



DSA APPLICATION NUMBER

A#03-125592

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INCREMENT 01

Specifications

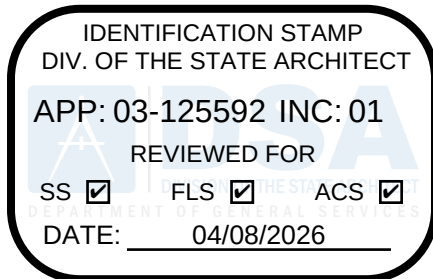
Ventura College Student Housing

4667 Telegraph Rd.

Ventura, CA 93003

100% Construction Documents

2 December, 2025



DSA STAMP



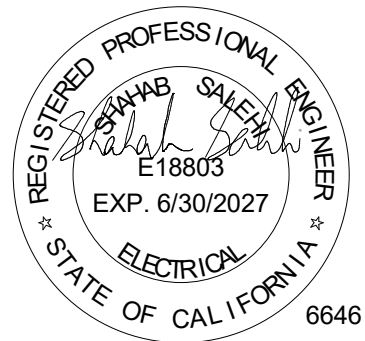
ARCHITECT



CIVIL ENGINEER



LANDSCAPE ARCHITECT



6646

ELECTRICAL ENGINEER

DOCUMENT 000110 - TABLE OF CONTENTS

INTRODUCTORY INFORMATION

000101	PROJECT TITLE PAGE
000107	SEALS PAGE
000110	TABLE OF CONTENTS

**GENERAL REQUIREMENTS SUBGROUP
DIVISION 01 - GENERAL REQUIREMENTS**

015639	TREE PROTECTION
015723	TEMPORARY STORM WATER POLLUTION CONTROL
017300	EXECUTION
017419	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

**FACILITY CONSTRUCTION SUBGROUP
NONE**

**FACILITY SERVICES SUBGROUP
DIVISION 26 – ELECTRICAL**

260010	SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL
260543	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

**SITE AND INFRASTRUCTURE SUBGROUP
DIVISION 31 - EARTHWORK**

311000	SITE CLEARING
312000	EARTHWORK
312333	TRENCHING AND BACKFILLING

DIVISION 32 – EXTERIOR IMPROVEMENTS

321123	AGGREGATE BASE COURSES
321216	ASPHALT CONCRETE PAVING
321300	CONCRETE PAVING

DIVISION 33 – UTILITIES

331000	WATER UTILITIES
333000	SANITARY SEWERAGE UTILITIES
334000	STORM DRAINAGE UTILITIES

END OF TABLE OF CONTENTS

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section Includes: Preserve and protect existing trees, shrubs and other plant materials to remain, including protecting plants and trees on adjoining properties.

1.2 RELATED DOCUMENTS

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

- 1. Section 311000 "Site Clearing"

1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.
- B. Diameter at breast height (DBH): diameter of a trunk as measured by a diameter tape at a height 4.5 feet from the ground surface.
- C. Canopy Radius: Approximate average distance from the stem to the limits of the drip line, or end of branches.
- D. Critical Root Zone (CRZ): The minimum volume of roots necessary for the maintenance of tree health and stability, typically determined by measuring the tree diameter 4.5 ft. above grade and multiplying by 12 in., a minimum radius of 10' from the trunk, or at the tree's dripline, whichever is farthest from the trunk, or as otherwise indicated on the drawings, or established in the field. CRZ will be determined/established on a case-by-case basis by the arborist and approval by the landscape architect.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- F. Stems: Number of trunks or shoots that contribute significantly to the canopy.
- G. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction. The Tree-Protection Zone is defined by the CRZ of individual trees.

1.4 PREINSTALLATION MEETINGS

- A. On Site Preinstallation Meeting: Conduct meeting at Project site with representatives for the architect, arborist, contractor, and client present.
 - 1. Contractor shall review and identify with Landscape Architect the limits of work and extent of plant and tree materials to be protected.

2. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
 - a. Tree-service firm's personnel and equipment needed to make progress and avoid delays.
 - b. Arborist's responsibilities.
 - c. Quality-control program.
 - d. Coordination of Work and equipment movement with the locations of protection zones.
 - e. Trenching by hand or with air spade within protection zones.
 - f. Field quality control.

1.5 ACTION SUBMITTALS

- A. Tree-Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
 1. Species and size of tree.
 2. Location on site plan. Include unique identifier for each.
 3. Reason for pruning.
 4. Description of pruning to be performed.
 5. Description of maintenance following pruning.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For tree service firm.
- B. Certification: From ISA certified arborist, certifying that trees indicated to remain have been protected during construction in accordance with recognized standards and that trees were promptly and properly treated and repaired when damaged.
- C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 1. Use sufficiently detailed photographs or video recordings.
 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- E. Quality-control program.

1.7 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by ISA.
- B. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection-zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

- A. No development, fill, excavation, construction materials, equipment staging, or traffic shall be allowed in the critical root zone of the trees that are to be retained. Practices prohibited within the protection zones include:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. If any construction work needs to be performed inside either the tree drip line, critical root zone, and/or the inner critical root zone, the project arborist will be on site to supervise the work.
- C. Do not direct vehicle or equipment exhaust toward protection zones.
- D. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Arborist Mulch: shall be coarse ground wood chips (approximately 1/2" to 4" along the longest dimension) derived from the mechanical grinding or shredding of the above-ground portions of trees. It may contain wood, wood fiber, bark, branches, and leaves; but may not contain visible amounts of soil. It shall be free of weeds and weed seeds, and shall be free of invasive plant portions capable of resprouting, including but not limited to horsetail, ivy, clematis, knotweed, etc. It may not contain more than 1/2% by weight of manufactured inert material (plastic, concrete, ceramics, metal, etc.).
- B. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
- C. Protection-Zone Fencing: Subject to approval by the Owners Representative, fencing fixed in position and meeting the following requirements:
 - 1. Protection-Zone Fencing: High density polyethylene fencing with 3.5" x 1.5" openings and steel posts installed 8' O.C. on pier blocks.
 - a. Height: 72 inches.
 - b. Color: Orange
 - 2. Gates: Double- swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches.

- D. Protection-Zone Signage: Signs shall be posted visibly on all sides of the fenced areas.
 - 1. Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
 - a. Sign placard: Twelve inches tall by 18 inches long, laminated in plastic.
 - b. Text: "Tree Protection Area"
 - c. Lettering: 4-inch- high minimum, black characters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. During the on-site pre-installation meeting, locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
 - 1. In addition to the above minimum tree protection measures, support tree protection efforts by employing, as appropriate, the following best management practices for maintaining the health of the tree:
 - a. Prune visible deadwood on trees to be protected or relocated.
 - b. Provide a layer of arborist mulch 3 inches deep in the CRZ of retained trees.
 - c. Ensure one inch of irrigation or rainfall per week during and immediately after construction and from early May through September until reliable rainfall occurs in the fall.

