. Adequate protection measures shall be provided to protect workmen, passers-by, and the site. Streets and adjacent property shall be fully protected throughout the operations.
- D. In accordance with generally practiced construction practices, the Contractor shall be solely and completely responsible for working conditions on the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.
- E. Any construction review of the Contractor's performance conducted by the Inspector is not intended to review the adequacy of the Contractor's safety measures in, on, or near the construction site.
- F. Adjacent streets, sidewalks, and property shall be kept free of mud, dirt, or similar nuisances resulting from earthwork operations.
- G. Provide for surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas.
- H. Water as required to suppress dust nuisance.
- I. Protection of Existing Improvements:
  - 1. Provide barricades, covering, or other types of protection necessary to prevent damage to existing improvements indicated to remain in place. Protect improvements on adjoining properties. Repair damaged existing improvements to original condition as approved by authority having jurisdiction.
- J. Provide erosion control measures as required.
- K. Protection of Other Property: Excavation and other work over, under and adjacent to existing pipelines, cables, conduit ruins or structures of any kind shall be procured in such a manner as not to interfere with the safe operation and use of such installations. Should any damage be incurred to existing facilities during the Contractor's operations, the Contractor shall immediately notify the Owner's Representative and authorities, and shall arrange for the immediate repair of same at his expense.
- L. Underground Obstruction: The locations of existing underground utilities and structures, insofar as that are known from information furnished by the respective utility companies and agencies, have been shown on the drawings. The Owner assumes no responsibility for the accuracy or completeness of said data, which is offered solely for the convenience of the Contractor.
- M. Control of Water: Take measures as may be required to furnish, install and operate such pumps or other devices as may be necessary to remove any seepage, storm water, or sewage that may be found or may accumulate in the excavations during the progress of the work. Keep excavations entirely free from water at all times during the progress of the work, and until the Geotechnical Engineer gives permission to cease pumping.
- N. Pavement Restoration: Pavement, bases and compacted subgrade disturbed by the trenching operations shall be replaced in an acceptable manner with materials equal to the adjacent compacted subgrade, bases and pavement for a minimum of 12' on each side of the trench, and shall conform to the requirements of these Specifications or to local ordinances governing such replacement.

- O. Turf & Landscape Restoration: Irrigation, turf and landscape disturbed by the trenching, excavation and grading operations shall be replaced in an acceptable manner with materials equal to the adjacent, and shall conform to the requirements of these Specifications or to local ordinances governing such replacement.

#### 1.10 QUALITY ASSURANCE

- A. Contractor shall provide adequate notice, cooperate with, provide access to the work, and assist testing agency and their representative in the execution of their function.
- B. When, during the progress of work, field tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or remove and replace defective materials with new materials as directed by the Inspector. Costs of additional labor, materials, and testing to attain specified density at Contractor's expense.
- C. The Contractor shall engage a California Registered Civil Engineer or licensed Land Surveyor to perform field engineering prior to and during earthwork activities.
- D. The Contractor shall engage a California Registered Civil Engineer or licensed Land Surveyor to perform a conformance survey at completion of the project and provide a hard copy of the survey at completion of the project and an AutoCAD copy of the survey as part of the closeout documents.
- E. Perform all grading with hydraulically laser controlled grading machinery.

#### 1.11 TESTING

- A. Testing and Inspection: Testing shall be performed by a qualified independent testing laboratory under the supervision of a registered professional engineer, specializing in soils engineering.
- B. The Owner will direct, provide, and pay for initial testing and inspection during earthwork operations.
- C. Provide and pay for re-testing and inspection during earthwork operations. Laboratory and inspection service shall be acceptable to the Owner.
- D. Where reference is made to relative compaction, it shall be in the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, determined by the ASTM D1557 laboratory test procedure. Optimum moisture is the water content that corresponds to the maximum dry density.
- E. For structural fills under footings, slabs or pavements. determine moisture density relationships in accordance with ASTM D1557.

### PART 2 – PRODUCTS

#### 2.1 FILL

- A. Structural Fill Materials: Inert subsoil material free of organic matter, rubbish, debris and rocks greater than 3" diameter, and meeting the following requirements:
  - 1. Liquid limit of less than 40.
  - 2. Plastic index of less than 15, per ASTM D4318.
  - 3. Minimum laboratory dry weight at optimum moisture content of 110 pounds per cubic foot.
  - 4. Provide imported fill material as required to complete the work. Obtain rights and pay all cost for imported materials.
  - 5. Proposed fill material shall be inspected, tested, and laboratory report issued prior to use in the work.
  - 6. Suitable excavated material removed to accommodate new construction may be used as fill material subject to inspection and approval.
  - 7. All fill material is subject to testing and inspection by the Geotechnical Engineer.
  
- B. Filter Materials
  - 1. Drain Rock: Per Section 31 23 33
  - 2. Angular Washed Sand: Per section 31 23 33

## 2.2 TOPSOIL

- A. Topsoil is defined as on-site surface soil. Satisfactory topsoil shall be free of subsoil, clay, lumps, stones, and other objects over 1/2" diameter, without any weeds, roots and other objectionable material.
  
- B. If herbicide contamination is suspected, then a radish/ryegrass growth trial must be performed. Consult with Inspector prior to decision to test or not.

## 2.3 SOIL STERILANT

- A. Sterilizer shall be approved as a weed and grass killer that is quick acting, short lived, non-selective, and not dangerous to installer.
  
- B. The Contractor is to submit a letter with the relevant material submittals certifying that the products used by the Contractor are consistent with the Environmental Safety Policy of San Rafael City Schools District.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations.
  
- B. Do no cover or enclose work of this Section before obtaining required inspections, tests and approvals and location recording.

### 3.2 EXISTING UTILITIES

- A. Notify the Underground Service Alert (U.S.A.) Center 48 hours in advance of performing any excavation works by calling (800) 227-2600. Verify the grade and location of existing utilities prior to any work where conflicts may arise by careful hand digging. Be responsible for the protection of all existing utilities. Be responsible for the protection of all existing survey monuments.
- B. Before starting grading and excavation, establish the location and extent of underground utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform the excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as the work progresses.
- C. Maintain, protect, relocate or extend as required, existing utility lines which pass through the work area. Pay costs for this work, except as covered by the applicable utility companies.
- D. Protect active utility services uncovered by excavation.
- E. Remove abandoned utility service lines from the area of excavation. Cap, plug, or seal abandoned lines and identify termination points at grade level with markers in pull boxes.
- F. Accurately locate and record abandoned and active utility lines rerouted or extended on project record documents.

### 3.3 SITE GRADING

- A. Perform grading within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide subgrade surfaces parallel to finish surface grades. Provide uniform levels and slopes between new elevations and existing grades.
- B. Grade surfaces to assure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes and as follows:
  - 1. Rough Grading: Plus or minus 0.10 ft. subgrade tolerance. Finish required will be that ordinarily obtained from a laser controlled blade grader operations.
  - 2. Provide subgrade surface free of exposed boulders or stones exceeding 3" in greatest dimension in paved areas, 1" in athletic field areas.
  - 3. Subgrade: Grade subgrade surface smooth and even, free of voids to the required subgrade suitable to receive granular base materials.
  - 4. Drainage Swales: Grade as shown on drawings.

### 3.4 EXCAVATING

- A. Excavate for structure to elevations and dimensions shown. Extend excavation a sufficient distance from foundations to permit placing and removal of formwork, installation of materials, services and inspection. Hand trim foundation excavations to final grade just before concrete is placed. Remove loose, soft materials, and all organic matter. Footings shall bear on approved undisturbed bearing soil.
- B. Obtain inspection and testing of foundation excavations by the inspector before concrete is placed.

- C. Excavate for structures and paving to cross-sections, elevations and grades indicated. Allow for base material.
- D. Extra Excavation: Excavate unsatisfactory soil materials extending below required elevations to depth a directed. Such extra excavation will be paid for as a change in work. Obtain Architect's written authorization before performing extra excavation work.
- E. Unauthorized excavation: Backfill and fill all over-excavation to proper grades. Fill over-excavation at footings with 1,500 psi concrete. Additional labor and material for unauthorized excavation and remedial work at Contractor's expense.
- F. Shore, sheet or brace excavations as required to maintain them secure. Remove shoring and bracing as backfilling progresses, when banks are safe against caving.
- G. Do not excavate footings or slabs to the full depth when freezing temperature may be expected, unless footings or slabs are placed immediately after the excavation has been completed. Protect excavation bottoms from freezing when the placing of concrete is delayed.
- H. Rock Excavating:
  - 1. Rock: Material which cannot be removed with  $\frac{3}{4}$  cu. yd. capacity power shovel without drilling or solid boulder with a volume of more than  $\frac{1}{2}$  cu. yd.
  - 2. Rock Excavation: Material excavation of buried boulders and rock in excess of  $\frac{1}{2}$ " cu. yd. that requires continuous use of ripper or other special equipment. All other excavation shall be classified as earth excavation.
  - 3. Contractor will be paid cost of rock excavation as a change in work. Obtain Inspector's written authorization prior to performing rock excavation work.

### 3.5 BACKFILLING

- A. Obtain inspection and approval of subgrade surfaces by Inspector prior to filling operations. Scarify, dry and compact soft and wet areas; remove and replace unsuitable subgrade materials with an approved compacted fill material. Take corrective measures before placing fill materials.
  - 1. Topsoil is not permitted as fill or backfill material under paved areas.
  - 2. Scarify the upper 6 inches of existing soil before placing any fill. In areas on which concrete, aggregate base, is to be placed, moisture condition and thoroughly mix the scarified material and re-compact to at least 90 percent relative compaction.
- B. Spread approved engineered fill material uniformly in layers not greater than 6" of loose thickness over entire area prior to compaction. Request monitoring of filling and compaction by Geotechnical Engineer.
  - 1. Lift thickness requirements may be modified by Inspector to suit equipment and materials or other conditions when required to assure satisfactory.
  - 2. Moisture-condition fill material to near Optimum Moisture Content by aerating or watering and thoroughly mix material to obtain moisture content permitting proper compaction.
  - 3. Place and compact each layer of fill to indicated density before placing additional fill material repeat filling until proposed grade, profile or contour is obtained.
  - 4. Suspend fill operations when satisfactory results cannot be obtained because of environmental or other unsatisfactory site conditions. Do not use muddy (or frozen) fill materials. Do not place fill material on muddy (or frozen) subgrade surface.

5. Maintain surface conditions which permit adequate drainage of rainwater and prevent ponding of surface water in pockets. When fill placement is interrupted by rain, remove wet surface materials or permit to dry before placing additional fill material.
- C. Place backfill materials in uniform layers not greater than 6" loose thickness over entire backfill area.
1. Use hand tampers at foundation retaining walls and similar locations. Do not use large rolling equipment adjacent to retaining walls.
  2. Do not backfill against retaining wall until walls for bearing surfaces have reached design strength or are properly braced, and backfilling operations approved. Provide clean backfill materials or granular materials as required; compact in maximum 6" layers.
- D. Fill all areas of settlement to proper grade before subsequent construction operations are performed.
- E. Compaction:
1. Provide minimum and maximum compaction control for all fill and backfill.
  2. Engineered Fill
    - a. Compact each layer of engineered fill or backfill material to 90% relative compaction, unless otherwise specified. Extend compaction at last 5'-0" at both sides of foundations and retaining walls and at least 1'-0" beyond slabs on-grade and paving.
  3. Water settling, puddling, and jetting of fill and backfill materials as a compaction method is not acceptable.
  4. Maintain moisture content of materials during compaction operations within required moisture range to obtained indicated compaction density.
  5. Provide proper equipment to achieve consistent and uniform compaction of fill and backfill materials.
  6. Do not use heavy equipment that will over-compact planting soil. Compact topsoil to maximum 85 % relative compaction.
- F. Maintenance of Finished Grades:
1. Protect finished graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and damaged areas.
  2. Where completed areas are disturbed by construction operations or adverse weather, scarify, reshape and compact or scarify to achieve required density.

### 3.6 FIELD QUALITY CONTROL

- A. The Owner will provide and pay for field quality control soils testing and inspection during earthwork operations.
- B. Contractor shall provide adequate notice, cooperate with, provide access to the work, obtain samples, and assist testing agency and their representatives in execution of their function.
- C. Fill Materials: The Owner will test proposed materials to verify suitability for use, gradation of material, moisture-density relation, design bearing value, and percent of materials.
- D. Subgrade Surfaces: Based on visual examination of the site, the Owner will provide and pay for bearing tests as required to verify subgrade surfaces are adequate and meet or exceed design bearing values.

1. Paved Areas: Make at least one test for each 2000 sq. ft. of paved area.
- E. Compaction Operations: The Owner will provide and pay for inspection and testing during paved area filling and compaction operations. Test each lift of fill to verify compaction meets specified requirements. The owner will provide and pay for periodic inspection and testing during site area filling and compaction operations.
- F. When, during progress of work, filed tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or removed and replace defective materials with new materials as directed by the inspector. Cost of additional labor, materials and testing to attain specified density is at Contractor's expense.

### 3.7 DISPOSAL OF WASTE MATERIALS

1. Stockpile, haul from site, and legally dispose of export and waste materials, including trash and debris.
2. Maintain disposal route clear, clean, and free of debris.
3. Clean excess soil may be distributed on site as accepted by Inspector, if it does not adversely affect specified finish grades. Coordinate with Drawings and Subgrade Preparation and Base Material.

### 3.8 CLEANING

- A. Upon completion of earthwork operation, clean areas within contract limits, remove tools and equipment. Provide a clear, clean site, free of debris and suitable for site work operations.

END OF SECTION

3/23/26

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**SECTION 31 23 33**

**TRENCHING AND BACKFILLING**

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PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Excavating, backfilling and compacting for utilities.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Select Bedding Sand: Class A screened fill sand with a maximum particle size of ½", not exceeding 19 percent and free of expansive materials, debris and organic matter.
- B. Select Backfill Material: Non-expansive soil excavated from the utility trench or site cut areas, or from off-site, borrowed fill material, which in the opinion of the Geotechnical Engineer is suitable for backfilling. Provide material which contains no rocks or clods over 3 inches in diameter, is free of debris and organic matter, and a minimum of 50 percent of material passes a No.4 screen. Limit rock and clod size to 3 inches maximum diameter for backfilling trenches 12 inches or less in width.

PART 3 – EXECUTION

3.1 GENERAL

- A. Layout: Carefully layout the route of each underground utility before trenching. Drawings and coordinate with underground construction by other trades to avoid conflicts.
- B. Clearances: Take special notice and maintain the required horizontal and vertical depth clearances from structural footings for utility trenches running parallel to footings. Do not violate the area of the footing bearing prism. In the event of conflict (i.e., the utility cannot be relocated or its depth changed), proceed as directed by the Architect.

3.2 TRENCHING

- A. Grades and elevations indicated and as specified. Hand trim changes in direction and bottoms of trenches. Provide shoring in trenches over 5 feet deep and also in trenches where unstable soil conditions are encountered. Comply with OSHA requirements.
- B. Pipe Trench Dimensions: The following requirements are considered minimal unless otherwise indicated, in order to provide adequate pipe clearances and bedding. Provide trenches wider than the specified minimums where required to properly install the particular type of piping. In the event utility company regulations, code requirements, or the pipe manufacturer's

recommendations differ from these provisions, the most restrictive requirements shall take precedence:

Pipe Burial Depths (minimum):	
Sewer & Drainage:	24" + pipe O.D. + 3" bed
Gas:	30" + pipe O.D. + 4" bed
Water (Domestic)	
PVC:	30" + pipe O.D. + 4" bed
All other:	24" (30" at planters) + pipe O.D. + 4" bed
Water (Irrigation Pressure Piping)	
3" diameter or less:	18" + pipe O.D. + 2" bed
4" diameter or more:	Same as domestic water

**Notes: Finish grade to top of pipe, typical. O.D.: Outside dimension.**

Trench Widths:

Sewer & Drainage:	12" + pipe O. D. for 4" to 18" diameter pipe
Gas:	8" + pipe O.D.
Water (Domestic):	8" + pipe O.D.
Water (Irrigation Pressure Piping):	
3" diameter or less:	4" + pipe O.D.
4" diameter or more:	8" + pipe O.D.

C. Common Trench Requirements:

1. Do not install copper piping or metal gas piping in a common trench with other dissimilar metal piping or conduit; separate a minimum of 4 feet when running parallel to such piping or conduit.
2. Separate multiple parallel lines of piping in a common trench a minimum of 12 inches, both horizontally and vertically, between individual pipes.
3. Install domestic water piping, running parallel in a common trench with sewer or drainage lines, on a solid shelf 12 inches above the sewer or drainage piping.
4. Do not run electrical power and communications conduit in a common trench with sewer, drainage, water or gas piping.

D. Requirements for underground electrical and communications conduit, ducts: applicable specification sections under Division 26 and details as indicated.

3.3 BEDDING AND BACKFILLING

A. Bedding: Lay and bed pipe in compacted select bedding sand, thickness as specified herein and backfill with the same material to a height of one foot above the top of pipe. Place in 6 inch layers and compact to a minimum relative density of 90 percent. Compact the soil in a manner that will not displace or damage the pipe.

1. Sewer and drain lines may be bedded in the native soil provided it is rock free and sandy. Dig out under bell portions of the piping for uniform bearing.
2. Irrigation Piping – not applicable
3. Conduits, ducts, laid in a single layer, running parallel and in the same horizontal plane and not concrete encased shall be "bedded" as specified herein. The select sand

bedding for multilayered banks of conduit not concrete encased, shall be water settled (not flooded) to completely fill the voids between the conduits with sand.

4. Provide warning tape in all gas and electrical trenches.
- B. Backfilling: Backfill the remaining trench depth, including concrete encased utilities, with select backfill material at optimum moisture content, place in 6 to 8 inch layers and compact to a minimum relative density of 90 percent. Attain compaction by any method (other than water jetting) that will obtain the minimum specified relative densities, without damaging the buried lines.
- C. Install underground utility materials requiring special bedding and backfilling methods as recommended in conjunction with these materials or as indicated.

### 3.4 QUALITY CONTROL

- A. Do not backfill underground utility lines until:
  1. The "As-built" elevations and dimensions are recorded on "Record Drawings" and verified.
  2. The Utility Lines have been inspected and satisfactorily tested.
- B. Backfill compaction tests will be performed by the Owner's Geotechnical Engineer at locations and depths as directed. If the required minimum relative compaction density has not been obtained, excavate and re-backfill the deficient portion of the trench.

### 3.5 CLEANUP

- A. Pick up and transport unsuitable and deleterious material to an off-site legal disposal area. Place acceptable excess earth in on-site areas as compacted fill.

END OF SECTION

4/8/25

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SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

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PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Erosion and sediment control through the use of the following:
  - 1. Dikes
  - 2. Swales
  - 3. Grade stabilization structures
  - 4. Sediment basins
  - 5. Sediment traps
  - 6. Silt fences
  - 7. Straw and bales
  - 8. Planting and ground coverage
  - 9. Maintenance of erosion control improvements
  - 10. Cleanup and removal of silt from roadways on-site and off-site
- B. Dust alleviation and control by watering, matting, planting, etc.
- C. Provision of all materials, equipment, and apparatus not specifically mentioned herein or noted on the plans, but which are obviously necessary to complete the dust and erosion control.

1.2 RELATED REQUIREMENTS: Not used

1.3 MEASUREMENT AND PAYMENT

A. Water Pollution Control

The contract lump sum price paid for bid item "Water Pollution Control Program" shall include full compensation for furnishing transportation, labor, materials, tools, equipment, and incidentals, and for doing all work involved in Water Pollution Control Program. Work includes, but not limited to, submitting water pollution control plan for City's review and approval prior to project construction, participation in stormwater construction inspections, use of best management practices during construction to prevent construction related pollutants from entering the storm drain system, maintenance of storm water pollution prevention measures, and removal and disposal of measures after completion of work. All work shall be complete in place as accordance specifications, permits, and as directed by the Engineer.

1.4 REFERENCE STANDARDS

- A. Manual of Standards for Erosion and Sediment Control Measures - Association of Bay Area Governments (ABAG)
- B. State of California Department of Transportation Standard Specifications (SS) Section 21 Erosion Control.
- C. American Association of State Highway and Transportation Officials (AASHTO)

D. ABAG Manual of Standards for Erosion and Sediment Control Measures

1.5 QUALITY ASSURANCE

All work shall be done to the satisfaction of the designated representative of the geotechnical consultant, and shall meet the approval of the Engineer.

PART 2 - PRODUCTS

2.1 GENERAL

All materials shall conform to applicable requirements of SS Section 21, "Erosion Control", listed as follows and meeting the requirements of ABAG Manual of Standards for Erosion and Sediment Control Measures.

2.2 TOP SOIL

- A. The soil shall contain no more than seventy percent (70%) sand (as defined by USDA, Soil Conservation Service). This is to provide enough available water- holding capacity to support plant growth.
- B. The soil shall have sufficient porous base (greater than thirty percent (30%)) to permit adequate root penetration and provide for exchange of gases and water.
- C. The soil shall be free from any material harmful to plant growth.
- D. Topsoil that has been graded from the site shall be stockpiled, whenever possible, for reapplication on exposed graded slopes during the final grading stage. The soil shall be disked into the existing soil to provide for a good bond.

2.3 SEED

- A. A seed mix similar to the native plants and grasses or the following seed mix shall be applied at above the minimum rate specified below:

Seed Type	Minimum Application Rate (Pounds per Acre)
Blando Brome	30
Annual Ryegrass	20

- B. All seed shall be certified live and delivered to the site tagged and labeled in accordance with the California Agricultural Code and shall be acceptable to the County Agricultural Commissioner.

2.4 FERTILIZER

- A. Fertilizer shall contain a minimum of sixteen percent (16%) nitrogen, twenty percent (20%) available phosphoric acid, zero percent (0%) water soluble potash, and fifteen percent (15%) sulfur. It shall be uniform in composition, dry and free flowing, pellet or granular.
- B. All fertilizer shall be delivered in unbroken or unopened containers, labeled in accordance with the applicable State regulations, and bearing the warranty of the producer for the grade furnished.

**2.5 STRAW MULCH**

Straw mulch shall be of un-rotted small grain straw and shall be applied at the rate of four thousand pounds (4,000#) per acre. Mulch materials shall be relatively free of all noxious weeds. If the straw is applied with a blower, it shall be chopped in lengths not shorter than six inches (6").

**2.6 STRAW BALES**

Straw shall be derived from wheat, oats, or barley. The Contractor shall furnish evidence that clearance has been obtained from the County Agricultural Commissioner, as required by law, before straw obtained from outside the County in which it is to be used is delivered to the site of the work. Straw that has been used for stable bedding shall not be used.

**2.7 SILT FENCE**

- A. Filter fabric shall be a pervious sheet of synthetic polymer composed of at least eighty-five percent (85%) by weight ethylene, propylene, amide, ester, or vinylidene yarn, woven or non-woven, and shall contain stabilizers and/or inhibitors to resist deterioration by heat, water and ultra-violet light. The fabric shall conform to the following criteria:
  - 1. The equivalent opening size (U.S. Standard Sieve) shall be within the range 70-100.
  - 2. The tensile strength (ASTM D 1682 G "Test Method for Breaking Load and Elongation of Textile Fabric") shall be at least one hundred twenty pounds (120#). The strength of fabric required depends on the wire support fence. The strength given is the minimum for a six-inch (6") square mesh wire support fence. If extra strength fabric is used without a support fence, the strength required shall be two hundred pounds (200#) minimum with posts spaced on six foot (6') centers.
- B. Posts for silt fences shall be either four-inch (4") square wood or 1.33 pounds per linear-foot steel with a minimum length of five feet (5'). Steel posts shall have projections for fastening wire to them.
- C. Wire fence reinforcement for silt fences shall be a minimum of forty-two inches (42") in height, shall be a minimum of 14 gauge, and shall have a maximum mesh spacing of six inches (6").

**2.8 LUMBER**

Lumber shall be construction grade redwood rough finished, or approved equal.

**2.9 PIPES**

Pipes and conduits shall conform to applicable sections of these specifications and the requirement of the ABAG Manual of Standards for Erosion and Sediment Control Measures.

### **PART 3 - EXECUTION**

#### **3.1 JOB CONDITIONS**

- A. Equipment and materials shall be stored as to ensure the preservation of its quality and fitness for the work. Equipment and materials shall be located on the construction site so it can be used on short notice.
- B. Erosion and sediment control measures shall be in place during the rainy season (October 1st through April 30th) and shall be frequently serviced to maintain their full function. However, for projects having the potential to cause water pollution, the Storm Water Pollution Prevention Plan (SWPPP) must be available on site and at all times and must be implemented year-round throughout the duration of the construction project. For the foregoing type of projects, no construction activity shall be performed until the SWPPP has been certified and appropriate Best Management Practices (BMPs) have been implemented in accordance with Section 2 of the California Storm Water BMP Handbook for Construction as developed by the California Storm Water Quality Association (CASQA), and such other storm water pollution regulatory agency implementing guidelines.
- C. Dust control measures shall be implemented at all times during the construction period until no longer required. Contractor shall pay for the removal of all silt from the storm drain system and the inspection thereof.

#### **3.2 TEMPORARY AND PERMANENT PLANTING OF EXPOSED SOILS**

- A. Before seeding, necessary drainage controls such as dikes at tops of slopes and swales on slope benches shall be installed to prevent runoff from eroding slopes before grass is established. Temporary drainage controls shall remain in place until permanent drainage facilities are installed or until slopes are stabilized and temporary controls are no longer necessary for continued slope stability.
- B. The area to be seeded shall have a firm seed bed that has previously been roughened by scarifying, disking, harrowing, chiseling, or track-walking, or otherwise worked to a depth of two inches (2") to four inches (4") unless a roughed condition already exists. No implement shall be used that will create an excessive amount of downward movement of soil or clods on sloping areas. The seedbeds may be prepared at the time of completion of earth-moving work.
- C. Seeding, fertilizing, and mulching shall be done by October 1st of any year.
- D. Slopes above critical areas, such as a water supply reservoir or an existing residence, shall be stabilized by October 1st of any year. Irrigation shall be used if rainfall is insufficient to establish protection by this date.
- E. Seed shall be distributed uniformly over the seedbed by hand broadcasting, hydro-seeding or other approved method. Seed shall be covered to a depth of one-quarter to one-half inch (1/4"-1/2"), except when seed is hydraulically applied with a mulch. Seed shall not have a soil cover greater than one inch (1").

- F. Fertilizer shall be distributed uniformly over the seedbed at a rate of not less than five hundred pounds (500#) per acre. Fertilizer shall be applied in any way that will result in uniform distribution. Fertilizer shall be incorporated into the soil if possible. Incorporation may be as part of the seedbed preparation or as part of the seeding operation. Fertilizer may also be applied as a mix with seed and fiber in a slurry (see Paragraph H below).
- G. A mulch cover shall be distributed uniformly over the surface of the seeded area. Mulching shall follow immediately after the seeding.
  - 1. For slopes flatter than 2:1 and within a fifty-foot (50') access of a straw blower, the following procedure shall be used: Straw mulch shall be applied at the rate of four thousand pounds (4,000#) per acre. The mulch shall be applied by hand, blower or other suitable equipment. The mulch shall be anchored in place using hand tools, mulching rollers, disks, nets, chemical tackifiers or other suitable means.
  - 2. For slopes steeper than two to one (2:1), mulch shall be applied hydraulically as specified in Item H, below.
- H. Hydro-seeding is defined as the simultaneous application of seed, fertilizer, and mulch in a slurry.
  - 1. The hydro-seeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogeneous slurry and with a discharge system that applies the slurry to the slopes at a continuous and uniform rate. Seed shall not remain in the slurry longer than thirty (30) minutes. The slurry shall contain the required fertilizer (see preceding Item F) and shall also contain wood fiber to be applied at the rate of one thousand five hundred pounds (1,500#) of wood fiber per acre.
  - 2. The water used shall be potable water or Class 1 or 2 agricultural irrigation water.
  - 3. The slurry shall be continuously mixed and shall be mixed for at least five (5) minutes after the last addition before application starts. The slurry shall be applied at a rate that is non-erosive and minimizes runoff. The slurry must have fibrous and/or chemical adhesives to ensure retention of seed mix on soil slopes.
- I. Irrigation is optional, except on critical areas (see Paragraph D above).
  - 1. If irrigation is required or desired, the following procedure shall be used. The top one-inch (1") of soil of all seeded areas shall be kept moist for the first twenty-one (21) days after seeding. Moisture needs will be determined by visual observation. After twenty-one (21) days, the top six inches (6") of soil shall be kept moist until the first major rainstorm (minimum 1.0-inch per 24- hour period). The moisture level shall not be allowed to drop below fifty percent (50%) available moisture capacity.
  - 2. Irrigation shall not exceed one-half inch (0.5") of water applied per acre per irrigation on sandy soils, and one-inch (1.0") of water applied per acre per irrigation on loam- and clay-type soils.
  - 3. Irrigation water shall be potable or Class 1 or 2 agricultural irrigation water. Water shall be applied by sprinklers or similar devices at a non-erosive rate using the above criteria as a guide.
- J. Seeded areas shall be inspected no more than thirty (30) days after planting and no more than thirty (30) days after the first rain. Follow-up inspections shall be done between sixty (60) and ninety (90) days after the first inspection and again in the spring. The spring inspection shall establish any corrective measures necessary before the next rainy season. If, at the sixty (60) day inspections, the vegetation is not established and/or erosion is expected to continue, slopes shall be reseeded and/or repaired. Eroded slopes shall be smoothed over, including the

filling of rills and/or gullies, before reseeding starts. The reseeding operation shall follow the specifications given above.

3.3 TEMPORARY DIKES

- A. The top width shall be a minimum of two feet (2').
- B. The height of compacted earth fill dike shall be a minimum of eighteen inches (18") measured from the existing ground at the upslope toe to the top of the dike and at least twelve inches (12") above any outlet pipe. The maximum allowable water depth in the diked areas shall not exceed thirty inches (30").
- C. The side slopes shall be 2:1 or flatter.
- D. The grade along the face of the dike (flow area) shall be dependent on topography, but shall be a minimum of one percent (1%) (sufficient grade to drain) to an adequate outlet. Drainage must be positive. The "flow area" of the dike is defined as the upslope portion of the dike face and adjacent ground surface over which diverted runoff water flows.
- E. The flow area shall be stabilized:
  - 1. Where the slope of the flow area exceeds five percent (5%); or
  - 2. Where the slope of the flow area is one percent (1%) to five percent (5%) and the maximum flow velocity from the ten (10) year frequency storm is exceeded as specified below:

Flow Area Surface	Maximum Velocity (Feet per Second)
Sand and Sandy Loam	2.5
Silt Loam	3.0
Sandy Clay Loam	3.5
Clay Loam	4.0
Clay, Fine Gravel, Graded Loam to Gravel	5.5
Graded Silt to Cobbles	5.5
Shale, Hardpan, and Course Gravel	6.0

- F. Stabilization, when required by Paragraph E above, shall be:
  - 1. In accordance with the ABAG Standard and Sample Specifications for Grass Protection of Waterways, Swales and Dikes, when the dike intercepts runoff from a protected or stabilized area; or
  - 2. By lining the flow area with stone that meets AASHTO M43 size No. 2 or 24 in a layer at least three inches (3") thick and pressed into the soil. The lining shall extend up the upslope side of the dike to a height of at least eight inches (8") measured vertically from the upslope toe and shall extend upslope from the upslope toe a distance sufficient to include the flow area.
- G. Diverted runoff from a protected or stabilized area shall flow directly to a grade stabilization structure and/or receiving water channel. Diverted water from a disturbed or exposed upland area shall flow to a sediment trap or a sediment basin or to an area protected by these practices.

- H. All dikes shall be machine-compacted with the tires or tracks going over at least ninety percent (90%) of the surface. There shall be a maximum of six inches (6") of lift between each compaction.
- I. The dike shall be inspected periodically and maintained as required.

3.4 TEMPORARY SWALE

- A. The bottom width shall be a minimum of seven feet (7') and the bottom shall be level.
- B. The depth shall be a minimum of one-foot (1').
- C. The side slope shall be two to one (2:1) or flatter (flat enough to allow construction traffic to cross if desired).
- D. The grade shall be dependent on topography, but shall be a minimum of one percent (1%) (sufficient grade to drain) to an adequate outlet. Drainage must be positive.
- E. The swale shall be stabilized:
  - 1. Where the slope of the swale bottom exceeds five percent (5%), or
  - 2. Where the slope of the swale bottom is one percent (1%) to five percent (5%) and the maximum flow velocity from the 10-year frequency storm is exceeded as specified below:

Swale Surface	Maximum Velocity (Feet per Second)
Sand and Sandy Loam	2.5
Silt Loam	3.0
Sandy Clay Loam	3.5
Clay Loam	4.0
Clay, Fine Gravel, Graded Loam to Gravel	5.5
Graded Silt to Cobbles	5.5
Shale, Hardpan, and Course Gravel	6.0

- F. Stabilization, when required by Paragraph E above, shall be:
  - 1. With grass protection when the swale receives runoff from a stabilized area; or
  - 2. By lining the flow area with stone that meets AASHTO M43 size No. 2 or 24 in a layer at least three inches (3") thick and pressed into the soil. The lining shall extend across the bottom and up both sides of the channel to a height at least eight inches (8") vertically above the bottom.
- G. At all points where the swale will be crossed by vehicles several times a day, the swale shall be stabilized according to preceding Paragraph 3.04 (F) 2, above, except that the stone lining shall be at least six inches (6") thick for the whole width of the traffic crossing.
- H. The swale shall be located to take advantage of the most suitable outlet. The swale shall discharge without causing erosion at its outlet.
- I. All trees, brush, stumps, obstructions and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the swale.

- J. The swale shall be excavated and/or shaped to line, grade, and cross-section as required to meet the criteria specified herein, and be free of bank projections or other irregularities that will impede normal flow.
- K. Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the completed swale.
- L. All earth removed and not needed in construction shall be spread or disposed of so it will not interfere with the functioning of the swale.
- M. The swale shall be inspected periodically and maintained as required.

### 3.5 TEMPORARY GRADE STABILIZATION STRUCTURE

#### A. Rigid Pipe Slope Drain

- 1. The inlet pipe shall have a slope of three percent (3%) or steeper.
- 2. The top of the earth dike over the inlet pipe, and those dikes carrying water to the pipe, shall be at least one foot (1') higher at all points than the top of the inlet pipe.
- 3. The pipe shall be corrugated metal pipe with watertight connecting bands.
- 4. A riprap apron shall be provided at the outlet. This shall consist of six-inch (6") diameter rocks placed as shown on the plans.
- 5. The soil around and under the inlet pipe and entrance section shall be hand tamped in four-inch (4") lifts to the top of the earth dike.
- 6. Follow-up inspection and any needed maintenance shall be performed after each storm.

#### B. Flexible Pipe Slope Drain

- 1. The inlet pipe shall have a slope of three percent (3%) or steeper.
- 2. The top of the earth dike over the inlet pipe, and those dikes carrying water to the pipe, shall be at least one foot (1') higher at all points than the top of the inlet pipe.
- 3. The inlet pipe shall be corrugated metal pipe with watertight connecting bands.
- 4. The flexible tubing shall be the same diameter as the inlet pipe and shall be constructed of durable material with hold-down grommets spaced no more than ten feet (10') on centers.
- 5. The flexible tubing shall be securely fastened to the corrugated metal pipe with metal strapping or watertight collars.
- 6. The flexible tubing shall be securely anchored to the slope by staking at grommets provided.
- 7. A riprap apron shall be provided at the outlet. This shall consist of six-inch (6") diameter rocks placed as shown on the plans.
- 8. The soil around and under the inlet pipe and entrance section shall be hand tamped in four-inch (4") lifts to the top of the earth dike.
- 9. Follow-up inspection and any needed maintenance shall be performed after each storm.

#### C. Paved Chute or Flume

- 1. The structure shall be placed on undisturbed soil or on well-compacted fill.
- 2. The cut or fill slope shall not be steeper than two-to-one (2:1) and shall not be flatter than twenty-to-one (20:1).
- 3. The top of the earth dike at the entrance, and those dikes carrying water to it, shall not be lower at any point than the top of the lining at the entrance of the structure.
- 4. The lining at the entrance to the structure shall extend above the crest as shown on the plans.

5. The lining shall be placed beginning at the lower end and proceeding up the slope to the upper end. The lining shall be well compacted and free of voids. The lining surface shall be reasonably smooth.
6. The entrance floor at the upper end of the structure shall have a slope toward the outlet of one-quarter to one-half inch (1/4" - 1/2") per foot.
7. The cut-off walls at the entrance and at the end of the discharge aprons shall be continuous with the lining.
8. The lining shall consist of Type 2 Portland cement concrete (3,000 psi), bituminous concrete or comparable non-erodible material.
9. An energy dissipater of adequate design shall be used to prevent erosion at the outlet.