3.3 TREE PROTECTION

- A. Prior to any land disturbance, place temporary construction fence around the tree protection zone to be preserved. If a cluster of trees is proposed for retention, the barrier shall be placed around the edge formed by the CRZ of the trees to be retained. If work is to occur within CRZs, fencing on Tree Retention Plan will indicate acceptable location and additional alternative protection methods employed (trunk wrap, CRZ matting, etc).
- B. Place fencing around each tree or group of trees to be retained.

1. Fence to be five feet outside Tree Protection Zone of the tree or group of trees or as noted on plans.
- C. Tree protection shall remain in place for the duration of the permit unless earlier removal is addressed through construction sequencing on approved plans.
- D. If any construction work must be performed inside either the tree drip line, critical root zone, and/or the inner critical root zone, the project arborist shall be on site to supervise the work.
 1. Install temporary root-protection matting over mulch to the extent indicated by the Tree Retention Plan.
 2. When excavation must occur within or near the critical root zone, any found roots three inches or greater in diameter will be cleanly cut to the edge of the trench to avoid ripping of the root. Arborist must evaluate roots prior to cutting any roots greater than 1 inch in diameter.

3.4 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
 1. Protection Zone Fencing: Install to comply with manufacturer's written instructions.
 2. Posts: Set posts using pier blocks only. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
 - a. Avoid driving posts or stakes into major roots.
 3. Access Gates: Install as required; adjust to operate smoothly, easily, and quietly; free of 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. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 50 ft. on protection-zone fencing, but no fewer than four signs with each facing a different direction. 4-inch minimum text size, sign laminated in plastic.
- C. Maintain protection zones free of weeds and trash.
- D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.

2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.5 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with requirements in Section 312000 "Earthwork" unless otherwise indicated.
- B. Trenching or Excavating within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

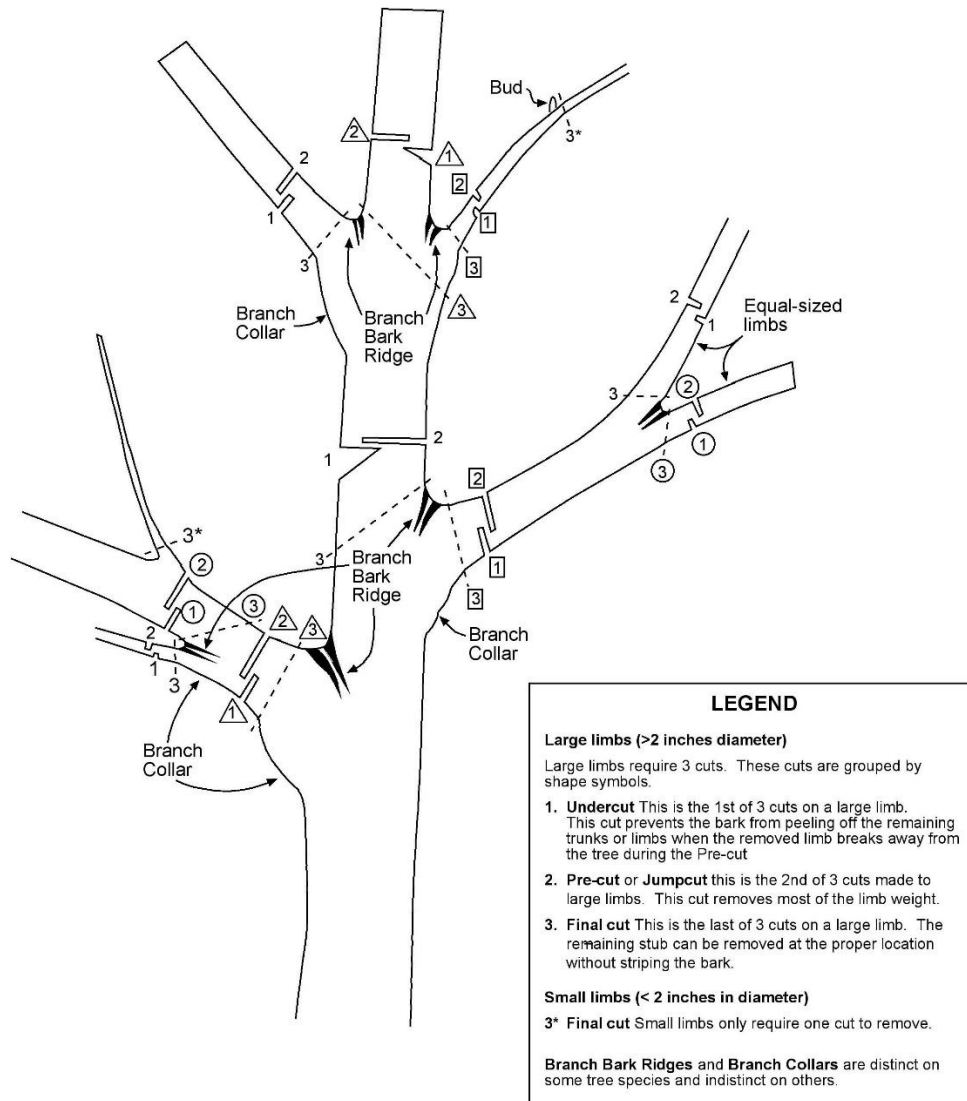
3.6 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots. Any root pruning must be supervised by an arborist.
 2. Cut Ends: Do not paint cut root ends.
 3. Temporarily support and protect roots from damage until they are permanently covered with soil.
 4. Cover exposed roots with burlap and water regularly.
 5. Backfill as soon as possible in accordance with requirements in Section 312000 "Earthwork."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

- D. Any roots exposed during construction activities that are larger than 2 inches in diameter should not be cut or damaged until the project arborist has an opportunity to assess the impact that removing these roots could have on the trees.

3.7 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Raise Prune branches as directed by arborist.
 - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
 - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 - 3. Pruning cuts should be made back to an appropriate branch or trunk. Do not stub cut branches or top a tree.
 - 4. Do not remove more than 25% of the overall canopy.
 - 5. Pruning Standards: Prune trees in accordance with ANSI A300 (Part 1).
- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- F. Chip removed branches and stockpile in areas approved by Architect.



3.8 REGRADING

- Lowering Grade:** Where new finish grade is indicated below existing grade around trees, construct rock walls around the tree, equal to the dripline. Maintain existing grades within the protection zone.
- Lowering Grade within Protection Zone:** Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
 - Root Pruning:** Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- Raising Grade:** Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

1. If additional grade is required within the CRZ, increase grade by a maximum of 3".

3.9 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.10 REPAIR

- A. Repair trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.
 1. Submit details of proposed pruning and repairs.
 2. Perform repairs of damaged trunks, branches, and roots within 24 hours in accordance with arborist's written instructions.
 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

3.11 REPLACEMENT

- A. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.
- C. Trees: Provide new trees of same size and species,
- D. Shrubs: Replace with 5 gal of same species.
- E. Plant and maintain new trees and plants as specified in Section 329300 "Plants."
- F. Decompaction: Decompact soils by hand as required by the Owners Representative.