### 3.6 SEDIMENT BASINS

- A. Areas under the embankment and any structural works shall be cleared, grubbed, and stripped of any vegetation and root mat. In order to facilitate cleanup and restoration, the basin area shall be cleared also.
- B. A cut-off trench shall be excavated along the centerline of earth-fill embankments. The minimum depth shall be two feet (2'). The cut-off trench shall extend up both abutments to the riser crest elevation. The bottom width shall be wide enough to permit operation of excavation and compaction equipment and a minimum of four feet (4') in width. The side slopes shall be no steeper than one to one (1:1). Compaction requirements shall be the same as those for the embankment. The trench shall be dewatered during the backfilling and compacting operations.
- C. Fill material for the embankment shall be taken from approved fill areas. It shall be clean material soil free of roots, woody vegetation, oversized stones, rocks or other objectionable material. Relatively pervious materials such as sand or gravel (Unified Soil Classes GW, GP, SW, and SP) shall not be placed in the embankment. Areas on which fill is to be placed shall be scarified prior to placement of fill. The fill material shall contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction. Fill material shall be placed in six to eight inch (6" - 8") thick continuous layers over the entire length of the fill. Compaction shall be obtained by routing the hauling equipment over the fill so that the entire surface of each layer of the fill is traversed by at least one wheel or tread track of the equipment, or by the use of a compactor. The embankment shall be constructed to an elevation ten percent (10%) higher than the design height to allow for settlement if compaction is obtained with hauling equipment. If compactors are used for compaction, the overbuild may be reduced to not less than five percent (5%).
- D. The principal spillway riser shall be securely attached to the discharge pipe by welding all around and all connections shall be watertight. The pipe and riser shall be placed on a firm, smooth soil foundation. The connection between the riser and the riser base shall be watertight. Pervious materials such as sand, gravel or crushed stone shall not be used as backfill around the pipe or anti-seep collars. The fill material around the pipe spillway shall be placed in four inch (4") layers and compacted under the shoulders and around the pipe to at least the same density as the adjacent embankment. A minimum of two feet (2') of hand-compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment. Steel base plates shall have at least two and one-half feet (2-1/2') of compacted earth, stone or gravel placed over them to prevent flotation.
- E. The emergency spillway shall not be installed in fill. Elevations, design width, and entrance and exit channel slopes are critical to the successful operation of the emergency spillway.
- F. Baffles shall be constructed of four-inch by four-inch (4" x 4") posts and four-feet by eight-feet (4' x 8') by one-half inch (1/2") exterior plywood. The posts shall be set at least three feet (3')

- into the ground, no further apart than eight feet (8') center to center, and shall reach a height six inches (6") below the riser crest elevation. The plywood shall be securely fastened to the upstream side of the posts.
- G. The embankment and emergency spillway shall be stabilized with vegetation immediately following construction.
  - H. Construction operations shall be carried out in such a manner that erosion and water pollution will be minimized. State and local laws concerning pollution abatement shall be complied with.
  - I. State and local requirements shall be met concerning fencing and signs warning the public of hazards of soft sediment and floodwater.
  - J. Maintenance and repairs shall be carried out as follows:
    - 1. All damages caused by soil erosion or construction equipment shall be repaired before the end of each working day.
    - 2. Sediment shall be removed from the basin when it reaches the specified distance below the top of the riser. This sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the embankment or in or adjacent to a stream or floodplain.
  - K. When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment deposits shall be leveled or otherwise disposed of in accordance with the approved erosion and sediment control plan.

### 3.7 SEDIMENT TRAPS

- A. The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. The pool area shall be cleared.
- B. The fill material for the embankment shall be free of roots or other woody vegetation, as well, as oversized stones, rocks, organic material or other objectionable material. The embankment shall be compacted by traversing with equipment while it is being constructed.
- C. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to within one foot (1') of the outlet elevation. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.
- D. The structure shall be inspected after each rain and repairs made as needed.
- E. Construction operations shall be carried out in such a manner that erosion and water pollution are minimized.
- F. The structure shall be removed and the area stabilized when the remaining drainage area has been properly stabilized.
- G. All cut-and-fill slopes shall be two-to-one (2:1) or flatter.
- H. When a riser is used, all pipe joints shall be watertight.

- I. When a riser is used, at least the top two-thirds of the riser shall be perforated with one-half inch (1/2") diameter holes spaced eight inches (8") vertically and ten to twelve inches (10"-12") horizontally.
- J. When a pipe outlet is used, fill material around the pipe spillway shall be hand compacted in four-inch (4") layers. A minimum of one and one half feet (1.5') of hand-compacted backfill shall be placed over the pipe spillway. At least two feet (2') of backfill shall be placed if construction equipment will cross over the pipe spillway.
- K. When an earth or stone outlet is used, outlet crest elevation shall be at least one foot (1') below the top of the embankment. Pipe outlets shall be at least one-and one-half feet (1.5') below the top of the embankment.
- L. When a crushed stone outlet is used, the crushed stone used in the outlet shall meet AASHTO M43, size No. 2, 24, or its equivalent such as MSHA NO. 2 Gravel meeting the above gradation may be used if crushed stone is not available. Crusher run is not acceptable.

### 3.8 TEMPORARY STRAW BALE DIKES

- A. Bales shall be placed in a row with ends tightly abutting as shown on the Plan.
- B. Each bale shall be embedded in the soil a minimum of four inches (4").
- C. Bales shall be securely anchored in place by two (2) wood stakes driven through the bales. The first stake in each bale shall be driven toward the previously laid bale to force bale together.
- D. The dike shall be inspected after each storm, and repair or replacement shall be made promptly as needed.
- E. Bales shall be removed when they have served their purpose so as not to block or impede storm flow or drainage.

### 3.9 TEMPORARY SILT FENCE

- A. The height of silt fence shall not exceed thirty-six inches (36"). On slopes, the fence line shall follow the contour as closely as possible. In small swales, the fence line shall be curved upstream at the sides to direct the flow toward the middle of the fence.
- B. If possible, the filter fabric shall be cut from a continuous roll to avoid the use of joints. When joints are necessary, filter cloth shall be spliced only at a support post, with a minimum six-inch (6") overlap and both ends securely fastened to the post.
- C. Posts shall be spaced a maximum of ten feet (10') apart and driven securely into the ground, a minimum of twelve inches (12"). When extra strength fabric is used without the wire support fence, post spacing shall not exceed six feet (6').
- D. A trench shall be excavated approximately four inches (4") wide and four inches (4") deep along the line of posts and upslope from the barrier.
- E. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch (1") long, tie wires or hog rings. The wire shall extend into the trench a minimum of two inches (2") and shall not extend more than thirty-six inches (36") inches above the original ground surface.

- F. The standard strength filter fabric shall be stapled or wired to the fence, and eight inches (8") of the fabric shall extend into the trench. The fabric shall not extend more than thirty-six inches (36") above the original ground surface. Filter fabric shall not be stapled to existing trees.
- G. When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of Subparagraph F, above, applying.
- H. The trench shall be backfilled and the soil compacted over the toe of the filter fabric.
- I. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.
- J. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
- K. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the barriers expected usable life and the barrier is still necessary, the fabric shall be replaced promptly.
- L. Sediment deposits should be removed when deposits reach approximately one-half (1/2) the height of the barrier.
- M. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required should be dressed to conform to the existing grade, prepared and seeded.

### 3.10 SPECIAL REQUIREMENTS

- A. All basins and check dams shall have been pumped dry, and all debris and silt removed within twenty-four (24) hours after each storm.
- B. Hydro-seed all fill and cut slopes as approved by the Engineer, with a vertical height of five feet (5') or more.
- C. Changes to the erosion and sediment control plans to meet field conditions will be made only with the approval of, or at the direction of, the Engineer.
- D. During the rainy season, all paved areas will be kept clear of earth material and debris. The site will be maintained so that a minimum of sediment-laden runoff enters the storm drainage system.

### 3.11 CONTROL OF GROUND WATER

The Contractor shall be solely responsible for dewatering excavations and subsequent control of ground water. The Contractor shall provide and maintain such pumps or other equipment as may be necessary to control ground water and seepage, to the satisfaction of the Engineer, until backfilling is completed.

END OF SECTION

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SECTION 32 11 23

AGGREGATE BASE COURSES

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PART 1 – GENERAL

1.1 SUMMARY

A. Related Documents:

1. Drawings and general provisions of the contract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section includes:

1. Aggregate base.
2. Subgrade Preparation.

C. Related Sections:

1. Division 32 Section 32 12 16 – Asphalt Paving and Surfacing

1.2 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

B. State of California – California Department of Transportation (CALTRANS):

1. Standard Specifications: Section 26 Aggregate Bases.

1.3 DEFINITIONS

A. Acceptance: Wherever the terms acceptance or accepted are used herein, they mean acceptance of the Architect-Engineer in writing.

B. Subgrade: The soil surface on which aggregate base or cement-treated base is placed.

1.4 SUBMITTALS

A. Test Results:

1. Compaction Tests.

1.5 QUALITY ASSURANCE

- A. Single Source: Furnished from single source throughout Work.
- B. Certification: Arrange with District to have District's Geotechnical Engineer certify that source materials for this Work meets these Specifications and provide tests required to prove that Work-in-progress meets requirements of these specifications.

1.6 DELIVERY, STORAGE AND HANDLING

- A. On Site Storage: Store aggregate-base material on-site covered or in a location where material will not be contaminated.

1.7 SITE CONDITIONS

- A. Unfavorable Weather: When weather is such that satisfactory results cannot be secured, suspend operations until the weather is considered favorable.
- B. Wet Subgrades: Do not place material on wet or muddy subgrade.

1.8 WARRANTY

- A. General Description: In addition to manufacturer's warranties, warrant Work for a period of one year from the Date of Final Completion against defects in materials and workmanship.
- B. Additional Items Covered: Warranty shall also cover repair of damage to other materials and workmanship resulting from defects in materials and workmanship.
- C. Exceptions: Subcontractor shall not be held responsible for failures due to ordinary wear, neglect by the District, vandalism, or other causes beyond the Subcontractor's control.

PART 2 – PRODUCTS

1.1 FORM MATERIALS

- A. Aggregate Base: SS Section 26-1.02A, Class 2, meeting requirements of ¾-inch (20 mm) maximum size from a single source.
- B. Water: Fresh, clean, potable.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verification of General Conditions: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.
- B. Subgrade: Review to verify that it has been inspected, graded to the correct grades, and compacted as required for correct installation of aggregate base.
- C. Notification of Unsuitable Conditions: Before proceeding with Work, notify the Project Manager in writing of unsuitable conditions and conflicts.

### 3.2 PREPARATION

- A. Protection of Existing Conditions:
  - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, plant materials and walks on or adjacent to the site of the Work. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
  - 2. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
  - 3. Submit written notification of damaged plants and structures to the Project Manager.
- B. Subgrade Preparation:
  - 1. Meet requirements of Project Geotechnical Report recommendations for subgrade preparation prior to placement of aggregate base or cement-treated base.
  - 2. Grade subgrade with uniform slope between points where elevations are given.
  - 3. Use equipment of proper size and appropriate type to achieve grades required.
  - 4. Grade subgrade surface to within 0.05-foot (15 mm) of elevations indicated by the Drawing details.
  - 5. Fill and compact any depressions and remove loose material to finish true to line and grade, presenting a smooth, compacted and unyielding surface, except where indicated otherwise.
  - 6. Remove debris, loose dirt and other extraneous materials.

### 3.3 AGGREGATE BASE

- A. Pre-wetting Aggregate Base: Meet requirements of CALTRANS Specifications Section 26.
- B. Hauling:
  - 1. Use of dragline equipment to transport aggregate from stockpiles to elevators or other loading devices will not be permitted.
  - 2. Distribute hauling over the area to be paved in such a manner as to be most effective in the compacting of the surfacing.
  - 3. Hauling over any of the surfacing in process of construction will not be permitted when, in the opinion of the District, the effect will be detrimental.
  - 4. Uniformly load hauling vehicles when it is practicable.
- C. Placement of Aggregate Base:

1. Spread base in an even distribution of material without perceptible segregation.
  2. Method of spreading and field operation shall be acceptable to the District at all times and in accordance with of CALTRANS Specifications Section 26.
  3. Construct base course in lifts not exceeding 6 inches (150 mm) in depth so that when compacted to the specified density, the finished surface will conform to grades and dimensions shown, with proper allowance for subsequent courses where specified.
  4. Construct the base course in an orderly manner so that reasonable size areas will be ready for testing and a reasonable length of time will be allowed for the District to perform tests and obtain the test results during normal working hours.
  5. Equipment such as scrapers, and other equipment essentially used for earth excavation, will not be permitted.
  6. Compaction equipment shall be adequate in design and number to obtain the specified density for each layer while still moist.
  7. Apply water as needed to obtain the specific densities.
  8. Place each layer of base course and compact to the specified density before a succeeding layer is placed.
- D. Compacting of Aggregate Base:
1. Compact each lift of base as soon after spreading operations as practicable and continue until a density of 95 percent of the maximum density has been achieved as determined in accordance with ASTM D1557.
  2. Roll each course of surfacing until the material does not creep under the roller before a succeeding course of surfacing material is applied.
  3. At the outer edges of the surfacing and continue toward the center.
  4. Correction of Surface Defects: Should irregularities develop in any surface during or after rolling, they shall be remedied by loosening the surface and correcting the defects, after which the entire area, including surrounding surfaces, shall be rerolled until thoroughly compacted. Finished surfaces shall be true to grade and crown before proceeding with surfacing.
- E. Patrolling: Surfacing in progress of construction shall be bladed and otherwise worked as may be necessary to maintain proper grade and cross section at all times and to keep the surface smooth and thoroughly compacted.
- F. Final Clean-up:
1. After work is completed, the entire area shall be neatly finished and trimmed to lines, grades and cross sections shown.
  2. Unused construction material shall be removed, and stockpile areas shall be cleaned of aggregate and left in an acceptable condition.

### 3.4 TOLERANCES

- A. Subgrade Surface: Plus or minus 0.05-foot or elevations indicated by the Drawing details.
- B. Aggregate Base Course Variation from Thickness: Plus or minus 0.05-foot.
- C. Aggregate Base Course Finished Surface Smoothness: Plus or minus ¼-inch.

END OF SECTION

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**SECTION 32 12 16**

**ASPHALT PAVING AND SURFACING**

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**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. This section describes general requirements, products, and methods of execution relating to on-site paving and surfacing. Any work within the Public right-of-way shall be done to the standards of the local City or County or the State of California Department of Transportation. Paving and surfacing includes but is not limited to:
1. Asphalt Concrete Paving.
  2. Liquid Asphalt and Asphalt Emulsion.
  3. Aggregate Base.
- B. Related work furnished under other sections but conforming to the provisions of this section:
1. Section 31 20 00 – Earthwork.
  2. Section 32 11 23 - Aggregate Base Courses.

**1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM International):
1. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  2. ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>)
  3. ASTM D5035 - 11(2015) - Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).
- B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site development Requirements for Handicapped Accessibility.
- C. California Department of Transportation (CalTrans):
1. Standard Specifications:
    - a. Section 26 Aggregate Bases.
    - b. Section 37 Bituminous Seals.
    - c. Section 39 Asphalt Concrete.
    - d. Section 92 Asphalts.
    - e. Section 93 Liquid Asphalts.
    - f. Section 94 Asphaltic Emulsions.
  2. Traffic Manual.
  3. Highway Design.
- D. Institute of Transportation Engineers: Transportation and Traffic Engineering Handbook.

**1.3 SUBMITTALS**

**A. Asphalt Concrete Paving:**

1. Provide two copies of material certificates signed by the material producer and the Contractor, certifying that each material item complies with or exceeds specified requirements.
2. The Contractor shall furnish a certified weight or load slip for each load of material used in the construction of the asphalt concrete pavement.

**B. Asphalt Paving:** The Contractor shall furnish material test reports showing compliance with the respective specifications. The Test Engineer may determine to compliance with specifications.

**C. Product Data:**

1. Liquid Asphalt.
2. Pavement Reinforcement Fabric.
3. Tack Coat.
4. Aggregate base.
5. Paint.

**1.4 PROJECT CONDITIONS**

**A. Liquid Asphalt and Asphalt Emulsion:**

1. Prime coat, seal coat, and paint binder shall be applied only when the ambient temperature is above 50° Fahrenheit and when temperature has not been below 35° Fahrenheit for 12 hours immediately prior to application.
2. Prime coat, fog coat, seal coat, and paint binder shall not be applied when base or surfaces are wet or contain excess moisture.

**B. Asphalt Concrete Paving:**

1. Asphalt concrete surfaces shall be constructed only when ambient temperature is above 50° Fahrenheit and when base is dry.

**1.5 GENERAL DESIGN CRITERIA:**

**A. Services Areas:** Approach ramps, driveways, and paved work areas in excess of 4 percent slope shall be provided with a rough texture for non-skid surface.

**B. Walks and Paths:** Concrete exterior slabs (walks, terraces, etc.) shall have a pitch of at least 2 percent. (unless otherwise noted on the drawings)

**C. Pavement Markings:** All traffic control striping and pavement markings shall conform to the standards illustrated in the CalTrans Standard Plans Book current edition.

**PART 2 - PRODUCTS**

**2.1 PAVING MATERIALS**

- A. Aggregate Base: Aggregate base shall conform to Caltrans Class 2 (R value 78 min) aggregate base, 3/4" maximum size, as specified in Section 26 of the CalTrans Standard Specifications.
- B. Asphalt Concrete Paving:
  - 1. Paving asphalt to be mixed with aggregate shall be steam-refined asphalt, AR-4000, conforming to Section 92 of the CalTrans Standard Specifications.
  - 2. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the CalTrans Standard Specifications.
  - 3. Maximum aggregate size shall be as follows:
    - a. Pathways: 1/2" Fine
    - b. Drive Aisle: 3/4" Medium
  - 4. Asphaltic emulsion for paint binder, fog coat, and seal coat shall be emulsified asphalt, Type SS-1h, conforming to Section 94 of the CalTrans Standard Specifications.
- C. Pavement Reinforcement Fabric: Pavement reinforcement fabric shall meet Caltrans Section 88-1.02, BP Petromat or approved equivalent.
- D. Crack Sealant:
  - 1. Crack sealant: Rubberized hot-pour type and shall meet ASTM D 3405, Husky 1611 or approved equivalent.
  - 2. Blotting Agent: One of: Screened sand, cement, or fly ash.
- E. Tack coat: Meet Caltrans Section 39-4.02.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Subgrade and Aggregate Base:
  - 1. Prepare a subgrade and over-excavation per Section 31 20 00 – Earthwork.
  - 2. Aggregate base shall be compacted to 95 percent ASTM D1557. Sections 26-1.04B and 26-1.05 of the CalTrans Standard Specifications shall apply.
  - 3. Apply soil sterilant to prepared subgrade in areas indicated by soils engineer or after installation of rock or aggregate base uniformly at the rate recommended by the manufacturer.
- B. Crack Sealing:
  - 1. Before sealing, clear cracks of dirt, dust, and all other deleterious materials to a depth of 1/4-inch to 1/2-inch.
  - 2. Seal cracks 1/8-inch in width and greater.
  - 3. Apply crack sealer accordance with the manufacturer's recommendations unless otherwise directed.