END OF SECTION

SECTION 01 57 23 - TEMPORARY STORMWATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Includes: Stormwater pollution prevention measures during construction activities.
 - 1. The Contractor shall continue to comply with the administrative requirements related to the SWPPP during and following completion of construction.
 - 2. Any and all fines resulting from the negligence of the Contractor to properly implement the measures specified in the SWPPP and/or by the Qualified SWPPP Practitioner shall be paid for by the Contractor.

1.2 REFERENCES

- A. *State of California Construction General Permit 2022-0057-DWQ*, dated September 08, 2022.
- B. *Waste Discharge Requirements for Storm Water (Wet Weather) and Non-Storm Water (Dry Weather) Discharges from the Municipal Separate Storm Sewer Systems Within the Ventura County Watershed Protection District, County of Ventura and the Incorporated Cities Therein, Order R4-2021-0105, NPDES Permit No. CAS004004*, dated July 23, 2021.
- C. *Storm Water Pollution Prevention Plan* dated 09/30/2025 (or as most recently revised) prepared by Encompass Consultant Group.

1.3 PROJECT CONDITIONS

- A. This project is subject to the State General Construction National Pollutant Discharge Elimination System (NPDES) Permit. Therefore, the contractor shall comply with all aspects of the State General Construction Permit including preparation and implementation of the required Storm Water Pollution Prevention Plan and related Sampling & Analysis section.

PART 2 – PRODUCTS

NOT USED.

PART 3 – EXECUTION

3.1 STORMWATER POLLUTION PREVENTION MEASURES

- A. All stormwater pollution prevention measures shall be in accordance with the SWPPP. In the event circumstances during the course of construction require changes to the original SWPPP, a revised plan shall be promptly submitted to the District's Representative in each instance for approval by the Qualified SWPPP Developer. No responsibility shall accrue to the Owner as a result of the plan or as a result of knowledge of the plan. All work installed by the contractor in connection with the SWPPP but not specified to become a permanent part of the project shall be removed and the site restored to its original condition prior to completion of construction or when directed by the District's Representative.

END OF SECTION

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering.
 - 3. Installation.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for coordination of Owner-furnished products , Owner's separate contracts, and limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 4. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

- A. Layout Conference: Conduct conference at **Project site**.

1. Prior to establishing layout of **new** perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Owner's Representative of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. **Professional surveyor** responsible for performing Project surveying and layout.
 - c. **Professional surveyor** responsible for performing site survey serving as basis for Project design.
2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **land surveyor**.
- B. Certified Surveys: Submit **two** copies signed by **land surveyor**.
- C. Certificates: Submit certificate signed by **land surveyor**, certifying that location and elevation of improvements comply with requirements.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."
- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of

- cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. **Operational elements include the following:**
 - a. Primary operational systems and equipment.
 - b. Fire-suppression systems.
 - c. Plumbing piping systems.
 - d. Fire-detection and -alarm systems.
 - e. Conveying systems.
 - f. Electrical wiring systems.
 - g. Operating systems of special construction.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. **Other construction elements include but are not limited to the following:**
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Piping, ductwork, vessels, and equipment.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the construction's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.

- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Owner's Representative in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Owner's Representative promptly.
- B. Engage a **land surveyor** experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owner's Representative.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Owner's Representative. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner's Representative before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey

showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb, and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Owner's Representative. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of Work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
- E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
- F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in **Section 017419 "Construction Waste Management and Disposal."**
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 3110000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to local building department, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of CM/ Contractor.

- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by demolition and construction Work, tracked as both volume (cu. yds.) and weight (tons).
- B. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt. Documentation must itemize donated items and include a total weight of all items.
- C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Documentation must itemize sold items and include a total weight of all items.
- D. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- E. Landfill Disposal Records: Indicate receipt and acceptance of waste by landfills facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with transportation and disposal regulations of California Green Building Code.
- B. Waste Management Conference: Conduct conference at Project site in conjunction with Progress Meetings specified in Section 013119 "Project Meetings" Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of each CM/ Contractor and waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of at least 80 percent by weight of total nonhazardous, non-land clearing and non-ADC solid waste generated by the Work. The project rate must be achieved by using a minimum of five different waste streams.
- B. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials. Example materials may include:
 1. Demolition Waste:
 - a. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Concrete masonry units.
 - e. Structural and miscellaneous steel.
 - f. Electrical conduit.
 - g. Copper wiring.
 2. Construction Waste:
 - a. Masonry and CMU.
 - b. Metals.
 - c. Piping.
 - d. Electrical conduit.

- e. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Wood pallets.
 - 8) Plastic pails.
- f. Construction Office and On-Site Staff Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Glass containers.
 - 4) To-go food containers and food packaging.
 - 5) Single-use plastic bottles.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Furnish handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal. Review materials handling onsite and the proper use of co-mingled and single stream bins.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled. Clearly label bins for co-mingled materials and single stream materials.

2. Comply with Section 015500 "Vehicular Access and Parking " for controlling site access.
 3. Comply with Section 015600 "Temporary Barricades and Enclosures" for controlling dust and dirt, environmental protection, and noise control.
- D. Create final waste report on the total construction and demolition waste produced by the project and the total waste diverted.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Furnish and install connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner's Representative.
 4. Transport items to Owner's storage area designated by Owner's Representative.
 5. Protect items from damage during transport and storage.
- C. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Break up and transport concrete to concrete-recycling facility
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 1. Break up and transport masonry to masonry-recycling facility
 2. Clean and stack undamaged, whole masonry units on wood pallets.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- G. Conduit: Reduce conduit to straight lengths and store by material and size.

3.4 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329300 "Landscape Planting" for use of clean sawdust as organic mulch.

3.5 DISPOSAL OF WASTE

- A. See Section 017400 "Cleaning and Waste Management".

SECTION 260010 – SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies supplemental requirements generally applicable to the Contract Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.
- B. Related Requirements:
 - 1. The general conditions and Division 1 are part of this section and apply to this section as fully as if repeated herein. This section, 260010, applies to all Division 26 categories.

1.2 CONSTRUCTION DOCUMENT INTENT

- A. These construction documents are intended to be diagrammatic and reflect the scope, quality, and character of the work to be performed; all miscellaneous materials and work required for a complete and operational system, though not specifically mentioned, shall be furnished, and installed by the Contractor.
- B. Equipment shown to scale is approximate only and based upon a general class of equipment specified. The Contractor shall confirm sizes, dimensions, weights and locations of all devices, light fixtures, and equipment prior to installation. Dimensioned architectural drawings shall take precedence over diagrammatic layouts shown on these contract documents.
- C. The specifications and the drawings are an integral document and shall be considered complementary to each other. In the case of a conflict between the specifications and the drawings, the more constricting condition shall be enforced.
- D. The Contractor shall be responsible for reporting any discrepancies, errors, or omissions noted prior to bid.
- E. It is the intent of the drawings to indicate schematic routing and placement of devices, fixtures, equipment and conduit. Equipment or devices requiring a precise location shall be dimensioned on other trade documents (architectural, mechanical, etc.). Offsets, elbows, or extensions shall be furnished and installed by the Contractor as necessary to avoid structure, piping, and clearances and to provide a complete and workmanlike installation.

1.3 QUALITY ASSURANCE

- A. All work, materials and equipment shall comply with the latest versions of the codes, ordinances and regulations enforced by the local government having jurisdiction,

including the regulations of serving utilities and any participating government agencies having jurisdiction.

- B. Comply with the latest editions of applicable codes, ordinances, regulations and standards of:
1. Americans with Disabilities Act (ADA)
 2. Insulated Cable Engineers Association (ICEA).
 3. Institute of Electrical and Electronics Engineers (IEEE).
 4. National Electrical Manufacturers Association (NEMA).
 5. American National Standards Institute (ANSI).
 6. National Bureau of Standards (NBS).
 7. Certified Ballast Manufacturers (CBM).
 8. American Society for Testing and Materials (ASTM).
 9. Underwriter's Laboratories (UL).
 10. California Code of Regulations (Titles 8, 19, 22, 24).
 11. California Building Code (CBC).
 12. California Electrical Code (CEC).
 13. National Electrical Safety Code (NECS).
 14. National Electrical Testing Agency (NETA).
 15. National Electrical Contractor's Association (NECA).
 16. National Fire Protection Association (NFPA)
- C. All materials and equipment shall be listed by and shall bear the label of an approved Nationally Recognized Testing Laboratory (NRTL) as approved by the authority having jurisdiction. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, and approved by the authority having jurisdiction, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled.
- D. Where requirements differ, the more stringent shall apply.

1.4 CONTINUITY OF POWER

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify Owner no fewer than fourteen (14) days in advance of proposed interruption of electrical service.
 2. Do not proceed with interruption of electrical service without Owner's written permission.
 3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
 - a. Exercising generators.
 - b. Emergency lighting.
 - c. Elevators.
 - d. Fire-alarm systems.
- B. Temporary electrical power shall be the responsibility of the Contractor.

1.5 SUBMITTALS

- A. Submittals shall be furnished by Contractor for each device, equipment, conduits, conductors and cables, light fixtures, and lighting controls intended to be used on the project. Submit material list within 2 weeks of Notice to Proceed and obtain review, prior to submission of manufacturer's data and shop drawings.
- B. All materials shown shall be new, of prime quality, and listed as suitable for the application. Materials shall be currently in production and shall be supported by spare parts, repair service, maintenance and factory technical support. Materials of one assembly (switchboards, substations, panelboards, etc.) shall be of one manufacturer unless noted otherwise in the construction documents.
- C. Piecemeal submittals will not be accepted. Incomplete submittals will be rejected at the discretion of the reviewing Engineer. Submit in brochure form with all listings referenced to applicable sections and paragraphs in the specifications. Listing items "as specified" without both name of manufacturer and model number or type (designation) is not acceptable.
- D. Contractor shall submit a complete list of materials and equipment proposed for the project including which is exactly as specified. List to contain only one (1) manufacturer's name and reference to applicable sections and paragraphs of the specifications. List shall be submitted within two (2) weeks of issue of Notice to Proceed. Any material or equipment installed without written approval shall be subject to immediate removal.
- E. Submittal brochures shall be complete and descriptive of the type, make, manufacturer, application, quantity, performance, capacity, ratings, options, dimensions, clearances, weights, nameplate data, special installation requirements, mounting method, NEMA type, NEMA class, environmental restrictions, layout requirements or other information as may be necessary for review of the material.
- F. Submittal brochures for switchboards (or switchgear, if applicable) shall include, as a minimum, the following: single-line diagrams; fault current ratings of buses and devices; device identification, ratings, layout and characteristics; dimensions; circuit identification; identification label type and method of affixing; mounting; conduit entry point and quantities; NEMA enclosure type; and additional data as required for a complete review.
- G. Submittal brochures for lighting systems shall include, as a minimum, the following: manufacturer; detailed drawing or photograph; dimensions; lamp data; ballast/driver data; certified photometric data from a third-party testing agency; NRTL label listing; fixture number or identification from the drawings; finish color and material; mounting equipment; socket type and rating; environmental ratings (damp location, watertight, explosion-proof, etc.); voltage; input wattage; and additional information as necessary for a complete review.
- H. The Contractor shall be responsible for all aspects of substitutions of material including any additional cost or delay incurred as a result of the substitution. The Contractor shall coordinate all substitutions with other trades, verify code compliance, verify clearances, photometric performance, appearance, suitability, constructability, and

availability of the material prior to submitting the substitution for review. The Contractor shall bear the responsibility of any increased costs to other trades which are directly related to the substitution.

1.6 EXISTING CONDITIONS

- A. The contractor shall verify all existing conditions prior to bid and include all costs associated with the existing conditions in the bid. The Contractor shall match the finish and appearance of all existing conditions where construction of new work is adjacent to existing surfaces or equipment.
- B. Coordinate work to be performed in occupied areas and comply with the Owner's requirements such that the Owner's work or ongoing activities are not disrupted by the Contractor. Verify the need for work to be performed during premium hours, evenings, weekends, or holidays prior to bid and include all costs in bid. Bring to the Owner's attention the need and locations for all disruptive work prior to commencement of work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The contractor shall arrange for the sequence of construction including the scheduling of long-lead items, expected shutdowns, work of other trades and Owner-scheduled events. The contractor shall coordinate and cooperate with all other trades for a successful completion of the Contract Work.
- B. The contractor shall provide adequate and qualified supervision for the work performed and at no point during the construction shall work be performed without the supervision of a representative of the Contractor.
- C. The drawings show general arrangement of equipment and appurtenances. Follow these drawings as closely as the actual construction will permit. Provide all offsets, fittings, and appurtenances required but not shown on drawings.
- D. All equipment shall be installed plumb and level, orthogonal or parallel to structure and in a professional and skillful manner. All equipment and junction boxes shall be accessible for maintenance, inspection and replacement.
- E. The locations of fixtures, outlets, devices, equipment, etc. indicated on drawings are approximate location only. Verify location and mounting height of outlets/equipment not dimensionally shown on the plans with Architect prior to rough-in. Revision and coordination may be necessary at the time the equipment is installed in order to meet field conditions or other coordination.