**3.2 ASPHALT CONCRETE PAVING**

**A. General:**

1. Proportion, mix, place, spread, and compact asphalt concrete in conformance with Section 39 of the CalTrans Standard Specifications.
2. Before placing asphalt concrete, apply an asphalt emulsion tack coat to all vertical surfaces of existing pavement, curbs, gutters, construction joints, and all existing pavement to be surfaced, in conformance with Section 39 of the CalTrans Standard Specifications.
3. Perform spreading and compacting of asphalt concrete in accordance with Section 39 of the CalTrans Standard Specifications.
4. Apply fog seal to all finished surfaces of asphalt concrete pavement at a rate of 0.05 gallons per square yard, in accordance with Section 37 of the CalTrans Standard Specifications.
5. After fog seal has been applied, allow ample time for drying before traffic is allowed on the pavement or paint striping is applied.

**3.3 FIELD QUALITY CONTROL**

- A. Asphalt Base:** The surface of finished aggregate base shall vary no more than 0.05 feet above or below the grade established as shown on the drawings.

**B. Asphalt Concrete Paving:**

1. The finished pavement, where not controlled by adjacent structures or features, shall not vary more than 0.05 feet above or below the planned grade, providing it is uniform and free of sharp breaks.
2. The cross section of the finished pavement shall be free of ridges and valleys and shall not vary more than 0.02 feet above or below the theoretical section at any point on the cross section.
3. The specified thickness of the finished pavement shall be the minimum acceptable.
4. Conforms shall form a smooth, pond free transition between exiting and new pavement.
5. Depressions in paving between high points are not to exceed 1/8 inch when measured below 10 feet long straight edged placed anywhere on the surface in any direction.

**3.4 CLEANUP**

**A. General:**

1. Surplus material remaining upon completion of paving operations shall become the property of the Contractor, to be removed from the work site and disposed of in a lawful manner.
2. Leave surfaces in a clean, neat, and workmanlike condition, and remove all construction waste, rubbish, and debris from the work site and dispose of in a lawful manner.

END OF SECTION

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**SECTION 32 17 23**

**PAVEMENT MARKINGS**

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**1.1 SECTION INCLUDES**

- A. Traffic line paint and thermoplastic material for traffic striping and marking.
- B. Application of traffic striping and control markings.

**1.2 REFERENCES:**

- A. Asphalt pavement is specified in Section 32 12 16 – Asphalt Paving.
- B. Concrete pavement and concrete curbs, gutters and walks are specified in Section 03 30 01 – Site Concrete.

**1.3 MEASUREMENT AND PAYMENT:**

- A. Measurement: Pavement markings will be measured for payment by the lump sum method, acceptable performed and completed.
- B. Payment: Pavement marking will be paid for at the indicated Contract lump sum price, as indicated in the Bid Schedule of the Bid Form.

**1.4 REFERENCES:**

- A. State of California, Department of Transportation (Caltrans), Standard Specifications, latest edition:
  - 1. Section 84: Traffic Stripes and Pavement Markings
- B. California Air Resources Board (CARB):
  - 1. Latest regulations governing permissible content of Volatile Organic Compounds (VOC) in paints.

**1.5 SUBMITTALS:**

- A. Shop Drawings: Submit drawings and diagrams, indicating stripe width of roadway divider stripes and parking stalls, configuration and dimensions of directional arrows, style and size of letters for “compact car” designation, configuration and dimensions of international handicapped symbol, and any other traffic control markings on pavement, such as “in” and “out” or “enter” and “exit” designations as indicated.
- B. Certificate of Compliance: Submit evidence or affidavit that certifies that paint to be used complies with latest CARB/VOC regulations.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Paint and Thermoplastic Material: Provide paint and thermoplastic material conforming to the requirements of Section 84 of the Caltrans Standard Specifications, color as indicated on the Standard Drawings Sheet CS20.
  - 1. Provide glass beads where indicated on Standard Drawings Sheet CS20 cement.
  - 2. Any paint with in walking areas shall have Slip resistant texture added to the paint to prevent slipping
- B. Stall Numbers: Pre-cut thermoplastic numbers, 90 mil minimum thickness. Numbers shall be yellow, 12 inches high, Helvetica Light font.
- C. Approved products or approved equals
  - PreMark® Preformed Thermoplastic (Ennis-Flint)
  - DuraMark® Playground Markings
  - 3M Stamark® Preformed Thermoplastic

**PART 3 – EXECUTION**

**3.1 APPLICATION:**

- A. PREPARATION
  - 1. Clean surface by sweeping and power-washing as necessary.
  - 2. Mask or chalk layout lines in accordance with approved plans.
  - 3. Prime surfaces if required by manufacturer.
- B. APPLICATION
  - 1. Apply paint in strict accordance with manufacturer's written instructions.
  - 2. Apply using mechanical striping machine or approved sprayer to produce uniform, sharp-edged lines.
  - 3. Typical Dry Film Thickness: 20–25 mils per coat.
  - 4. Apply minimum two coats where bright, opaque color is required.
  - 5. Allow first coat to dry completely before applying second coat.
  - 6. Apply glass beads or anti-slip additive immediately after wet application where reflectivity is desired.
  - 7. Apply no paint or thermoplastic material until pavement has cured for at least 60 days or for the number of days as recommended by the manufacturer, whichever is longer. Ensure that pavement has cured sufficiently to carry application equipment without damage. The surface shall be tested per manufactures recommendation prior to application.
- C. Provide traffic striping and control markings on pavement, parking stalls, and curbs in accordance with the layout, configurations, and dimensions indicated on the Contract Drawings and approved Shop Drawings.

- D. Application equipment and procedures shall conform to the applicable requirements of the Caltrans Standard Specifications. Keep paint thoroughly mixed throughout application.
- E. Traffic control markings and parking stalls shall be applied with the use of substantial cutout patterns and templates, or with striping equipment that applies straight, uniform width, sharp lines. Coverage shall be thorough and complete in accordance with the paint and thermoplastic manufacturer's instructions and recommendations and the Caltrans Standard Specifications.
- F. Traffic control markings and parking stalls shall be sharp and accurate, straight where required, without fuzziness at edges of lines.
- G. Accessible parking stalls shall include the International Symbol for Accessibility.
- H. At completion, the Contractor shall check the work thoroughly and shall touchup traffic control markings and parking stalls that are not distinct or thorough in coverage, or are not uniform in color.

**3.2 TOLERANCES AND APPEARANCE:**

- A. In addition to the tolerances and appearance requirements specified in the Caltrans Standard Specifications, edges shall be uniform with local variations not exceeding 1/8 inch per foot and surfaces shall be smooth and uniform.
- B. Letter sizes and patterns shall be as indicated on the Contract Drawings with variations not more than plus or minus 15% in dimension.

END OF SECTION

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SECTION 32 31 13

CHAIN LINK FENCES AND GATES

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PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Galvanized steel chain-link fabric.
2. Galvanized steel framework.
3. Galvanized steel gates.

1.2 DEFINITIONS

- A. CLFMI: Chain Link Fence Manufacturers Institute.
- B. Zn-5-Al-MM Alloy: Zinc-5 percent aluminum-mischmetal alloy.

1.3 SUBMITTALS

- A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:
1. Fence and gate posts, rails, and fittings.
  2. Chain-link fabric, reinforcements, and attachments.
  3. Gates and hardware.
- B. Shop Drawings: Show locations of fence, each gate, posts, rails, and tension wires and details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, sections, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing.
- C. Product Certificates: Signed by manufacturers of chain-link fences and gates certifying that products furnished comply with requirements.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Field Test Reports: Indicate and interpret test results for compliance of chain-link fence and gate grounding and bonding with performance requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Chain-Link Fences and Gates: Obtain each grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.
- C. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.

1.5 PROJECT CONDITIONS

- A. 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 Construction manager not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Construction written permission.
- B. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:
  - 1. Chainlink Fence
    - a. Anchor Fence Co.
    - b. All Fence Company, Inc.
    - c. Diamond Fence Co., Inc.

2.2 CHAIN-LINK FENCE FABRIC

- A. Steel Chain-Link Fence Fabric: Height to match existing Fence. Provide fabric fabricated in one-piece widths for fencing in height of 12 feet (3.6 m) and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:
  - 1 Galvanized Steel Fabric: 9 gauge, 2" mesh, Type II, zinc coated (galvanized) with a minimum coating weight Class 2, not less than 2 oz./sq. ft. of uncoated wire surface.
  - 2. Coat selvage ends of fabric that is metallic coated during the weaving process with manufacturer's standard clear protective coating.

**2.3 INDUSTRIAL FENCE FRAMING**

- A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. ft. zinc. Strength and stiffness requirements, Line, End, Corner, and Pull Posts and Top Rail: Per requirements for Light Industrial Fence. Posts to be set in concrete, minimum of 2-feet deep. Depth of footings shall be proportionate to height of fence posts.
- B. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.
- H. Top Rails: Fabricate top rail from lengths 21 feet or longer, with swedged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric.
- I. Intermediate Rails: Match top rail for coating and strength and stiffness requirements
- J. Bottom Rails: Match top rail for coating and strength and stiffness requirements.
- K. Extended Members: Extend posts above top of chain-link fabric to match existing as required to attach barbed wire assemblies.

**2.4 TENSION WIRE**

- A. General: Provide horizontal tension wire at the following locations: As indicated on Drawings.
- B. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 824. Type II, zinc coated (galvanized) by the hot-dip process with the following minimum coating weight: Matching chain-link fabric coating weight.

**2.5 PEDESTRIAN SWING GATES**

- A. General: Comply with ASTM F 900 and Section 1133 B.2.4.1 for the following swing-gate types: Single gate, and double gate. Gates are to be ADA compliant and have accessible hardware if in the path of travel.
- B. Metal Pipe and Tubing: Galvanized steel.
- C. Frames and Bracing: Fabricate members of galvanized aluminum for the gate fabric height: As indicated on Drawings.
- D. Frame Corner Construction: Welded or assembled with corner fittings and 5/16-inch- diameter, adjustable truss rods for panels 5 feet wide or wider.
- E. Gate Posts: Fabricate members from round schedule 40 pipe, hot-dipped galvanized pipe with outside dimension and weight according to ASTM F 900.

F. Hardware: Provide hardware and accessories for each gate:

**HARDWARE SET: 01      GATE 01**

2	Ea	Hinge	5BB1HW 5 X 4.5 NRP	630	IVE
1	Ea	Leverset	ND70T RHO	626	SCH
1	Ea	Primus Rim Cylinder	20-757-XP	626	SCH
1	Ea	Primus Mort. Cylinder	20-771-XP XQ11-948	626	SCH

**HARDWARE SET: 02      GATE 02&03**

3	Ea	Hinge	5BB1HW 5 X 4.5 NRP	630	IVE
1	Ea	Panic Hardware	CD-OUT-PA-AX-99-L-KC-06-WH	626	VON
1	Ea	Primus Rim Cylinder	20-757-XP	626	SCH
1	Ea	Primus Mort. Cylinder	20-771-XP XQ11-948	626	SCH
1	Ea	Surface Closer	4111 EDA MCSRI	689	LCN
1	Ea	Floor Stop	FS18S	BLK	IVE

**HARDWARE SET: 03      GATE 04**

2	Ea	Hinge	5BB1HW 5 X 4.5 NRP	630	IVE
1	Ea	Panic Hardware	CD-OUT-PA-AX-99-L-KC-06-WH	626	VON
1	Ea	Primus Rim Cylinder	20-757-XP	626	SCH
1	Ea	Primus Mort. Cylinder	20-771-XP XQ11-948	626	SCH

**2.8      FITTINGS**

- A. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.
- B. Post and Line Caps: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide weathertight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  - 1. Top Rail Sleeves: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron . Not less than 6 inches long.
  - 2. Rail Clamps Hot-dip galvanized pressed steel. Provide line and corner boulevard clamps for connecting intermediate rails in the fence line to line posts.
- E. Tension and Brace Bands: Hot-dip galvanized pressed steel.
- F. Tension Bars: Hot-dip galvanized steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Hot-dip galvanized steel rod and turnbuckle or other means of adjustment.

- H. Tie Wires, Clips, and Fasteners: Provide the following types according to ASTM F 626:
1. Standard Round Wire Ties, for attaching chain-link fabric to posts, rails, and frames, Hot-Dip Galvanized Steel: 0.148-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
  2. Power-driven fasteners.
  3. Round Wire Hog Rings: Hot-dip galvanized steel or aluminum for attaching chain-link fabric to horizontal tension wires.

## 2.9 FOOTINGS

- A. Provide Class A ready-mixed concrete. Batch mixing at site not acceptable. Adding water to concrete after initial batching is subject to approval of the Testing Lab Technician and/or Project Inspector.

Use Portland Cement Concrete containing not less than 564 pounds of Portland Cement per cubic yard, with a compressive strength of not less than 3000 p.s.i.

- B. Indicate water added to mix at job site on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance. Do not begin installation before final grading is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

### 3.3 INSTALLATION, GENERAL

- A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
- C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil. Set terminal, line, and gateposts in concrete footing. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Using mechanical devices to set line posts per ASTM F 567 is permitted. Verify that posts are set

plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.

1. Dimensions and Profile: As indicated on Drawings.
2. Exposed Concrete Footings: Extend concrete to grade, smooth, and shape to shed water.
3. Posts Set into Concrete in Voids: Form or core drill holes not less than 5 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

### 3.4 CHAIN-LINK FENCE INSTALLATION

- A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignments.
- B. Line Posts: Space line posts uniformly at not more than 10' o.c.
- C. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- D. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.
  1. Top Tension Wire: Install tension wire through post cap loops.
  2. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same gage and type of wire.
- E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.
- F. Intermediate Rails: Install in one piece as indicated on Drawings, spanning between posts, using fittings, special offset fittings, and accessories.
- G. Bottom Rails: Install, spanning between posts, using fittings and accessories.
- H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.
- J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach

other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to braces 24 inches o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

O. Tennis Court Fencing: Construct tennis court fence according to ASTM F 969.

### 3.5 GATE INSTALLATION

A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

### 3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware, and other moving parts.

### 3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates.

1. Test and adjust hardware, and other operable components. Replace damaged or malfunctioning operable components.

END OF SECTION

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**SECTION 32 84 00****PLANTING IRRIGATION**

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## PART 1 – GENERAL

## 1.1 DESCRIPTION

- A. Work included: Order and furnish all labor, materials, supplies, tools and transportation and perform all operations in connection with and reasonably incidental to complete installation of the automatic sprinkler irrigation systems as shown on the drawings. Items hereinafter are included as an aid to take off and are not necessarily a complete list of work items.
1. Trenching, stockpiling, excavation, backfill materials and refilling trenches.
  2. Furnishing materials and installation for complete system including piping, backflow prevention assembly, valves, fittings, sprinkler heads, automatic controls and final adjustment of heads to insure complete and uniform coverage.
  3. Line voltage connections to the irrigation controllers and low voltage control wiring from controllers to remote control valves.
  4. Replacement of unsatisfactory materials.
  5. Clean-up, inspection and approval.
  6. All work of every description mentioned in the specification and/or addenda thereto, and all other labor, and materials reasonably incidental to the satisfactory completion of the work, including clean-up of the site, as directed by the Architect.
  7. Tests.
  8. Record drawings.

## 1.2 GENERAL REQUIREMENTS

- A. OSHA Compliance: All articles and services covered by this specification shall meet or exceed the safety standards established under the Federal Occupational Safety and Health Act of 1970, together with all amendments in effect as of the date of this specification.
- B. Codes and Standards: Comply with all applicable codes and standards.
1. All work and materials shall be in full accordance with the latest rules and regulations of the National Electric Code; the Uniform Plumbing Code, published by the Western Plumbing Officials Association; and other State or local laws or regulations. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes.
  2. When the Specifications call for materials or construction of a better quality or larger size than required by above-mentioned rules and regulations, the provision of the Specifications shall take precedence over the requirements of the said rules and regulations.
  3. The Contractor shall furnish without any extra charge any additional material and labor when required by the compliance with these rules and regulations, though the work may not be mentioned in these particular

Specifications or shown on the Drawings.

4. The Contractor shall erect and maintain barricades, guards, warning signs, and lights as necessary or required by OSHA regulations for the protection of the public or workers.
5. Any existing buildings, equipment, piping, pipe covering sewers, sidewalks, landscaping, etc damaged by the Contractor during the course of this work shall be replaced or repaired by the Contractor in a manner satisfactory to Architect and at Contractor's expense, and before final payment is made. The Contractor shall be responsible for damage caused by leaks in the piping systems being installed or having been installed by him. He shall repair, at his own expense, all damage so caused, in a manner satisfactory to the Architect.
6. The Contractor shall pay for all permits, licenses, and fees required.

### 1.3 SUPERVISION AND WORKMANSHIP

- A. The Contractor, personally or through an authorized and competent representative, shall supervise the work constantly, and shall as far as possible keep the same foreman and workers on the job from commencement to completion. The workmanship of the entire job must in every way be first class, and only experienced and competent workers will be allowed on the job.

### 1.4 LAYOUT OF WORK

- A. The Contractor shall stake out the irrigation system as shown on the Drawings. These areas shall be checked by the Contractor and Architect before construction is started. Any changes, deletions or additions shall be determined in this check.

### 1.5 INSTRUCTION

- A. After the system has been installed and approved, Contractor shall instruct the Owner's Representative in complete operation and maintenance of the irrigation system.

### 1.6 SUBMITTAL

- A. Submit catalog information on all materials which are to be used in the installation. Product and specified options must be highlighted on the catalog information. No substitution will be permitted without prior written approval by the Irrigation Consultant. Complete submittal approval must be obtained prior to construction.
- B. Record Drawings:
  1. The Contractor shall maintain in good order in the field office one complete set of black line prints of all sprinkler drawings which form a part of the contract, showing all water lines, sprinklers, valves, controllers and stub-outs. In the event any work is not installed as indicated on the Drawings, such work shall be corrected and dimensioned accurately from the building walls.
  2. All underground stub-outs for future connections and valves shall be

located and dimensioned accurately from building walls on all record drawings.

3. Upon completion of the work, obtain reproducible prints from Architect and neatly correct the prints to show the as-built conditions.

## PART 2 - MATERIALS

### 2.1 PIPE AND FITTINGS

- A. Main lines (constant pressure) 3" and larger shall be polyvinylchloride (PVC) 1120-CL 200 with ring-tite connections; 2 1/2" and smaller shall be PVC 1120-Schedule 40 plastic pipe.
  1. Join lengths of pipe by means of integrally formed bell end on pipe using rubber ring seal. Use Schedule 40 PVC solvent weld couplings on Schedule 40 pipe.
  2. Ring-Tite Main Line: At changes in direction or branch appropriate ductile iron fittings with one-piece molded rubber ring seal for use with Class 200 PVC O-ring pipe as approved by the Uniform Plumbing Code. Solvent Weld Main Lines: At changes in direction or branch mains, use appropriate Schedule 40 PVC solvent weld fittings as approved by the Uniform Plumbing Code.
- B. Leemco Joint Restraint system on pipe fittings and connections in accordance with Leemco specification.
- C. Lateral lines (non-pressure): 1/2" shall be 1120-315 PSI PVC plastic pipe, 3/4" and larger shall be 1120- Schedule 40 PVC plastic pipe. All lateral lines shall be connected with Schedule 40, Type 1, Grade 1, PVC solvent weld fittings.
- D. Connections between main lines and RCVs shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.
- E. Risers shall be as follows: Schedule 80 PVC threaded nipples and Schedule 40 PVC ells as shown in the construction details. Offset risers shall be King Bros. model FR-500 flex-risers.

### 2.2 QUICK COUPLING VALVES

- A. Quick coupling valve shall be as listed on the Drawings.

### 2.3 CONTROLLERS

- A. Controllers shall be as listed on the Drawings.

### 2.4 REMOTE CONTROL VALVES

- A. Remote control valves shall be globe pattern with brass / plastic body and bonnet,

flow stem and manual bleed petcock. Sizes of remote-control valves shall be as listed on the Drawings.

2.5 GATE VALVES

- A. 2 1/2" and smaller shall be bronze construction with operating wheel and screwed connections. 3" and larger shall be ductile iron with operating nut (2" square) and "O" ring connections for PVC plastic pipe. Install in 9" diameter plastic valve box as detailed.

2.6 CONTROL WIRE, DECODERS AND GROUNDING

- A. The control wire shall be copper with U.L. approval for direct burial in ground, size #14-1. Common ground wire shall have white insulating jacket; control wire shall have insulated jacket of color other than white. Splices shall be made with 3M DBR/Y-6 Scotchlok seal packs. Provide a separate ground wire for each controller.
- B. 120-volt A.C. electrical shall be U.L. approved for use below grade in conduit. Size as noted on Drawings. Install in 1" PVC electrical conduit with splice boxes set approximately 300 feet on center and at wire splices. Splice boxes shall be set on 4 bricks with drain rock 6" deep at bottom of box. Splices shall be made waterproof with epoxy seal packs.

2.7 BOXES FOR REMOTE CONTROL VALVES

- A. Rain Bird VB black plastic valve box with black plastic lid. Lid shall be marked: "Irrigation Control Valve".

2.8 SPRINKLER HEADS

- A. All sprinkler heads shall be as listed on the Drawings.

2.9 DRIP TUBING

- A. Drip tubing and associated components and fittings shall be as listed on the Drawings.

2.10 BACKFLOW PREVENTION DEVICE

- A. Backflow prevention device shall be the reduced pressure type with gate valves, check valves, test cocks, reduced pressure chamber and air vent. Install 12" above finish grade.

2.11 EMITTERS

- A. Emitters shall be as listed on the Drawings.

2.12 SUB-SURFACE DRIP

- A. Sub-surface drip irrigation shall be Rain Bird XFS-CV, flush valves, air-vacuum relief valves, fittings and all other components specified and detailed on the drawings.

2.13 PRESSURE GAUGES

- A. Pressure gauges shall be hermetically sealed, watertight, dust proof, with shatterproof face (2" diameter) and 1/4" standard pipe thread brass connection. Irro-meter model 7-100 or approved equal.

2.14 FILTER

- A. The emitter filter shall have a plastic housing, FIPT/MIPT connections with removable screen and integral flush valve with hose threads.
- B. Emitter filter shall be part of drip valve assembly as listed on the Drawings.

2.15 FLOW SENSOR

- A. Flow sensor shall be Creative Sensor Technology or as listed on the Drawings.

2.16 WEATHER SENSOR

- A. Weather sensor as listed on the Drawings compatible with irrigation controller.

2.17 MISCELLANEOUS INSTALLATION MATERIALS

- A. Solvent cement and primer for solvent weld joints shall be of make and type approved by manufacturer(s) of pipe and fittings. Cement shall be maintained at proper consistency throughout use.
- B. Lubricant for assembling rubber ring seal joints shall be of make and type approved by manufacturer of pipe.
- C. Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Performance shall be same as Permatex No. 51.

2.18 MISCELLANEOUS EQUIPMENT

- A. Provide all equipment called for by the Drawings.
- B. Provide to the Owner, at completion of Maintenance Period, three (3) each of all operating and servicing keys and wrenches required for complete maintenance and operation of all heads and valves. Include all wrenches necessary for complete disassembly of all heads and valves.

PART 3 - INSTALLATION

3.1 PREPARATION

- A. Schedule and coordinate placement of materials and equipment in manner to affect the earliest completion of work in conformance with construction and progress schedule.

3.2 HANDLING AND STORAGE

- A. Protect work and materials from damage during construction and storage as directed by Architect.
- B. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight.

3.3 LAYOUT

- A. Lay out work as accurately as possible in accordance with diagrammatic drawings.
- B. Where site conditions do not permit location of piping, valves and heads where shown, notify Architect immediately and determine relocation in joint conference.
- C. Run pipelines and automatic control wiring in common trenches wherever practical.

3.4 EXCAVATION AND TRENCHING

- A. Excavation shall be in all cases ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining.
- B. Make trenches for pipelines deep enough to provide minimum cover from finish grade as follows:
  - 1. 18" minimum cover over main lines to control valves and quick coupling valves.
  - 2. 18" minimum cover over control wires from controller to valves.
  - 3. 12" minimum cover over RCV controlled lateral lines to sprinkler heads.
  - 4. 4" cover over dripline.
- C. Restore surfaces, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in manner approved by Architect.
- D. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by Architect.

3.5 ASSEMBLING PIPELINES

- A. All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.
- B. Rubber Ring Seal Joint:
  - 1. Use factory-made male end or prepare field-cut male end to exact specifications of factory-made end.
  - 2. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's instructions.

3. Lubricate male end according to manufacturer's instructions and insert male end to specified depth. Use your hands only when inserting PVC pipe.
  4. O-Ring pipe and fitting connections shall be restrained with the Leemco joint restraint system. Contractor shall install joint restraints on the ductile iron fittings and O-ring pipe in strict accordance with Leemco requirements.
- C. Solvent Weld Joint:
1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe and fitting of dirt, dust and moisture.
  2. Dry-insert pipe into fitting to check for missizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.
  3. Coat the inside socket surface of the fitting and the fitting and the male end of the pipe with P-70 primer (manufactured by Weld-On). Then without delay, apply Weld-On 711 cement liberally to the male end of the pipe and also apply Weld-On 711 cement lightly to the inside of the socket. At this time, apply a second coat of cement to the pipe end.
  4. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must sit at the bottom of the socket and fitting. Check alignment of the fitting. Pipe and fitting shall be aligned properly without strain to either.
  5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.
  6. Cure joint a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.
- D. Threaded Joint:
1. Field threading of plastic pipe or fittings is not permitted. Factory-formed threads only will be permitted.
  2. Factory-made nipples shall be used wherever possible. Field-cut threads in metallic pipe will be permitted only where necessary. When field threading, cut threads accurately on axis with sharp dies.
  3. All threaded joints shall be made up with pipe joint compound. Apply compound to male threads only.
  4. Where assembling metallic pipe to metallic fitting or valve, no more than three (3) full threads shall show when joint is made up.
  5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.

6. Where assembling soft metal (brass or copper) or plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.
- E. Connection at Drip Tubing:
  1. Connections shall be made with fittings specifically designed for use with Rain Bird XFS-CV drip tubing. Follow manufacturer's requirements for installation.
- F. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly.
- G. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.

### 3.6 REMOTE CONTROL VALVES

- A. Install where shown on Drawings and group together where practical. Limit one remote control valve per box--No Exceptions.
- B. Locate valve boxes 12" from and perpendicular to walk edges, buildings, and walls. Provide 12" between valve boxes where valves are grouped together.
- C. Thoroughly flush the main line before installing valve.
- D. Install in shrub or ground cover areas where possible.
- E. Label control line wire at each valve with a 2 1/4" x 3/4" polyurethane I.D. tag, indicating identification number of valve (controller and station number). Attach label to control wire.
- F. Install decoders per manufacturer's instructions.

### 3.7 AUTOMATIC CONTROL WIRE

- A. Run lines along mains wherever practical. Tie wires in bundles with pipe wrapping tape at 10' intervals and allow slack for contraction between strappings.
- B. Loop a minimum of three (3) feet of extra wire in each valve box; both control wire and ground wire.
- C. Connections shall be made by crimping bare wires with brass connectors and sealing with 3M DBR/Y-6 sealer packs.
- D. Splicing will be permitted only on runs exceeding 2500'. Locate all splices at valve locations within valve boxes.
- E. Where control lines pass under paving, they shall pass through Schedule 40 electrical PVC conduit.
- F. Install wire, decoders, grounding, etc. in strict accordance with Hunter two-wire installation instructions.

3.8 AUTOMATIC CONTROLLER

- A. Provide and install automatic irrigation controller in approximate locations shown on Drawings. The exact location will be determined on the site by Architect. Provide conduit and wire and connect to 120 volt switch accessible to controller for ease of maintenance.
- B. Connect control lines to controller in sequential arrangement according to assigned identification number of valve. Each control line wire shall be labeled at the controller with a permanent non-fading label indicating station number of valve controlled. Attach label to control wire.
- C. Provide, program and install all decoders for 2-wire control system.

3.9 SPRINKLER HEADS AND QUICK COUPLING VALVES

- A. Thoroughly flush lines before installing heads or QCVs.
- B. Locate heads and QCVs as shown in the Drawings and Details.
- C. Adjust sprinkler heads for proper distribution and trim.

3.10 DRIP EMITTERS AND DRIP FITTINGS

- A. Install as indicated on the Drawings.
- B. Install emitters on uphill side of plants unless otherwise noted.
- C. Use only special tools manufactured or recommended by the drip equipment manufacturer for installation of emitters and fittings.
- D. Thoroughly flush lines.

3.11 DRIPLINE AND FITTINGS

- A. Install as indicated on the Drawings.
- B. Install tubing at a uniform depth of 4 inches.
- C. Use only special tools manufactured or recommended by the drip equipment manufacturer for installation of tubing and fittings.
- D. Thoroughly flush lines.

3.12 SYSTEM TESTING

- A. Perform test as specified below. Remake any faulty joints with all new materials. Use of cement or caulking to seal leaks is absolutely prohibited.

The Contractor shall:

1. Notify Architect at least three (3) days in advance of testing.
2. Perform testing at his own expense.

3. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered.
4. Apply the following tests after weld plastic pipe joints have cured at least 24 hours.
  - a. Test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for six (6) hours. The lines shall be restored to the original test pressure and the amount of water required to do so shall be measured. Approved tables of allowable loss will be consulted, and the line will be approved or not approved as such results may indicate. The Contractor shall make tests and repairs as necessary until test conditions are met.
  - b. Test RCV controlled lateral lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.
  - c. Perform an Irrigation Audit by a Third Party CLIA only Certified Auditor as per WELO guideline.

3.13 THIRD PARTY IRRIGATION AUDIT AND PERFORMANCE TESTING

- A. Perform an Irrigation Audit by a Third Party CLIA only Certified Auditor as per WELO guidelines and submit to the Landscape Architect. All corrections identified by Third Party Irrigation Auditor must be repaired at contracts expense.

3.14 BACKFILLING

- A. Backfill only after piping has been tested, inspected and approved.
- B. Backfill material shall be the earth excavated from the trenches, free from rocks, concrete chunks, and other foreign or coarse materials. Carefully select backfill that is to be placed next to plastic pipe to avoid any sharp objects which may damage the pipe.
- C. All pipes under asphalt paving shall be backfilled with 4" of clean sand on all sides of pipe.
- D. Place backfill materials in 6" layers and compact by jetting or tamping to a minimum compaction of 90 percent of original soil density.
- E. Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfilling is completed.
- F. If settlement occurs along trenches, and adjustments in pipes, valves and sprinkler heads, soil, sod, or paving are necessary to bring the system, soil, sod or paving to the proper level or the permanent grade, the Contractor, as part of the Work under this contract, shall make all adjustments without extra cost to the Owner.

3.15 GUARANTEE

- A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for one year following completion and acceptance of the job.
- B. The Contractor shall also guarantee all materials, equipment and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within one year after installation is accepted, all defective parts that may be found.

3.16 CLEAN-UP

- A. When work of this section has been completed and at such other times as may be directed, remove all trash, debris, surplus materials, and equipment from site.

END OF SECTION

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**SECTION 32 93 00**

**PLANTING**

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PART 1 – GENERAL

1.01 DESCRIPTION

- A. Provide planting work and planting maintenance complete as shown on the drawings and as specified.
- B. Related work specified elsewhere includes:
  - 1. Section 32 84 00, PLANTING IRRIGATION

1.02 QUALITY ASSURANCE

- A. Reference Standards:
  - 1. Manufacturer's recommendations.
  - 2. "The New Sunset Western Garden Book," TI Inc. Books, 814 N. Franklin St., Chicago, IL, 60610; current edition.
  - 3. "American Standards for Nursery Stock," AmericaHort (American Horticultural Industry Association), 2130 Stella Court, Columbus, OH 43215.
  - 4. Geotechnical Engineering and Geologic Hazards Study, Highlands Elementary School, New Classroom Buildings, 4141 Harbor Street, Pittsburg, California 94565, prepared for Pittsburg Unified School District. October 8, 2025, Report Project No. 32-1769 prepared by Geo-Engineering Solutions, Inc.
  - 5. Weed Control Methods Handbook, The Nature Conservancy, Tu, M., Hurd, C. & J.M. Randall. 2001. <http://tncweeds.ucdavis.edu>.
  - 6. Wallace Labs: Soils Report: 365 Coral Circle, El Segundo, CA 90245, Highlands Elementary School, Pittsburg, CA, Print Date: January 14, 2025.
- B. Qualifications:
  - 1. Experience: Assign a full-time employee to the job as foreman for the duration of the Contract with a certified landscape technician, certification through CLCA or minimum of four (4) years experience in landscape installation and maintenance supervision, with experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.
  - 2. Labor Force: Provide a landscape installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner acceptable to the Owner.
- C. Requirements:
  - 1. Supervision: The foreman shall directly supervise the work force at all times and be present during the entire installation. Notify Owner's Representative of all changes in supervision.

2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and a labor force uniformly dressed in a manner satisfactory to Owner's Representative.
- D. Plant Material Standards
1. Quality and Size of Plants: Conform to the State of California Grading Code of Nursery Stock, No. 1 grade. Use only nursery-grown stock which is free from insect pests and diseases.
  2. Comply with federal and state laws requiring inspection for plant diseases and infestations. Submit inspection certificates required by law with each shipment of plants, and deliver certificates to the Owner. Obtain clearance from the County Agricultural Commissioner as required by law, before planting plants delivered from outside the County in which planted.
  3. Without a commercial endorsement, plant material may be available from the following sources:
    - a. Central Coast Wilds, Telephone: 831-750-2365, or equal grower.
    - b. Pacific Coast Seed, Telephone: 925-373-4417 or equal.
    - c. Hedgerow Farms, Telephone: 530-662-6847 or equal
    - d. Lerner Seeds, Telephone: 415-868-9407 or equal.
    - e. Norman's Nursery, Telephone: 209-887-2025 or equal grower.
    - f. Valley Crest Tree Nursery, Telephone: 925-862-2485 or equal grower.
    - g. Devil Mountain Nursery, Telephone: 925-829-6006 or equal grower.
    - h. Cornflower Farms, Telephone: 916-689-1015 or equal grower.
    - i. Western Star Nursery, Telephone: 925-862-9008 or equal grower.
    - j. Pacific Nurseries, Telephone: 650-755-2330 or equal grower.
    - k. Bamboo Pipeline, Telephone: 888-288-1619 or equal.
    - l. Morning Sun Herb Farm, Telephone: 707-451-9406 or equal.
- E. Testing Agency: Soil and Plant Laboratory, Inc. 1101 S. Winchester Blvd., Suite G-173, San Jose, CA 95128. (408) 727-0330.
- F. Planting Soil (Topsoil):
1. Provide and install import planting soil (topsoil) where shown on drawings and as specified.
  2. On-site and import topsoil used on this project shall be tested, and approved before placement.

3. Secure acceptance before stripping topsoil (planting soil) from a borrow area or delivering topsoil (planting soil) to the project site.

1.03 SUBMITTALS.

- A. Product Data: Manufacturer's current catalog cuts and specifications of the following:
  1. Fertilizers
  2. Herbicide
  3. Tree Tie and Stake
  4. Iron Sulfate
  5. Mulch
  6. Soil Amendment
  7. Mycorrhiza
  8. Seed
  9. Import planting soils
- B. Samples:
  1. Plants: Submit typical sample photograph of each variety or entire quantity to site for approval by Landscape Architect.
  2. Organic Mulch: Submit 1-pint sample.
  3. Import topsoil. Submit 1-quart sample
  4. Soil Amendment
  5. Seed (1 pound grab sample)
  6. Filter Fabric
- C. Certificates of Compliance for the following:
  1. Import soils chemical and physical properties.
  2. Herbicides and chemicals per school district standards.
  3. Soil amendment, chemical and physical properties.
  4. Quantity of soil amendment delivered to site and incorporated into soil preparation.
  5. Within 30 days of Notice to Proceed, provide a letter from the contactor certifying that all plant materials are available.
- D. Topsoil Analysis: After approval of rough grading and topsoil placement, obtain three representative samples of topsoil taken from approved site locations and submit to an accredited Soils Laboratory for "agricultural suitability" analysis report, including evaluation of

physical and chemical properties of soil and recommendations for adding amendment and fertilizers to the soil.

Upon approval of the Laboratory's report by the Landscape Architect, the recommendations in the report shall become a part of the Specifications and the quantities of soil amendment, fertilizer and other additives shall be adjusted to conform with the report. Request Testing Laboratory to send one copy of test results directly to Landscape Architect and one copy to the Owner.

E. Substitutions:

1. If the Contractor desires to substitute a product, he shall list each item and note it as a "substitution" and provide the following information:
  - a. Descriptive information describing its similarities to the specified product.
  - b. Reason Contractor wants the substitution.
  - c. The price difference in the two different products.
2. If the product is approved and, in the opinion of the Owner's Representative, the substituted product does not perform as well as it should, the Contractor shall replace it with the specified product at no additional cost to the Owner.

1.04 PROJECT/SITE CONDITIONS

- A. Site Visit: At beginning of work, visit and walk the site with the Owner's Representative to clarify scope of work and understand existing project/site conditions.