- F. Coordinate all equipment points of connection, including voltage, wiring installation method, fuse and overcurrent protection, etc. with equipment vendor. The Contractor shall notify the Engineer of any discrepancies immediately.
- G. Coordinate the placement and sequence of installation for all mounting bolts, conduits, sleeves, etc. that are to be installed in cast-in-situ concrete slabs, concrete walls, and post-tension concrete slabs with the structural drawings prior to rough-in.
- H. Coordinate locations of all penetrations, openings, slots, chases, and sleeves as necessary for the installation of raceways, conductors and equipment. The Contractor shall install access panels in walls or ceilings in coordination with the Architect for all electrical boxes and equipment requiring access. The Contractor shall provide approved fire sealant where required to maintain fire ratings at all penetrations.
- I. Coordinate location of light fixtures, disconnect switches, and controllers in mechanical equipment rooms with other trades contractors prior to installation to avoid any conflicts and to be in compliance with code. Maintain proper mounting heights and clearances.
- J. Examine and compare the contract drawings with contract specifications and report any discrepancies to Architect and Engineer.

3.2 SEISMIC ANCHORAGE

- A. All switchgear and other free standing electrical equipment shall be anchored to withstand seismic forces in this area.
- B. Wall mounted equipment shall be anchored/braced to withstand seismic force.
- C. Conduit supports shall be adequately sized and braced to comply with seismic criteria.

3.3 START UP AND COMMISSIONING

- A. Contractor shall be responsible to provide manufacturer's technician for startup service of each system as indicated. The Contractor shall demonstrate that all systems operate within the manufacturer's recommended performance characteristics, the electrical construction documents, system requirements, and Owner requirements.
- B. The Contractor shall initiate start up of all electrical equipment including operation of all devices, switches, generators, transfer switches, overcurrent protection, disconnect switches, etc. to verify normal operation of all moving parts and electrical performance.
- C. The Contractor shall test, adjust, aim, align, label, clean and complete all systems prior to acceptance by the Owner's Representative.
- D. The Contractor shall test each system per the manufacturer's requirements and shall perform the following system tests:
 - 1. Inspect cables for physical damage and proper connection.

2. Torque test cable connection and tighten in accordance with termination manufacturers recommendations.
3. Insulation resistance test of each cable.
4. Inspect ground system connections.
5. Voltage drop tests on the main grounding electrode of system.
6. Determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral points.
7. Check rated voltage and phase balance at all equipment, motors and selected devices at full load conditions. Measure no load voltage conditions at each location.
8. Furnish all material, equipment, instruments and labor as required to complete testing.
9. Provide all test results properly bound in PDF format.

3.4 INSTRUCTION MANUAL AND TRAINING

- A. Operating instructions shall be provided by the Contractor at the conclusion of the project for each system and each principal piece of equipment for the use of operating and maintenance personnel. The operating instructions shall include wiring and control diagrams showing the entire system, including, but not limited to, equipment, devices, and control sequences. All operating instructions shall be approved by the University's Representative.
- B. The Contractor shall provide the operation and maintenance manuals to the Owner's Representative at the completion of the project, O&M manuals may be submitted in PDF format. Each manual shall be labeled indicating: the project name; system name; Contractor's name, telephone number, and contact person; and Owner's name. The Contractor shall provide the following minimum information within each manual:
 1. List of the Subcontractors performing work on the system including contact names, telephone numbers, and email addresses.
 2. Routine and emergency service contact names, telephone numbers, and email addresses for each system.
 3. Description of system operation.
 4. Single line diagrams and control wiring diagrams.
 5. Detailed product literature with technical information.
 6. Local factory representative contact name, telephone number, and email address.
 7. Sequence of starting, shutdown and operation.
 8. Installation instructions and safety requirements.
 9. Maintenance schedule, testing instructions and performance parameters.
 10. Parts list including recommended spare parts.
- C. Include Automatic operation of the emergency system gear, switchgear and/or subsystem including required component settings (e.g. automatic transfer, medium voltage switchgear, etc.). Include operation of the switchgear and/or subsystems, and any emergency operation capability and procedures.
- D. Safety features built into the switchgear and/or subsystem.
- E. Start-up, checkout and shutdown procedures.

- F. Shop Drawing Manual: Complete set of record shop drawings, cut sheets and brochures.
- G. Owner's staff and maintenance personnel shall be thoroughly trained, minimum four (4) hours, in the use of each system or major piece of equipment installed unless otherwise stated in other sections of Division 26. This training shall be provided as part of the Contractor's base bid to supply the system or equipment. Refer to other sections of Division 26 for additional information. The training is to be scheduled at mutually agreeable times between the Owner's Representative and the Contractor.

3.5 CLEANING AND REPAIR

- A. The Contractor shall provide cutting and patching as required to install the electrical system in this contract. Patching shall be performed with materials which exactly match the adjacent surfaces in color, texture, character, and appearance. All patches must maintain the fire ratings of the original surface and shall be sealed with a U.L. listed and Fire Marshal approved sealant.
- B. The Contractor shall match the finish and appearance of all existing conditions where construction of new work is adjacent to existing surfaces or equipment. The Contractor shall protect all surfaces, structure, furnishings, and finishes not directly affected by cutting or patching. Provide dust and moisture barriers as required during cutting and prior to patching openings.
- C. Vacuum clean the interiors of all switchboards, substations, panelboards, transformers, motor control centers and transfer switches upon completion of all work to remove dust and debris. After cleaning, cover all equipment to prevent any construction dust from recurring. Before equipment is energized, vacuum all interiors a second time to assure clean equipment.

END OF SECTION

SECTION 260543 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Type PVC raceways and fittings.
 - 2. Fittings for conduit, tubing, and cable.
 - 3. Electrically conductive corrosion-resistant compounds for threaded conduit.
 - 4. Solvent cements.
 - 5. Duct accessories.
 - 6. Handholes and boxes for exterior underground wiring.
 - 7. Duct sealing.
- B. Related Requirements:
 - 1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
 - 2. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
 - 3. Section 260553 "Identification for Electrical Systems" specifies underground-line warning tape.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For concrete and steel used in precast concrete manholes and handholes, also include product certificates as required by ASTM C858.
- B. Shop Drawings:
 - 1. Electric Duct Banks and Structures:
 - a. Include plans, elevations, sections, and details, including attachments to other Work.
 - b. Indicate locations of all easements.
 - 2. Precast or Factory-Fabricated Concrete Structures:
 - a. Include plans, elevations, sections, and details, including attachments to other Work.
 - b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
 - c. Include reinforcement details.
 - d. Include frame and cover design and manhole chimneys.
 - e. Include ladder details.
 - f. Include grounding details.
 - g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, sumps, and other accessories.
 - h. Include joint details.
 - 3. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

- a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
 - c. Include cover design.
 - d. Include grounding details.
 - e. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and other accessories.
- C. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- B. Field Reports:
 - 1. Factory Test Reports: For handholes and boxes.
 - 2. Manufacturer's field reports for field quality-control support.