1.05 WARRANTY AND REPLACEMENT

- A. Pre-Emergence Weed Killer: Warrant the work against weed growth for a period of four (4) months after application.
- B. Warrant all plants and planting to be in a healthy, thriving condition until the end of the maintenance period, and deciduous trees beyond that time until active growth is evident.
- C. Replace all dead plants and plants not in a vigorous condition immediately as directed by the Owner's Representative at Contractor's expense. Install replacement plants before the final acceptance at the size specified.
- D. Warrant all plant material for a period of one year after final acceptance of the maintenance work against defects in the plant prior to installation.
- E. Warrant plant installation and maintenance by Contractor against defects for a period of one year.

PART 2 - PRODUCTS

2.01 PLANTS

- A. Plant the variety, quantity and size indicated. The total quantity tabulated are considered approximate and furnished for convenience only.

- B. Tag plants of the type or name indicated and in accordance with the standard practice recommended by the American Association of Nurserymen.
  - C. Install healthy, shapely and well-rooted plants with no evidence of having been rootbound, restricted or deformed.
  - D. Take precautions to ensure that the plants will arrive at the site in proper condition for successful growth. Protect plants in transit from windburn and sunburn. Protect and maintain plants on site by proper storage and watering.
  - E. Substitutions will not be permitted, except as follows:
    - 1. If proof is submitted to the Landscape Architect that any plant specified is not obtainable, a proposal will be considered for use of nearest equivalent size or variety with an equitable adjustment of contract price.
    - 2. Substantiate and submit proof in writing to the Landscape Architect within 10 days after the effective date of Notice to Proceed.
  - F. Trees: Select straight trunks with the leader intact, undamaged and uncut with all old abrasions and cuts completely callused over. Do not prune plants prior to delivery.
  - G. Measure trees and shrubs with branches in normal position. Height and spread dimensions indicated refer to the main body of the plant, and not from branch tip to tip.
- 2.02 PRE-EMERGENCE WEED KILLER: Clean non-staining as recommended by a licensed pest control specialist.

2.03 FERTILIZERS

- A. Commercial fertilizer, pelleted or granular form, conform to the requirements of Chapter 7, Article 2, of the Agricultural Code of the State of California for fertilizing materials as follows:

Type A: Complete fertilizer 6% Nitrogen, 20% Phosphoric Acid and 20% Potash (6-20-20).

Type B: AgSafe 20-10-5, 21-gram Planting Tablets complete fertilizer 20% Nitrogen, 10% Phosphate and 5% Potash (20-10-5) slow-release plant food with minors, 10% humus, Mycorrhizae, plant extracts, and fish extracts for two year root zone feeding. Product P101 Grower & Landscaper Bulk Case (21g), 500 tablets (21g) per case, available from Agritab Corporation, Clearfield, UT, [www.agritab.com](http://www.agritab.com), 800-398-3803.

Type C: AgSafe 20-10-5, 10-gram Planting Tablets complete fertilizer 20% Nitrogen, 10% Phosphate and 5% Potash (20-10-5) slow-release plant food with minors, 10% humus, Mycorrhizae, plant extracts, and fish extracts for two year root zone feeding. Product P102 Grower & Landscaper Bulk Case (10g), 1,000 tablets (10g) per case, available from Agritab Corporation, Clearfield, UT, [www.agritab.com](http://www.agritab.com) 800-398-3803.

Composted Greenwaste Amendment: 4 Cubic yards per 1,000 Square feet

Blood Meal (12-0-0): 6 lbs. per 1,000 square feet. Feather Meal (12-0-0): 14 lbs. per 1,000 square feet

Gypsum (Calcium Sulfate): 10 lbs. per 1,000 square feet

If commercial fertilizer having this analysis is not obtainable, other similar commercial fertilizer may be used providing it meets the acceptance of the Architect.

Type D: Complete fertilizer 21% Nitrogen, 7% Phosphoric Acid and 14% Potash (21-7-14).

If commercial fertilizer having this analysis is not obtainable, other similar commercial fertilizer may be used providing it meets the approval of the Landscape Architect.

B. Maintenance Fertilizer: Type D

#### 2.04 SOIL AMENDMENT:

A. Approved Products: Super-Humus Compost. Available at BFI Organics, 1601 Dixon Landing Road, Milpitas, CA, 408-945-2836, "Wonder Grow" available from TMT Enterprises, 408-432- 9040, Redi-Crop, 408-888-7632, or Lopez Ag Service Organic Compost, 916-682-5450, Al., or Organic Compost from Z-Best Products, 980 State Hwy. 25, Gilroy, CA ,408-846-1574, may be used without pre-approval.

B. Submit sample to the Landscape Architect two weeks before accepted delivery of amendment to the project with laboratory organic amendment analysis report to include the data outlined in the table below, and shall possess a carbon to nitrogen ratio of or less than 25:1. Odor shall be soil-like (musty or moldy) not sour, ammonia-like or putrid. Laboratory organic amendment analysis report is to be from a sample that is no older than one month old.

C. Additional Requirements:

1. The compost provider must be a compost producer and a participant in the United States Composting Council (USCC) Seal of Testing Assurance (STA) program.
2. The compost producer must be fully permitted as a compost producer in accordance with requirements of the California Integrated Waste Management Board (CIWMB), Local Enforcement Agencies (LEA) and any other State and Local Agencies that regulate solid waste facilities. If exempt from State permitting requirements, the composting facility must certify that it follows all guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
3. Compost may be derived from any single or mixture of any of the following feedstock materials: Green material consisting of chipped, shredded, or ground vegetation; or clean processed recycled wood products, Biosolids, Manure or Mixed food waste.
4. Compost the feedstock materials such that weed seeds, pathogens and deleterious materials are reduced as specified under Title 14, California

- Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3.
5. Metal concentrations in the composted mulch must not exceed the maximum metal concentrations listed in Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
  6. Compost shall comply with the following table:

**Physical and Chemical Requirements**

Property	Test Method	Requirement
pH	TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.5
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0–10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30–60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor, % Relative to Positive Control Seed Emergence Seedling Vigor	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO <sub>2</sub> -C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	Inches      % Passing 2"            98% 3/8          95% Max. Length 4 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	<1000 (Pass)
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	<3 (Pass)
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 0.5
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps % > 4mm fraction (Sewing needles, hypodermic needles)	None Detected

NOTE: TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

7. Odor shall be soil-like (musty or moldy) not sour, ammonia-like or putrid.

2.05 IRON SULFATE: Dry form.

2.06 PLANT BACKFILL: Except for acid loving plants (Azaleas, Rhododendrons, Ferns, Camellias, etc.), use a mixture of 2 parts soil from the hole, and 1 part amendment with

iron added at the following rates:

1 gallon can plants	- iron, 1/4 cup
5 gallon can plants	- iron, 1/3 cup
15 gallon can plants	- iron, 1/2 cup
24" box and larger	- iron, 1 cup

Mix the iron, amendment and soil thoroughly for use in the top 8 inches of backfill around plants. For acid loving plants, mixture to be 1/2 soil from the hole and 1/2 amendment.

2.07 MULCH

- A. Bark Mulch: Pro-chip decorative mulch, small, 1-inch maximum size in any direction, redwood color, or equivalent as accepted by the Landscape Architect. Available at BFI Organics, 1601 Dixon Landing Road, Milpitas, CA, 408-945-2836 or Z-Best Products, 980 State Hwy. 25, Gilroy, CA ,408-846-1574.
- B. Submit one (1) samples of mulch to the Landscape Architect for acceptance within two weeks of award of Contract. Resubmit until acceptable to Owner, at no extra cost.

2.08 TREE SUPPORT POLES: Peeled lodge pole pine logs, clean, smooth, new, and sized as follows:

- A. Three-inch (3") diameter by eight to ten feet (8' - 10') long.

2.09 TIES: Rubber strap, 32-inch minimum length without sharp edges adjacent to trunk, V.I.T. cinch- tie, Escondido, CA, 800.729.1314, or approved equal.

2.10 ON-SITE PLANTING SOIL (TOPSOIL):

- A. Only use on-site planting soil for topsoil if acceptable to the Architect and if it meets the following requirements:
  - 1. On-site planting soil shall be fertile, friable, natural, productive soil containing a normal amount of humus, and shall be capable of sustaining healthy plant life. Planting soil shall be free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash, and other deleterious substances. Soil shall not be infested with nematodes or with other noxious animal life or toxic substances. Soil shall be obtained from well- drained, arable land, and shall be of an even texture. Soil shall not be taken from areas on which are growing any noxious weeds such as Acacia, Morning Glory, Fennel, Broom, English Ivy, German Ivy, Sorrel, Oxalis, Bermuda Grass, or plants listed in the Current Edition of the California Invasive Plant Inventory published by the California Invasive Plant Council. <http://www.cal-ipc.org/>
  - 2. On-site planting soil shall have a pH value of between 6.0 and 7.5, a boron concentration of the saturation extract of less than 1 ppm, salinity of the saturation extract at 25 degrees C. of less than 4.0 millimoles, and a sodium absorption rate (SAR) of less than 8.
  - 3. The silt and clay content of On-site planting soil shall not exceed that of the existing soil it is to be placed over. It shall have sand content not less than a "Sandy Loam" as classified in accordance with USDA Standards.

4. Make the site of the source of supply of on-site planting soil available to the Landscape Architect for observation and acceptance prior to any hauling or placing of soil. In addition, submit for approval a 1-quart sample of soil, together with a standard soil analysis report by an accredited soils analyst showing chemical analysis stating source, fertility, agricultural suitability and particle size distribution of the soil. Deliver the sample to the Landscape Architect two weeks before starting the contemplated hauling of the soil. Following approval of the sample, provide a one-half cubic yard sample, which shall be stored at the site of work for comparison with subsequent loads of soil. The comparison sample shall be protected by a cover until the furnishing of all soil has been completed and accepted. Should the soil submittal lack certain requirements which can be added to the soil, the Landscape Architect will consider a request by the Contractor to amend the soil as recommended by the Soils Analyst at the Contractor's expense.

2.11 IMPORTED PLANTING SOIL (TOPSOIL):

A. Imported planting soil shall be imported soil as follows:

1. Imported planting soil shall be fertile, friable, natural, productive soil containing a normal amount of humus, and shall be capable of sustaining healthy plant life. Planting soil shall be free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash, and other deleterious substances. Soil shall not be infested with nematodes or with other noxious animal life or toxic substances. Soil shall be obtained from well- drained, arable land, and shall be of an even texture. Soil shall not be taken from areas on which are growing any noxious weeds such as Acacia, Morning Glory, Fennel, Broom, English Ivy, German Ivy, Sorrel, Oxalis, Bermuda Grass, or plants listed in the Current Edition of the California Invasive Plant Inventory published by the California Invasive Plant Council. <http://www.cal-ipc.org/>
2. Imported planting soil shall have a pH value of between 6.0 and 7.5, a boron concentration of the saturation extract of less than 1 ppm, salinity of the saturation extract at 25 degrees C. of less than 4.0 millimoles, and a sodium absorption rate (SAR) of less than 8.
3. The silt and clay content of imported planting soil shall not exceed that of the existing soil it is to be placed over. It shall have sand content not less than a "Sandy Loam" as classified in accordance with USDA Standards.
4. Make the site of the source of supply of planting soil available to the Landscape Architect for observation and approval prior to any hauling or placing of soil. In addition, submit for approval a 1-quart sample of soil, together with a standard soil analysis report by an accredited soils analyst showing chemical analysis stating source, fertility, agricultural suitability and particle size distribution of the soil. Deliver the sample to the Landscape Architect two weeks before starting the contemplated hauling of the soil. Following approval of the sample, provide a one-half cubic yard sample, which shall be stored at the site of work for comparison with subsequent loads of soil. The comparison sample shall be protected by a cover until the furnishing of all soil has been completed and accepted. Should the soil submittal lack certain requirements which can be added to the soil, the Landscape Architect will consider a request by the Contractor to amend the soil as recommended by the Soils Analyst at the Contractor's expense.

B. Imported planting soil may conform to the following:

1. Lyngso Garden Material's Top Soil or equivalent from Lyngso Garden Materials

Inc., 19 Seaport Boulevard, Redwood City, CA 94063. (650) 364-1730.  
<http://lyngsogarden.com/>.

- 2. Loam topsoil, well drained homogeneous texture and of uniform grade, without the admixture of subsoil material and entirely free of dense material, hardpan, sod, or any other objectionable foreign material.
- 3. Containing not less than 4 percent nor more than 20 percent organic matter in that portion of a sample passing a 1/4 inch sieve when determined by the wet combustion method on a sample dried at 105 degrees C.
- 4. Containing a pH value within the range of 4.5 to 7 on that portion of the sample which passes a 1/4 inch sieve.
- 5. Containing the following gradations:

Sieve Designation	Percent
Passing 1 inch	100

Sieve Designation	Percent
Passing 1/4 inch	97 - 100
No. 200	20 - 65 (of the 1/4 inch sieve)

- 6. Make the site of the source of supply of planting soil available to the Landscape Architect for observation and approval prior to any hauling or placing of soil. In addition, submit for approval a 1-quart sample of soil, together with a standard soil analysis report by an accredited soils analyst showing chemical analysis stating source, fertility, agricultural suitability and particle size distribution of the soil. Deliver the sample to the Landscape Architect two weeks before starting the contemplated hauling of the soil. Following approval of the sample, provide a one-half cubic yard sample, which shall be stored at the site of work for comparison with subsequent loads of soil. The comparison sample shall be protected by a cover until the furnishing of all soil has been completed and accepted. Should the soil submittal lack certain requirements which can be added to the soil, the Landscape Architect will consider a request by the Contractor to amend the soil as recommended by the Soils Analyst at the Contractor's expense.

2.12 FILTER FABRIC (GEOTEXTILE FABRIC and WEED FABRIC))

- A. Polypropylene non-woven geotextile fabric with uniform fiber distribution by "Mirafi, Inc." #140NC, or accepted equal.

2.13 ROOT BARRIER

- A. ROOTBLOCK BIO BASED, 75CM, WB/BB 75/BIO VERTICAL ROOT BLOCK. Polyethylene based on residual sugar cane waste.

2.14 OTHER MATERIALS

- A. As shown on drawings or approved equal

2.15 GRASSES

- A. For turf seeding:
    - 1. Fescue Blend.
      - 10 lbs/1000 sq. ft.
      - 30% Rambler Tall Fescue
      - 60% 2<sup>nd</sup> Millennium Dwarf Fescue
      - 10% Midnight Kentucky Blue
    - 2. Supplier shall be Pacific Coast Seed, Livermore, CA, 800-733-3462 or approved equal.
  - B. Provide extra seed for top seeding as required during the plant establishment period.
- 2.16 MYCORRHIZA PLANTING BACKFILL
- A. MycoApply® All Purpose Granular available from Mycorrhizal Applications, Inc [www.mycorrhizae.com](http://www.mycorrhizae.com), PO Box 1181 Grants Pass, OR 97528, Telephone 866-476-7800, or 541.476.3985 fax, 541.476.1581.
- 2.17 HERBICIDE
- A. As recommended by a licensed pest control specialist. Use Integrated Pest Management practices that use the least toxic practices. Apply according to manufacturer's instructions using certified applicators.

### PART 3 - EXECUTION

#### 3.01 PAVING REMOVAL

- A. General:
  - 1. Coordinate paving removal with other work as required. Remove materials in an orderly and careful manner.
  - 2. Repair or replace all removal work performed in excess to that required at no cost to the Owner. Repair or replacement shall match and equal construction, condition and finish existing at time of award of Contract.
- B. Remove following from locations to the extent required or directed for new construction.
  - 1. Asphalt, concrete paving, base rock under paving, curbs and related materials.
  - 2. Designated utility services occurring within removal areas, including disconnection, capping and complete removal or abandonment.
  - 3. Miscellaneous structural elements which interfere with the new construction and as directed by the Owner's Representative.

- C. Cutting asphalt, concrete curb and concrete pavement:
  - 1. All lines shall be marked and accepted by Owner's Representative before the cutting operation.
  - 2. Cut edges of pavement at 90-degree angle to the surface in a true and straight line in accordance with dimensions shown on the Drawings. Make cuts with a concrete saw, to a 1-1/2" minimum depth.
- D. Legally dispose of demolished materials offsite. Backfill and compact areas excavated and open pits and holes resulting from removal operations. Comply with requirements specified in this Section and Section 31 20 00 Earthwork for backfill materials, compaction and installation methods.

3.02 FINE GRADING AND SOIL PREPARATION

- A. Planting Soil Placement:
  - 1. Inspect planting areas and remove all base rock and other foreign material. Spread type A (6-20-20) Fertilizer over all subgrade areas at the rate of 15 pounds per 1,000 square feet prior to ripping. Rip all planting areas in two directions full depth of compacted fill (to a minimum of 12 inches) into undisturbed native soil prior to backfilling. Scarification of any planting area which cannot be accomplished with a tractor shall be accomplished by an alternative method approved by the Landscape Architect to the specified depth to ensure proper drainage.
  - 2. Uniformly distribute and spread planting soil backfill in planting areas in layers not to exceed 24" and compact to a maximum of 85% relative compaction.
  - 3. When the planting soil differs in clay and silt content from the subsoil it is to be placed upon, install a 4-inch thick lift of planting soil on the subgrade and rototill into the subgrade 6 inches deep before installing the remaining required planting soil.
  - 4. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.
  - 5. Water settling, puddling, and jetting of fill and backfill materials as a compaction method is not acceptable.
  - 6. Maintain moisture content of materials during compaction operations within required moisture range to obtain indicated compaction density.
  - 7. Provide a minimum of 12 inches depth of topsoil in planting areas and as shown on drawings.
- B. Rip all planting areas in two directions full depth of compacted fill (to a minimum depth of 12 inches) prior to planting.
- C. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities. Immediately inform the Landscape Architect of any discrepancy between the drawings and specifications and actual conditions and secure approval to proceed.

- D. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.
- E. Thoroughly wet down the planting areas to settle the soil and confirm irrigation coverage and operation. Allow soil to dry so as to be workable.
- F. Planting area soil shall be in a loose, friable condition prior to planting.
- G. Drag to a smooth, even surface. Grade to form all swales, pitch to catch basins, streets, curb, etc., to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas which shall be uniformly level or sloped between finish elevations.
- H. Hold finish grade and/or mulch surface in planting areas 1/2-inch below adjacent pavement surfaces, tops of curbs, manholes, etc.
- I. Spread soil amendment, iron and Type A fertilizer evenly over installed and rough graded topsoil in all planting areas including ground cover and shrub areas (at the following rates:
  - 1. Soil Amendment: 6 cubic yards per 1,000 square feet.
  - 2. Fertilizer: Type A (60-20-20) at 25 lbs. per square feet.
  - 3. Blood Meal (12-0-0): 6 lbs. per 1,000 square feet.
  - 4. Feather Meal (12-0-0): 14 lbs. per 1,000 square feet
  - 5. Gypsum (Calcium Sulfate): 10 lbs. per 1,000 square feet

The rate is based on the analysis of the amendment provided. This rate is based on 270 pounds dry weight of organic matter per cubic yard of amendment. If a composted greenwaste amendment is selected that contains a significant amount of phosphorous or potassium, the steamed bone meal or potassium sulfate should be reduced or omitted accordingly.