PART 2 - PRODUCTS

2.1 TYPE PVC RACEWAYS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cantex, Inc.
 - 2. Allied Tube and Conduit
 - 3. Carlon Electrical Products.
 - 4. JM Eagle
 - 5. Or equal.
- B. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL 651 and UL CCN DZYR.
- C. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:
 - 1. Dimensional Specifications: Schedule 40.
 - 2. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Markings: For use with maximum 90 deg C wire.

2.2 FITTINGS FOR CONDUIT, TUBING, AND CABLE

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

2.3 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: UL Subject 2419 and UL CCN FOIZ.

2.4 SOLVENT CEMENTS

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.

2.5 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Performance Criteria:
 - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
 - 2. General Characteristics:
 - a. ASTM C858 for design and manufacturing processes.
 - b. SCTE 77.
- B. Precast Concrete Handholes and Boxes:
 - 1. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover must form top of enclosure and must have load rating consistent with that of handhole or box.
 - 2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
 - 3. Frame and Cover:
 - a. Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 - b. Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
 - c. Weatherproof steel frame, with concealed-hinge steel access door assembly; tamper-resistant, captive, cover-securing bolts; hold-open ratchet assembly; and recessed cover handle.
 - d. Weatherproof aluminum frame, with concealed-hinge aluminum access door assembly; tamper-resistant, captive, cover-securing bolts; hold-open ratchet assembly; and recessed cover handle.

- e. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - f. Cover Legend: Molded lettering, as indicated for each service.
 - 4. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
 - a. Extension must provide increased depth of 12 inch (300 mm).
 - b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
 - 5. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
 - 6. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inch (300 mm) vertically and horizontally to accommodate alignment variations.
 - a. Center window location.
 - b. Knockout panels must be located no less than 6 inch (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
 - c. Knockout panel opening must have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct.
 - d. Knockout panels must be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.
 - e. Knockout panels must be 1-1/2 to 2 inch (38 to 50 mm) thick.
 - 7. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
 - a. Type and size: Match fittings to duct to be terminated.
 - b. Fittings must align with elevations of approaching duct and be located near interior corners of handholes to facilitate racking of cable.
 - c. Provide minimum of one cast end-bell or duct-terminating fitting of each size provided in each wall.
 - 8. Handholes 12 inch wide by 24 inch long (300 mm wide by 600 mm long) and larger must have inserts for cable racks and pulling-in irons installed before concrete is poured.
- C. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:
- 1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or combination.
 - 2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
 - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.
 - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
 - b. Cover Legend: Molded lettering, as indicated for each service.
 - 4. Conduit Entrance Provisions: Conduit-terminating fittings must mate with entering ducts for secure, fixed installation in enclosure wall.
 - 5. Duct Entrance Provisions: Duct-terminating fittings must mate with entering duct for secure, fixed installation in enclosure wall.
 - 6. Handholes 12 inch wide by 24 inch long (300 mm wide by 600 mm long) and larger must have factory-installed inserts for cable racks and pulling-in irons.

- 7. Options:
 - a. Color: Gray.

2.7 DUCT SEALING

- A. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Compound must be capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.
- B. Inflatable Duct-Sealing System: Wraparound inflatable bladder that seals ducts that are empty or containing conductors against air and water infiltration. System is suitable for use in steel, plastic, or concrete ducts and penetrations.

2.8 SOURCE QUALITY CONTROL

- A. Factory Tests for Handholes and Boxes:
 - 1. Testing Administrator: Engage qualified structural testing agency to evaluate handholes and boxes.
 - a. Tests of materials must be performed by independent testing agency.
 - b. Strength tests of complete boxes and covers must be by independent testing agency or manufacturer. Qualified registered professional engineer must certify tests by manufacturer.
 - 2. Factory Tests and Inspections: Perform the following tests and inspections on handholes and boxes, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, before delivering to site. Affix label with name and date of qualified testing laboratory's certification of system compliance.
 - a. Precast Concrete Structures: Test and inspect in accordance with ASTM C1037.
 - b. Polymer Concrete and Nonconcrete Handhole and Pull-Box Prototypes: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests must be for specified tier ratings of products supplied. Testing machine pressure gages must have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.
 - 3. Nonconforming Work:
 - a. Equipment that does not pass tests and inspections will be considered defective.
 - 4. Factory Test Reports: Prepare and submit factory test and inspection reports

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.
- C. Clear and grub vegetation to be removed, and protect vegetation to remain in accordance with Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication in accordance with Section 311000 "Site Clearing."

3.2 SELECTION OF UNDERGROUND DUCTS

- A. Duct for Electrical Cables More Than 600 V: PVC-40, concrete encased unless otherwise indicated.
- B. Duct for Electrical Feeders 600 V and Less: PVC-40, concrete encased unless otherwise indicated.
- C. Duct for Electrical Branch Circuits: PVC-40, direct buried unless otherwise indicated.
- D. Underground Ducts Crossing Paved Paths Walks and Driveways: PVC-40.
- E. Underground Ducts Crossing Roadways and Railroads: PVC-40, encased in reinforced concrete.
- F. Stub-ups: Concrete encased, PVC-40.

3.3 SELECTION OF UNDERGROUND ENCLOSURES

- A. Handholes and Boxes:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete, AASHTO HB 17, H-20 structural load rating.
 - 2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
 - 3. Units in Sidewalk and Similar Applications with Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
 - 4. Units Subject to Light-Duty Pedestrian Traffic Only: , structurally tested in accordance with SCTE 77 with 3000 lbf (13 345 N) vertical loading.
 - 5. Cover design load must not exceed load rating of handhole or box.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 312000 "Earthwork," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Restore area after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Landscape Planting."
- E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Cutting and Patching" Article in Section 017300 "Execution."