Rototill above additives into soil 6 to 8 inches deep. Keep iron sulfate off pavement and other surfaces to prevent rust staining. Correct all rust damage to work.

- J. After the rototill work, float areas to a smooth, uniform grade as indicated on the drawings. Slope all planting areas to drain. Roll, scarify, rake and level as necessary to obtain true, even planting surfaces. Remove rocks, sticks and debris 1/2 inch or larger in shrub and ground cover areas. Secure approval of the grade by the Landscape Architect before any planting.
- K. Scarify all planting areas that become compacted prior to planting.

**3.03 TREE, SHRUB AND VINE PLANTING**

- A. Mark plant locations on site using stakes, gypsum or similar approved means and secure location approval by the Landscape Architect before plant holes are dug. Adjust as necessary prior to planting.
- B. Test drainage of plant beds and pits by filling with water (minimum 6"). The retention of water in planting beds and plant pits for more than eight (8) hours shall be brought to

the attention of the Landscape Architect. If rock, underground construction work, tree roots, poor drainage, or other obstructions are encountered in the excavation of plant pits, alternate locations may be selected by Architect.

- C. Excavate plant pits as shown on the Drawings and a minimum of twice the rootball diameter.
- D. Break and loosen the sides and bottom of the pit to ensure root penetration and water test hole for drainage as required above.
- E. Backfill plant holes with mix as specified, free from rocks, clods or lumpy material. Backfill native soil free of soil amendments under rootball and foot tamp to prevent settlement.
- F. Install fertilizer Type 'B' for 1-gallon plants and larger adjacent to the rootball per the manufacturer's specifications. Install fertilizer Type 'C' for 4" pot or plug plant adjacent to the rootball per the manufacturer's specifications.
- G. Carefully remove and set plants without damaging the rootball. Superficially cut edge roots vertically on three sides using a knife. Remove bottom of plant boxes before planting. Remove sides of boxes after positioning the plant and partially backfilling.
- H. Set plants in backfill with top of the rootball 2 inches above finished grade. Backfill remainder of hole and soak thoroughly by jetting with a hose and pipe section. Water backfill until saturated the full depth of the hole. Backfill plant holes free from rocks, clods or lumpy material. Soil immediately below the trees should be left undisturbed to provide support but the bottom and sides should be cultivated to improve porosity. Backfill remainder of the hole with soil as follows
  - 1. Greater than 12-inches below grade: native and un-amended soil.
  - 2. Less than 12-inches below grade: four parts top soil and one part soil amendment, and blend with
    - Blood Meal (12-0-0): 1/3 lbs per cubic yard of
    - backfill Feather Meal (12-0-0): 3/4 lbs per cubic
    - yard of backfill Gypsum (Calcium Sulfate): 1/2 lbs
    - per cubic yard of backfill
  - 3. 1-gallon and smaller, 4" pots and plugs: four parts top soil and one part soil amendment.
- I. Mix Mycorrhiza planting backfill with the planting backfill in the top 1" of the planting hole as close to the root ball and evenly distributed as possible at the following rates:
  - 4" pot or plug plant - 1 teaspoon
  - 1 gallon can plant - 1 tablespoon
  - 3 gallon can plant - 3 tablespoons

5 gallon can plant	- 4 tablespoons
15 gallon can plant	- 6 tablespoons.
24-inch box plant	- 8 tablespoons
Larger plants	- 4 tablespoons per inch of trunk caliper at 6" above finish grade

- J. Build 6" high watering basin berms around trees and shrubs to drain through rootball. Basins are not required around trees in grass areas.
- K. Stake trees as detailed. Drive stake until solid and remove excess stake protruding above top tree tie to prevent rubbing against branches.
- L. Remove any soil from top of plant rootballs and secure Landscape Architect's approval of rootball height prior to mulching.
- M. After approval of rootball height, mulch watering basins with mulch to 3-inch depth and thoroughly water.

3.04 SEED PLANTING

- A. Soil shall be friable to a depth of 12 inches with soil amendment incorporated prior to installing seed.
- B. Spread soil amendment, Iron Sulfate, Potassium Sulfate and Sulfur evenly over rough graded soil in sod areas at the following rates:  
  
Soil Amendment: 7 cubic yards per 1,000 square feet  
Iron Sulfate: 15 lbs. per 1,000 square feet  
Potassium Sulfate (0-0-50): 12 lbs. per 1,000 square feet  
Sulfur: 20 lbs. per 1,000 square feet
- C. Rototill above additives into soil 6 to 8 inches deep. Keep iron sulfate off pavement and other surfaces to prevent rust staining. Correct all rust damage to work.
- D. Lightly roll surface and re-shape to level humps and hollows. Secure Architect's approval prior to seeding. Do not seed on dry soil.
- E. Firm soil. Smooth to uniform surface and verify that finish grade is the specified dimension below pavement, mow edge or curb as shown on the drawings.
- F. Apply fertilizer Type A, to surface prior to installing seed. Apply Type A fertilizer to surface at a rate of 10 pounds per 1,000 square feet.
- G. Broadcast Mycorrhiza at a rate of 2 pounds per 1,000 square feet on the soil surface that is to receive seed. Broadcast when it will not be disturbed by wind.
- H. Water area lightly immediately prior to installing seed.
- I. Seed Installation:
  - 1. Remove all "humps" and depressions prior to seeding.

2. Ensure that the wind is not a factor in the seeding process.
  3. After completing soil preparation, fine grading, and irrigation coverage test and just before seed installation, broadcast Mycorrhiza at a rate of 2 pounds per 1,000 square feet on the soil surface that is to receive seed. Broadcast when it will not be disturbed by wind.
  4. Sow the seed with an accepted spreader, such as a drill seeder, drill the seed  $\frac{1}{4}$ " below the surface, starting with half the required application rate in one direction and the second half in a second direction perpendicular to the direction of the first application.
  5. Apply the turf seed at a total rate of 10-lbs/1,000 square feet.
  6. Rake seeded areas lightly to cover seed.
  7. Keep seeded areas moist until seed has germinated.
  8. Grow and maintain seeded turf as required under seeded turf maintenance.
- J. Protect seeded areas by erecting fences, barriers and signs necessary to prevent trespass. Keep barriers neat and well maintained.

3.08 DITCHES AND SWALES

- A. Construct ditches and swales in the areas designated to convey storm water to the storm drainage facilities. Refer to Civil Drawings.

3.09 MULCH: Mulch all shrub and ground cover areas with organic mulch to a 3-inch depth. Hold bark mulch away from base (trunk) of plant 2" to 4" or as directed by the Landscape Architect.

3.10 PRE-EMERGENCE WEED KILLER: Apply pre-emergence weed killer in all areas to receive ground cover planting. Work shall be done under the supervision of a person licensed by the State of California as a pest control applicator and holding a qualified applicator license or a Qualified Applicator Certificate. Obtain approval of the finish grades prior to applying weed killer and coordinate planting and watering with the pest control specialist prior to planting. Take care to keep weed killer off areas to be seeded.

3.11 WATERING: Water trees, shrubs and ground cover immediately after planting. Apply water to all plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering of trees and shrubs during the first 3 weeks of plant establishment. Hand water plants that do not have automatic irrigation for the duration of the planting establishment maintenance period.

3.12 MAINTENANCE OF PLANTING: Maintain plants from time of delivery to site until final acceptance of landscape installation.

3.13 PRE-MAINTENANCE PERIOD REVIEW AND APPROVAL OF PLANTING

- A. Receive approval of the installed planting prior to commencement of planting establishment maintenance period. Notify the Landscape Architect a minimum of seven (7) days prior to requested review. Before the review, complete the following:

1. Complete all construction work.
2. Present all planted areas neat and clean with all weeds removed and all plants installed and appearing healthy.
3. Plumb all tree stakes.
4. No partial approvals will be given.

### 3.14 PLANTING ESTABLISHMENT MAINTENANCE

#### A. General Requirements:

1. The planting establishment maintenance period required shall be 90 calendar days after all planting is complete, erosion control areas are seeded, and installation approved. A longer period may be required if the erosion control areas are not thick, vigorous and even, or if the plant material is not acceptably maintained during the maintenance period. The maintenance period may be suspended at any time upon written notice to the Contractor that the landscaping is not being acceptably maintained, and the day count suspended until the landscape is brought up to acceptable standards as determined by the Landscape Architect.
2. Planting establishment maintenance immediately follows, coincides with, and is continuous with the planting operations, and continues through erosion control areas installation, and after all planting is complete and accepted; or longer where necessary to establish acceptable stands of thriving plants.
3. Protect all areas against damage, including erosion and trespass, and provide proper safeguards. Maintain and keep all temporary barriers erected to prevent trespass.
4. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work or maintenance.
5. Repair all damaged planted areas, and replace plants and reseed immediately upon discovery of damage or loss.
6. Check sprinkler systems at each watering; adjust coverage and clean heads immediately. Adjust timing of sprinkler controller to prevent flooding.
7. Maintain adequate moisture depth in soil to ensure vigorous growth. Check rootball of trees and shrubs independent of surrounding soils and hand water as required.
8. Keep Contract areas free from weeds by cultivating, hoeing or hand pulling. Use of chemical weed killers will not relieve the Contractor of the responsibility of keeping areas free of weeds over 1-inch high at all times.

#### B. Tree, Shrub and Ground Cover Maintenance:

1. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the Landscape Architect.

2. Keep watering basins in good condition and weed-free at all times.
3. Replace all damaged, unhealthy or dead trees, shrubs, vines and ground covers with new stock immediately; size as indicated on the drawings.

C. Fertilizing:

1. Upon approval and after submitting fertilizer delivery tags, fertilize shrub and ground cover areas by broad-casting Type D (21-7-14) fertilizer at the rate of 5 lbs. per 1,000 square feet evenly throughout, and reapply every forty-five (45) days until acceptable.
2. Apply ammonium sulfate fertilizer as necessary to maintain vigorous, green grass between fertilizing mentioned above.
3. Observe plant's color, and if a soil pH imbalance is suspected, take soil samples and obtain laboratory analysis for confirmation. Take necessary action recommended in laboratory analysis such as top dressing with soil sulfur, leaching soil, etc.

D. Seeded Turf Maintenance:

1. Contractor is required to mow the turf seed for the first time when it has grown to 2.5" and shall be cut to 2". At this point the turf seed shall be mowed from 3" to 2.5" throughout the maintenance period. If the soil is too moist, then mowing can be less frequent.
2. Turf seed shall not be allowed to exceed 3" in height and shall not be mown shorter than one-third (1/3) of grass leaf height.
3. Seed shall be well established, free of bare spots and weeds, and of a "sod-like" quality to the satisfaction of the School District prior to Final Acceptance.
4. Turf seed shall be cut with a dedicated mower. Cutting height will be determined on environmental conditions, condition of turf, and time of year or activities.
5. Excess grass clippings shall be picked up and removed from the site and premises.
6. Let seed areas dry out enough so that mower wheels do not skid, tear or mark the turf.
7. Edges shall be trimmed at least twice monthly or as needed for neat appearance. Clippings shall be completely removed and disposed of.
8. Contractor will not be responsible for turf damage due over use by the school and the public after the initial 90-day plant establishment period.
9. Watering: Seeded turf shall be watered at such frequency, as weather conditions require to replenish soil moisture below root zone and to establish healthy sod areas.
10. Fertilization: Immediately after completion of planting, fertilize all turf seed with specified maintenance fertilizer at rates specified. Repeat application at 20-day intervals as noted below.

- a) Turf that is installed from sod should receive a light fertilization 2 weeks after planting with 5-5-5 applied at a rate of 6 pounds per 1000 square feet. For turf from seed, the first application of the 5-5-5 should be after the first mowing. If an organic program will be utilized and the goal is to address the nitrogen requirement for 1-1/2 to 2 months, then just Blood Meal could be used at a rate of 12 pounds per 1000 square feet. In order to provide a good supply of nitrogen for a 3-4 month time frame a good combination would be 6 pounds Blood Meal and 14 pounds Feather Meal per 1000 square feet. Once the turf is well established, the frequency of fertilization should be decreased depending on color and rate of growth desired. In the spring and fall substitute a complete fertilizer such as 5-5-5 to help ensure continuing adequate phosphorous and potassium. If grass clippings remain after mowing, this can also help return nutrients to the soil.

Maintenance fertilization for other areas should rely primarily on a nitrogen only program supplemented with a complete fertilizer in the fall and spring. Alternatively, Blood Meal (12-0-0) provides available nitrogen fairly rapidly while materials such as Feather Meal (12-0-0), Soybean or Cotton Seed Meal (7-1-1) are slower to provide available nitrogen, but they extend the length of time they make this contribution. In order to provide a good supply of nitrogen for a 3-4 month time frame a good combination would be 6 pounds Blood Meal and 14 pounds Feather Meal per 1000 Square feet. The first application should be 3-4 months after planting if soils have been amended as suggested. The long term maintenance program should consider spring and fall applications of an organic fertilizer blend such as General Purpose 5-5- 5, Ringer 10-2-6 lawn Restore or E.B. Stone 10-1-4 Lawn that would also supplement phosphorous and potassium nutrition to a greater extent.

- b) After completion of 60-days of establishment period, fertilize all turf seed with 16-16- 16 at a rate of 3.0 pounds per 1,000 square feet and continue through the maintenance period at the discretion of the turf maintenance contactor to provide a healthy, well-rooted, even-colored, viable lawn well established, free of weeds, open joints, bare areas, and surface irregularities through the Athletic Field Maintenance Period.

- 11. Disease Control: Control turf diseases throughout the Field Maintenance Period with legally approved fungicides and herbicides.
- 12. Weed Control: Control broad leaf weeds with Bay-Friendly practices or selective, legally approved herbicides. No herbicide shall be used without the prior consent of the School District.

3.15 FINAL PLANTING CLEANING & CLOSEOUT PROCEDURES,

- A. At the conclusion of the planting establishment period, schedule a final review with the Owner, the Owner's maintenance person, and the Landscape Architect. On such date, all project improvements and all corrective work shall have been completed. If all project improvements and corrective work are not completed, continue the planting establishment, at no additional cost to the Owner, until all work has been completed. This condition will be waived by the Owner under such circumstances wherein the Owner has granted an extension of time to permit the completion of a particular portion of the work beyond the time of completion set forth in the Agreement.
- B. Submit written notice requesting review at least 10 days before the anticipated review.

- C. Prior to review, weed and rake all planted areas, repair plant basins, plumb tree stakes, clear the site of all debris and present in a neat, orderly manner.

**END OF SECTION FOLLOWING WALLACE LABORATORIES REPORT, RESULTS &  
RECOMMENDATIONS**

# WALLACE LABORATORIES, LLC

365 Coral Circle

El Segundo, CA 90245

phone (310) 615-0116 fax (310) 640-6863

January 14, 2026

Audrey Newell, Audrey@thefoxygarden.com  
Plum Architects  
2944 23<sup>rd</sup> Street  
San Francisco, CA 94110

RE: Soil Management Report  
Newell / Highland Elementary School  
Seven samples received Jan. 12, 2026

Dear Audrey

## Samples

#1 Parking Lot, 8"  
#3c, In Turfgrass Sports Field, 8"  
#5c, Empty Planting Bed, 8"  
#8, Empty Planting Bed at Front of School  
#9, In Turfgrass Front of School, 8"  
#10, In Turfgrass Front of School, 8"  
#11, Parking Lot, 8"

## Analytical Results

**Acidity/Alkalinity** – The average pH is slightly acidic at 6.83.

The pH values ranges from 6.13 for #3c to 7.49 for #5c.

**Salinity** – The average salinity or electrical conductivity is modest at 0.67 millimho/cm.

Salinity ranges from 0.18 millimho/cm for #3c to 1.96 millimho/cm for #1.

The average concentration of chloride is 105 parts per million in the saturated extract. Chloride ranges from 20 parts per million for samples #3c and #5c to 345 parts per million for #1.

## Fertility -

**Nitrogen** – Nitrogen is modest for #11. Nitrogen is low for the other samples.

**Phosphorus** – Phosphorus is high for #1 and #5c. Phosphorus is low for #9 and #11.

Phosphorus is modest for #3c, #8 and #10.

**Potassium** – Potassium is moderate for #5c and #9. Potassium is high for the other samples.

**Iron** – Iron is sufficient.

**Manganese** – Manganese is low for #5c and is sufficient for the other samples.

**Soil Analyses    Plant Analyses    Water Analyses**

Zinc – Zinc is excessive high at 35 parts per million for #1 and at 94 parts per million for #3c. Zinc is sufficient for the other samples.

The optimal level of zinc is several parts per million. It is essential but is toxic if it is too high. Sensitive plants such as woody plants frequently need plant available zinc below about 30 parts per million. Herbaceous plants generally need zinc below about 50 parts per million. Grasses are fairly tolerant of high zinc. Excessive zinc causes stunting, dieback and discoloration. High zinc restricts the uptake of potassium and other micronutrients. Since heavy metals do not normally migrate through the soil profile, deeper soil is expected to be more suitable.

Copper – Copper is high.

Boron – Boron is modest on average.

Magnesium – Magnesium is high.

Sulfur – Sulfur is low on average.

**Sodicity** – Available sodium is moderate on average. Available sodium is high for #11. The average SAR (sodium adsorption ratio) is 1.6. SAR ranges from 0.2 for #5c to 3.7 for #11.

Ideally, SAR should be less than about 3. High sodium and high SAR values limit soil physical properties, reduces water percolation, decreases soil aggregate stability, increases clay dispersion, increases swelling of expandable clays, increases surface crusting and reduces soil tilth. High sodium also restricts the uptake of competitive ions such as potassium and calcium. Sodium and SAR can be lowered with the addition of gypsum followed with leaching.

**Soil organic matter** – The average soil organic matter content is moderate at 3.79% on a dry weight basis. Soil organic matter ranges from 1.33% to 2.52% for samples #3c, #5c, #9 and #11. Soil organic matter is modest at 3.18% for #8 and is good at 5.36% for #10.

The average carbon:nitrogen ratio is good at 9.9.

**Texture** - The average texture is clay loam. Sample #1 is sandy clay loam. Sample #3c is gravelly clay loam. The gravel content is 24.3%. Sample #5c is sandy loam. Based on the non-gravel fraction, the soils contain on average 45% sand, 25% silt and 31% clay. The gravel content is 5% on average.