3.5 INSTALLATION OF DUCTS AND DUCT BANKS

- A. Reference Standards:
 - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
 - 2. Consult Architect for resolution of conflicting requirements.
- B. Special Techniques:
 - 1. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
 - 2. Steel raceway, bends, and fittings in on Project must be of same type.
 - 3. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
 - 4. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to manhole or handhole.
 - 5. Install expansion fitting near center of straight line duct with calculated expansion of more than 3/4 inch (19 mm).
 - 6. Curves and Bends:
 - a. Use 5-degree angle couplings for small changes in direction. Use manufactured sweep bends with minimum bend radius equal or greater to four (4) times the conduit diameter, both horizontally and vertically, at other locations unless otherwise indicated.
 - b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of 48 inch (1200 mm). Use only equipment specifically designed for

- material and size involved. Use PVC heating bender for bending PVC conduit.
- c. Duct must have maximum of 360 degrees of bends between pull points.
7. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with minimum 3 inch (75 mm) of concrete for minimum of 12 inch (300 mm) on each side of coupling.
- a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inch (300 mm) below grade or floor level and do not terminate in hubs.
8. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing duct will not be subject to environmental temperatures above 104 deg F (40 deg C). Where environmental temperatures are calculated to rise above 104 deg F (40 deg C), and anywhere duct crosses above underground steam line, install insulation blankets listed for direct burial to isolate duct bank from steam line to maintain maximum environmental temperature of 104 deg F (40 deg C).
9. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inch (250 mm) o.c. for 5 inch (125 mm) duct, and vary proportionately for other duct sizes.
- a. Begin change from regular spacing to end-bell spacing 10 ft (3 m) from end bell, without reducing duct slope and without forming trap in line.
- b. Grout end bells into structure walls from both sides to provide watertight entrances.
10. Duct Terminators for Entrances to Cast-in-Place Manholes and Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inch (150 mm) o.c. for 4 inch (100 mm) duct, and vary proportionately for other duct sizes.
- a. Begin change from regular spacing to terminator spacing 10 ft (3 m) from terminator, without reducing duct line slope and without forming trap in line.
11. Building Wall Penetrations: Make transition from underground duct to steel raceway at least 10 ft (3 m) outside building wall, without reducing duct line slope away from building and without forming trap in line. Use fittings manufactured for transition to steel raceway type installed. Install steel raceway penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
12. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig (1.03 MPa) hydrostatic pressure.
13. Pulling Cord: Install 200 lbf (1000 N) test nylon cord in empty ducts.
14. Concrete-Encased Ducts and Duct Bank:
- a. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earthwork" for pipes 6 inch (150 mm) or less in nominal diameter.
- b. Width: Excavate trench 3 inch (75 mm) wider than duct on each side.
- c. Depth: Install so top of duct envelope is at least 24 inch (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inch (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated. Install so top of duct envelope is below local frost line.
- d. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
- e. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft (6 m) of duct. Place spacers within 24 inch (600 mm) of duct ends. Stagger spacers approximately 6 inch (150 mm) between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire

- assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
- f. Minimum Space between Ducts: 3 inch (75 mm) between edge of duct and exterior envelope wall, 2 inch (50 mm) between ducts for like services, and 4 inch (100 mm) between power and communications ducts.
 - g. Elbows:
 - 1) Use manufactured duct elbows for stub-ups and at changes of direction in duct unless otherwise indicated. Extend encasement throughout length of elbow.
 - 2) Use manufactured steel elbows for stub-ups, at building entrances, and at changes of direction in duct run.
 - h. Stub-ups to Outdoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch (1500 mm) from edge of equipment base.
 - 1) Stub-ups must be minimum 4 inch (100 mm) above finished floor and minimum 3 inch (75 mm) from conduit side to edge of slab.
 - i. Stub-ups to Indoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch (1500 mm) from edge of wall. Install insulated grounding bushings on terminations at equipment.
 - 1) Stub-ups must be minimum 4 inch (100 mm) above finished floor and no less than 3 inch (75 mm) from conduit side to edge of slab.
 - j. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 - k. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
 - l. Concrete Cover: Install minimum of 3 inch (75 mm) of concrete cover between edge of duct to exterior envelope wall, 2 inch (50 mm) between duct of like services, and 4 inch (100 mm) between power and communications ducts.
 - m. Place minimum 6 inch (150 mm) of engineered fill above concrete encasement of duct.
 - n. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
 - 1) Start at one end and finish at other, allowing for expansion and contraction of duct as its temperature changes during and after pour. Use expansion fittings installed in accordance with manufacturer's published instructions, or use other specific measures to prevent expansion-contraction damage.
 - 2) If more than one pour is necessary, terminate each pour in vertical plane and install 3/4 inch (15 mm) reinforcing-rod dowels extending

minimum of 18 inch (450 mm) into concrete on both sides of joint near corners of envelope.

- o. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.
- 15. Underground-Line Warning Tape: Bury nonconducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inch (300 mm) above concrete-encased duct and duct banks and approximately 12 inch (300 mm) below grade. Align tape parallel to and within 3 inch (75 mm) of centerline of duct bank. Provide additional warning tape for each 12 inch (300 mm) increment of duct-bank width over nominal 18 inch (450 mm). Space additional tapes 12 inch (300 mm) apart, horizontally across width of ducts.
- 16. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

- A. Reference Standards:
 - 1. Precast Concrete Handholes: Comply with ASTM C891 unless otherwise indicated.
 - 2. Consult Architect for resolution of conflicting requirements.
- B. Special Techniques:
 - 1. Cast-in-Place Manholes:
 - a. Finish interior surfaces with smooth-troweled finish.
 - b. Knockouts for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inch (38 to 50 mm) thick, arranged as indicated.
 - c. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.
 - 2. Precast Concrete Handholes and Manholes:
 - a. Install units level and plumb and with orientation and depth coordinated with connecting duct to minimize bends and deflections required for proper entrances.
 - b. Unless otherwise indicated, support units on level bed of crushed stone or gravel graded from 1 inch (25 mm) sieve to No. 4 (4.75 mm) sieve and compacted to same density as adjacent undisturbed earth.
 - c. Field-cut openings for conduits in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
 - 3. Elevations:
 - a. Manhole Roof: Install with rooftop at least 15 inch (375 mm) below finished grade.
 - b. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch (25 mm) above finished grade.
 - c. Install handholes with bottom below frost line, below grade.

- d. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- e. Where indicated, cast handhole cover frame integrally with handhole structure.
- 4. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.
- 5. Manhole Access: Circular opening in manhole roof; sized to match cover size.
 - a. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
 - b. Install chimney, constructed of precast concrete collars and rings, and cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight joints and waterproof grouting for frame and chimney.
- 6. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.
- 7. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.
- 8. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inch (97 mm) for manholes and 2 inch (50 mm) for handholes, for anchor bolts installed in field. Use minimum of two anchors for each cable stanchion.
- 9. Ground manholes, handholes, and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Special Techniques:

- 1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
- 2. Unless otherwise indicated, support units on level bed of crushed stone or gravel, graded from 1/2 inch (12.5 mm) sieve to No. 4 (4.75 mm) sieve and compacted to same density as adjacent undisturbed earth.
- 3. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
- 4. Install handholes and boxes with bottom below frost line, below grade.
- 5. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- 6. Field cut openings for duct in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- 7. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour concrete ring encircling, and in contact with enclosure entry, and with top surface screeded to top of box cover frame. Bottom of ring must rest on compacted earth.
 - a. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with troweled finish.
 - b. Dimensions: 10 inch wide by 12 inch deep (250 mm wide by 300 mm deep).
- 8. Ground handholes and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and manhole structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch (300 mm) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
 - 3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Nonconforming Work:
 - 1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
 - 2. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- D. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.
 - 1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at Project site.