Soils are defined as being gravelly if the gravel content is over 20%. The presence of elevated levels of gravel is undesirable. Gravel dilutes the soil fertility. Soil analyses are made with soil fraction that does not contain gravel. If the amount of gravel were taken into account, the actual fertility would be lower than what is reported. Gravel does not supply nutrients nor does it hold moisture. Gravel blocks root growth. Gravel particles are not permeable. The path of travel of roots, drainage and air exchange is increased, is tortuous and is circuitous in the presence of large amounts of elevated gravel which restricts rooting, drainage and soil aeration. Gravel without fine particles (sand, silt and clay) has rapid percolation but gravel with fine particles (sand, silt and clay) that fill the internal matrix has slow percolation since the voids are occluded.

**Water percolation** - The average estimated rate of water percolation based on Soil Water Characteristics version 6.02.74 model developed by Keith Saxton of the USDA is moderately slow at 0.44 inches per hour for normal soil compaction. The model is based on the soil texture, percent gravel and percent soil organic matter.

The rates of water percolation range from 0.09 inches per hour for #11 to 1.31 inches per hour for #5c.

**Heavy metals** – Plant-available lead is moderate at 21 parts per million for #1. Vanadium is moderate for samples #1 and #10.

Normally, plant available lead should be less than about 30 parts per million for good plant growth.

Vanadium is competitive with iron and limits the metabolic functions of iron and may cause iron deficiency. Vanadium is more active in poorly aerated soil and in acidic soil.

### **Recommendations**

Use a plant palette which is tolerant of high levels of zinc for #1 or else use a more suitable soil. Deeper soil may be more suitable. Turf is fairly tolerant of high levels of zinc.

Lower the gravel content as feasible where gravel is high.

Rip compacted soils at least 1 foot deep.

General soil preparation on a square foot basis. Broadcast the following uniformly. The rates are per 1,000 square feet for a 6-inch lift. Incorporate them homogeneously 6 inches deep. Reduce soil clods to less than ½ inch in diameter:

Simplot or Yara calcium ammonium nitrate (27-0-0) – 4 pounds for all

Potassium sulfate (0-0-50) – 6 pounds for #5c and #9

Triple superphosphate (0-45-0) – 4 pounds for all except none for #1 and #5c

Agricultural gypsum - 20 pounds for all except 40 pounds for #11

Organic soil amendment - about 4 cubic yards or as needed, not needed for #1 and #10, sufficient for 4% to 6% soil organic matter on a dry weight basis

For soil preparation on a volume basis, incorporate homogeneously the following materials into clean soil. Rates are expressed on a cubic yard basis. Reduce soil clods to less than ½ inch in diameter:

Simplot or Yara calcium ammonium nitrate (27-0-0) – 1/4 pound for all

Potassium sulfate (0-0-50) – 1/4 pound for #5c and #9

Triple superphosphate (0-45-0) – 1/4 pound for all except none for #1 and #5c

Agricultural gypsum – 1 pound for all except 2 pounds for #11

Organic soil amendment - about 20% by volume or as needed, not needed for #1 and #10, sufficient for 4% to 6% soil organic matter on a dry weight basis

#### Soil organic amendment suggestions

1. Fully composted aerobic humus compost without presence of decomposition products. The organic matter content shall be at least 50% on a dry weight basis. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%.
2. The pH of the material shall be between 6 and 7.5.
3. The salt content shall be less than 10 millimho/cm @ 25° C. in a saturated paste extract.
4. Boron content of the saturated extract shall be less than 1.0 parts per million.
5. Silicon content (acid-insoluble ash) shall be less than 50%.
6. Calcium carbonate shall not be present if to be applied on alkaline soils.
7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
8. Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
9. Sludge-based materials are not acceptable.
10. Carbon:nitrogen ratio less than 25:1. Molar ratio of ammonia to nitrate less than 3.0. Total ammonia less than 400 parts per million.
11. The compost shall be aerobic without malodorous presence of decomposition products.
12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen for soil amending.

Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

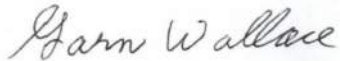
arsenic	12	copper	100	selenium	30
cadmium	15	lead	200	silver	10
chromium	200	mercury	10	vanadium	50
cobalt	30	molybdenum	20	zinc	200
		nickel	100		

Normally irrigate deeply but not frequently. Lower the chloride where it is elevated. Salt-sensitive plants need chloride below about 150 parts per million in the saturation extract. Balance soil moisture with soil aeration. Reduce SAR to less than 3.0 where it is elevated.

For site maintenance, apply Simplot or Yara calcium ammonium nitrate (27-0-0) at 4 pounds per 1,000 square feet about once per quarter. Nitrate helps to increase soil aeration.

Monitor the site with periodic soil and leaf tissue testing. Adjust the maintenance program as needed.

Sincerely,



Garn A. Wallace, Ph. D.  
GAW:n

sample ID description	pH	salinity	chloride	nitrate	IR	wetability	texture	organic matter	C:N	SAR	phosphorus	potassium	iron	manganese	zinc	copper	boron	magnesium	sodium	sulfur	molybdenum	lead
26-13-04 #1 Parking Lot, 8"	7.17	1.96	345	6	1.00	hydrophobic	clay loam	11.00%	13.6	1.5	54.8	1887	15.73	16.35	35.37	2.79	0.31	306	95	30	0.12	20.77
26-13-05 #5c, In Turfgrass Sports Field, 8"	6.13	0.18	20	2	0.13	gravely clay loam	sandy clay loam	1.56%	9.0	1.3	3.1	151	7.07	0.78	94.45	2.49	0.16	499	75	6	0.25	1.50
26-13-06 #5c, Empty Planting Bed, 8"	7.49	0.20	20	2	1.31		sandy loam	1.57%	9.5	0.2	13.0	93	6.34	0.53	5.28	11.80	0.18	124	5	4	0.02	3.34
26-13-07 #8, Empty Planting Bed at Front of School	6.98	0.32	23	7	0.14		clay loam	3.18%	8.5	0.4	5.5	613	4.19	0.99	2.69	3.57	0.19	411	18	5	0.03	7.41
26-13-08 #9, In Turfgrass Front of School, 8"	6.57	0.45	46	7	0.11		clay loam	1.33%	6.5	2.4	1.8	95	19.60	1.49	3.65	4.23	0.18	727	205	16	0.02	3.71
26-13-09 #10, In Turfgrass Front of School, 8"	6.89	0.40	29	3	0.29		clay loam	5.36%	10.5	1.9	5.1	315	49.97	2.65	5.49	4.54	0.22	630	190	21	0.05	6.51
26-13-10 #11, Parking Lot, 8"	6.58	1.18	254	10	0.09		clay loam	2.52%	12.1	3.7	1.6	260	4.22	7.81	1.95	2.62	0.20	684	365	23	0.05	5.73
average	6.83	0.67	105	5	0.44		clay loam	3.79%	9.9	1.6	12.1	484	15.30	4.37	21.27	4.58	0.21	483	136	15	0.08	6.97
target	6.5-7.9	0.5-3	<150	20-30	>1	no	sandy loam	3% - 5%	10	<3	12-20	120-180	4-15	0.6-3	1-3	0.2-3	0.2-0.5	25-100	<200	25-100		

Jan. 13, 2026

Audrey Newell, Plum Architects  
Newell / Highland Elementary School



365 Coral Circle  
 EI Segundo, CA 90245  
 (310) 615-0116  
 ammonium bicarbonate/DTPA  
 Location Newell / Highland Elementary School  
 Requester Audrey Newell, Plum Architects  
 graphic interpretation: \* very low, \*\* low, \*\*\* moderate  
 \*\*\*\* high, \*\*\*\*\* very high

Sample ID Number	Sample Description	26-13-04 #1 Parking Lot, 8" graphic	26-13-05 #3c, In Turfgrass Sports Field, 8" graphic	26-13-06 #5c, Empty Planting Bed, 8" graphic	26-13-07 #8, Empty Planting Bed at Front of School graphic	
extractable - mg/kg soil	Interpretation of data	54.79 ***** 1,857.44 ***** 15.73 ***** 16.35 ***** 35.37 ***** 2.79 ***** 0.31 ***** 486.14 ***** 305.76 ***** 95.15 ** 29.58 *** 0.12 ***** 1.62 ** n.d * 0.18 * 0.96 * 0.15 * 0.04 * 0.20 * 20.77 *** 0.30 * 0.06 * n.d * n.d * 2.10 * 2.76 ***	3.05 ** 151.09 ***** 7.07 *** 0.78 *** 94.45 ***** 2.49 ***** 0.16 ** 360.66 *** 498.51 ***** 74.73 ** 5.68 * 0.25 ***** 1.64 ** n.d * 0.21 * 2.10 * 0.10 * n.d * 0.03 * 1.30 ** 0.24 * n.d * 0.15 * n.d * 2.50 * n.d * 0.42 *	12.99 ***** 92.86 ***** 6.34 *** 0.53 ** 5.28 ***** 11.80 ***** 0.18 ** 428.93 ***** 124.25 ***** 5.41 * 4.00 * 0.02 ** 0.22 ** n.d * 0.17 * 1.06 * 0.07 * n.d * 0.02 * 3.34 ** 0.26 * n.d * 0.12 * n.d * 1.26 * n.d * 0.36 *	5.54 ** 612.84 ***** 4.19 *** 0.99 *** 2.69 ***** 3.57 ***** 0.19 ** 376.42 ***** 411.49 ***** 17.52 * 5.01 * 0.03 *** 1.25 ** n.d * 0.13 * 1.59 * 0.10 * n.d * 0.03 * 7.41 ***** 0.27 * n.d * 0.19 * n.d * 2.06 * n.d * 0.53 *	millieq/l 1.7 0.8 0.4 3.4 0.6 0.5 0.0 0.3 1.5
problems over 150 ppm	chloride	345	20	20	23	
nitrate as N	6	2	2	2	7	
phosphorus as P	6.8	0.2	0.2	1.0	0.5	
sulfate as S	43.6	5.5	5.5	3.6	4.6	
boron as B	0.21 **	0.10 *	0.13 *	0.13 *	0.17 *	
SAR	1.5 *	1.3 *	1.3 *	0.2 *	0.4 *	
est. gypsum requirement-lbs./1000 sq. ft.	35	95	95	1	56	
calculated infiltration rate in/hr	1.00	0.13	0.13	1.31	0.14	
soil texture	sandy clay loam	gravely clay loam	gravelly clay loam	sandy loam	clay loam	
sand	53.7%	44.9%	44.9%	70.8%	37.0%	
silt	22.3%	24.6%	24.6%	15.6%	25.9%	
clay	24.0%	30.5%	30.5%	13.6%	37.1%	
lime (calcium carbonate)	no	no	no	no	no	
Total nitrogen	0.405%	0.087%	0.087%	0.083%	0.188%	
Total carbon	5.500%	0.779%	0.779%	0.786%	1.591%	
carbon:nitrogen ratio	13.6	9.0	9.0	9.5	8.5	
organic matter based on carbon	11.00%	1.56%	1.56%	1.57%	3.18%	
moisture content of soil	5.8%	5.6%	5.6%	2.1%	5.7%	
half saturation percentage	22.1%	28.2%	28.2%	17.0%	33.5%	
hydrophobic	0.0%	0.0%	0.0%	0.0%	0.0%	
gravel > 2 mm	1.7%	24.3%	24.3%	4.2%	3.0%	
gravel > 1/4 inch	0.6%	22.7%	22.7%	3.8%	1.2%	
gravel > 1/2 inch	0.0%	20.2%	20.2%	3.1%	0.0%	

The following trace elements may be toxic  
 The degree of toxicity depends upon the pH of the soil, soil texture, organic matter, and the concentrations of the individual elements as well as to their interactions.  
 The pH optimum depends upon soil organic matter and clay content for clay and loam soils; under 5.2 is too acidic 6.5 to 7 is ideal over 9 is too alkaline  
 The ECe is a measure of the soil salinity: 1-2 affects a few plants 2-4 affects some plants, >4 affects many plants.  
 Saturation Extract  
 pH value 7.17 \*\*\*  
 ECe (milli-mho/cm) 1.96 \*\*\*  
 calcium 112.8  
 magnesium 38.2  
 sodium 71.1  
 potassium 314.0  
 cation sum 19.9  
 chloride 9.7  
 nitrate as N 0.4  
 phosphorus as P 0.2  
 sulfate as S 2.7  
 anion sum 13.1  
 boron as B 0.21 \*\*  
 SAR 1.5 \*  
 est. gypsum requirement-lbs./1000 sq. ft. 35  
 calculated infiltration rate in/hr 1.00  
 soil texture sandy clay loam  
 sand 53.7%  
 silt 22.3%  
 clay 24.0%  
 lime (calcium carbonate) no  
 Total nitrogen 0.405%  
 Total carbon 5.500%  
 carbon:nitrogen ratio 13.6  
 organic matter based on carbon 11.00%  
 moisture content of soil 5.8%  
 half saturation percentage 22.1%  
 hydrophobic

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.  
 pH and ECe are measured in a saturation paste extract. nd means not detected.  
 Analytical data determined on soil fraction passing a 2 mm sieve.

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**SECTION 33 40 00**

**STORM DRAINAGE**

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Foundation drainage, sub-drainage, and underground storm drainage systems complete with cleanouts, catch basins, inlets, manholes, piping, and connection of the roof drain lines.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference.
- B. American Association of State Highway and Transportation Officials (AASHTO) American Society for Testing and Materials (ASTM International).

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's catalog cuts of pipe, fittings, joints and couplings; meters; valves; and valve boxes.
- B. On a set of Contract Drawings, kept at the site during construction, mark construction that is installed differently from that indicated. Locate materials installed underground by dimensions from fixed identifiable points whether installed as indicated or not.

1.4 REGULATORY REQUIREMENTS

- A. Materials and installation shall be in accordance with the following documents hereinafter referred to as the "Standard Specifications".

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Do not store materials directly on the ground. Support the pipe uniformly during shipping and storage. Do not stack higher than 4 feet nor stack with weight on bells. Cover plastic pipe to protect it from sunlight. Keep inside of pipe and fittings free of dirt and debris. Avoid scratching the pipe surface.
- B. Do not install pipe that is cracked, broken, gouged, scratched or forming a clear depression. Remove damaged pipe from the site.

- C. Take special care to avoid injury to coatings and lining on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Hoist pipe with mechanical equipment using a cloth belt sling or continuous fiber rope which avoids scratching the pipe. Pipes may be lowered by rolling on two ropes controlled by snubbing.

## PART 2 – PRODUCTS

### 2.1 STORM DRAIN LINES

- A. Polyvinyl Chloride (PVC) or HDPE Sewer Pipe and Fittings: Comply with Section 207-17 of the Standard Specifications.

### 2.2 FOUNDATION AND SUBSURFACE DRAIN PIPE

- A. Perforated Polyvinyl Chloride (PVC) Pipe: ASTM D 3034-16, SDR 26 or HDPE, may be used where height of fill above pipe does not exceed 35 feet.

### 2.3 RELATED MATERIALS

- A. Precast Concrete Units: Catch basins and inlets shall meet the requirements of ASTM C 913-18 and manhole sections shall meet the requirements of ASTM C 478-19 except that portland cement shall be Type II, low alkali.
- B. Castings: Manufacture castings true to pattern free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Castings shall be of grey iron, ductile iron or steel as indicated or as required to withstand loadings and have cathodic protection.
  - 1. Grey Iron Castings: Meet the requirements of ASTM A 48-03(2016), Class 35.
  - 2. Ductile Iron Castings: Meet the requirements of ASTM A 536-84(2019)e1, Grade 60-40-18.
  - 3. Steel Castings: Meet the requirements of ASTM A 27-19 for mild to medium strength castings and ASTM A 148-19 for high strength castings.
- C. Fabricated Steel Gratings and Frames: Fabricate from steel meeting the requirements of ASTM A 36-19 or ASTM A 576-17, Grades 1021, 1022, 1026, 1029 or 1030. Welding shall meet the requirements of AWS 01.1-96. Burrs, rough and sharp edges, and other flaws shall be removed. Warped pieces shall be straightened after all fabrication. No grating shall have openings greater than 1/4-inch in any direction.
- D. Painting: Castings and steel fabrications shall be given one coat of bituminous paint.
- E. Concrete Appurtenances: Concrete for catch basins and manholes shall be 2500 psi at 28 days and conform to CalTrans Specifications.
- F. Filter Fabric: Provide nonwoven polyester fabric. Acceptable products include, but are not limited to, the following or equal:
  - Crown Zellerbach; Fibertex 200
  - Celanese Fibers; Mirafi 140
  - DuPont; Typar

- G. Filter Material: Clean coarse sand and gravel or crushed stone 3/4 inch minimum to 1-1/2 inch maximum, free draining.

### PART 3 - EXECUTION

#### 3.1 TRENCHING

- A. Trenching is specified in Section 31 23 33.
- B. Trench bottom shall be accurately graded to provide uniform bearing and to support pipe, and a uniform slope of not less than 0.2 percent unless otherwise indicated. Excavate for pipe hubs. Remove unsuitable soils or rock to depths deemed necessary.

#### 3.2 CONNECTIONS TO APPURTENANCES

- A. Where pipe connects into catch basin inlet or manhole walls, sleeves may be installed in the forms; after the forms are removed, the pipe shall be dry packed in place.

#### 3.3 INSTALLATION OF STORM DRAINS

- A. Pipe laying: Keep trenches dry and free of rocks, clods and other unsuitable material during laying and bedding operations. Open ends of pipe shall be closed temporarily at the end of each days work using wood blocks or bulkheads.
  - 1. ABS Composite Pipe: Install pipe and make solvent welded joints in accordance with pipe manufacturer's directions.
  - 2. Polyvinyl Chloride Pipe: Install pipe in accordance with manufacturer's directions using solvent welded joints.
  - 3. Reinforced Concrete Pipe: Provide proper facilities for lowering pipe into trenches. lay pipe with groove ends in upgrade direction. Adjust tongues in grooves to give a uniform space all around. Use compressive polyvinyl gaskets in accordance with manufacturer's directions or mortar joints of 1 part portland cement to 2 parts sand with sufficient water to give mix a stiff consistency. Retempering of mortar will not be permitted.
- B. Backfilling: Do not backfill until elevations and dimensions of pipe are recorded on the Record Drawings. Backfilling and compaction are specified in Section 31 23 33 – Trenching and Backfilling.

#### 3.4 INSTALLATION OF CULVERTS

- A. Handle pipe carefully so as not to damage bituminous coating. If coating is damaged, give damaged areas an application of bituminous material equal to that specified for the pipe. Make joints using coupling bands furnished with the pipe. Keep space between pipe and couplings free from dirt so that corrugations will fit snugly. While tightening the bands, tap them with soft-head mallet to take up the slack and ensure a tight joint. Backfill and compaction are specified in Section 31 23 33 – Trenching and Backfilling.

END OF SECTION

3/23/26