3.9 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump, and building interiors affected by Work.
 - 1. Sweep floor, removing dirt and debris.
 - 2. Remove foreign material.

END OF SECTION

SECTION 31 10 00 - SITE CLEARING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section requires the selective removal and subsequent off-site disposal of the following:
 - 1. Removal and disposal of all abandoned pipe and conduit except for pipe or conduit indicated specifically on plans for abandonment in place.
 - 2. Removal and offsite disposal of grass and root mat.
 - 3. Demolition of asphalt concrete and pavements as indicated on the drawings to straight, neatly saw cut surface.
 - 4. Removal of trees as indicated on the drawings.
 - 5. Demolition and removal of block walls as indicated on the drawings.
 - 6. Demolition and removal of street lights as indicated on the drawings.
 - 7. All other removals which may or may not be shown on plans as required for the project construction.

1.2 SITE CONDITIONS

- A. Protections: Contractor shall provide temporary barricades and other forms of protection to protect general public from injury due to demolition work.
- B. Traffic: Conduct demolition operations and debris removal to ensure minimum interference with roads, streets, walks, bike paths, and other adjacent occupied or used facilities. Access must be coordinated with District's Representative.
- C. Utility Services: Maintain all existing utilities to remain in service and protect them against damage during demolition operations.
- D. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations and County Air Pollution Control District pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.

1.3 REFERENCES

- A. *Standard Specifications for Public Works Construction (Green Book)*, latest edition.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.1 DEMOLITION

- A. General: Perform demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with governing regulations.
- B. Provide services for effective air and water pollution controls as required by County Air Pollution Control District regulations.
- C. Prior to commencing grading operations, soil containing debris, organics, pavement, or other unsuitable materials, shall be stripped from the foundation and pavement areas. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, tree roots, and soil disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill.
- D. Concrete sidewalks will be removed to the nearest construction or expansion joint to the limits of removal as shown on the plans. Exact locations will be determined in the field by the District's Representative.
- E. Where an existing wall is removed to the nearest pilaster, the pilaster shall be patched as necessary to ensure no rebar is exposed. Painting exposed rebar with zinc primer or epoxy coating is an acceptable alternative to patching the pilaster.

3.2 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove from Project site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose of off-site.
- B. If hazardous materials are encountered during demolition operations, contact District's Representative.
- C. Burning of removed materials is not permitted on project site.

3.3 HAZARDOUS MATERIALS

- A. Except as otherwise specified, in the event Contractor encounters on the Project site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or other hazardous materials which have not been rendered harmless, Contractor shall immediately stop Work in the area affected and report the condition to the District's Representative in writing. The Work in the affected area shall not thereafter be resumed except by written

agreement of the Contractor if in fact the material is asbestos, PCB, or other hazardous materials and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos, PCB, or other hazardous materials, or when such materials have been rendered harmless.

- B. Construction involving asbestos cement (transite) pipe shall be performed by qualified personnel in accordance with the standards and specifications set forth by American Water Works Association (AWWA), the Occupational Safety and Health Act (OSHA) and the Environmental Protection Agency (EPA), as well as location jurisdictional codes.

3.4 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment and demolished materials from site.
 - 1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to existing condition prior to start of operations. Repair adjacent construction or surfaces soiled or damaged by demolition work.

END OF SECTION

SECTION 31 20 00 – EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes: Excavation, Compaction, Grading, Fill, and Building Geo-grid Reinforcement.

1.2 REFERENCE

- A. Standard Specifications for Public Works Construction (SSPWC), latest edition.
- B. Geotechniques (2025), "Geotechnical Study, Student Housing at SW Campus Lot, Ventura College" Project No. 1003.010.03, dated February 28.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork in compliance with applicable requirements of governing authorities having jurisdiction.
 - 1. Standard Specifications for Public Works Construction (SSPWC), latest edition.
 - 2. CAL/OSHA Construction Safety Order Requirements.
- B. Soil Testing Service
 - 1. The District will engage a soil testing service to include testing soil materials proposed for use in the Work and for quality control testing during grading operations.
 - 2. Samples of materials shall be furnished to the testing service by the Contractor at least one week before their anticipated use.
 - 3. Work for this Section includes excavating/blading areas for density tests and otherwise facilitating safe testing work, as directed.

1.4 PROJECT CONDITIONS

- A. The Contractor shall visit the site and familiarize himself with existing site conditions.
- B. Additional test borings and other exploratory operations may be made by the Contractor at no cost or liability to the District.
- C. Existing Utilities:

1. Where uncharted or incorrectly charted piping or other utilities are encountered during excavation, consult District's Representative immediately for directions. Cooperate with the District's Representative in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the District's Representative at no cost to the District. Disturbed trench sections shall be replaced in kind.
- D. Protection of Subgrade: Do not allow equipment to pump, rut, or disturb subgrade, stripped areas, or other areas prepared for Project.
- E. Contractor shall implement measures to prevent soil erosion, and where possible, sediment shall be retained onsite.

PART 2 – PRODUCTS

2.1 GEOGRID-REINFORCED COMPACTED FILL MAT

- A. Geotextile Fabric:
 1. Geotextile fabric shall be Mirafi 600x.
- B. Triaxial Geogrid:
 1. Triaxial geogrid to be Tensar TX160.
- C. Aggregate Base:
 1. Aggregate base shall consist of imported material conforming to SSPWC Section 200-2.5 for Crushed Miscellaneous Base (CMB).
 2. No recycled asphalt materials shall be used within the geogrid-reinforced compacted fill mat.

PART 3 – EXECUTION

3.1 SITE PREPARATION

- A. General:
 1. Remove vegetation, including complete root mat, improvements, or obstructions interfering with installation of new construction. Transport and legally dispose of off-site. Contractor shall utilize the best construction method to minimize the erosive effect from the removal of site vegetation.
 2. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over one inch

in size with tree pruning compound. Care shall be taken so as not to scar any area of the tree's bark.

3. In order to protect from sediment transfer or contamination from urban run-off during construction, the following grading and erosion control practices shall be followed:
 - a. If grading occurs during the rainy season (November through April), sediment traps, barriers, covers or other methods shall be used to reduce erosion and sedimentation.
 - b. Excavated materials shall not be deposited or stored where the material can be washed away by high water or storm run-off.
 - c. Grading operations on site shall be conducted so as to prevent damaging effects of sediment production and dust on the site and on adjoining properties.
 - d. When vegetation has to be removed on site, the methods shall be one that minimizes the erosive effects from the removal.
 - e. Exposure of soil to erosion by removing vegetation shall be limited to the area required for construction operations. The construction area shall be fenced to define the project area.
 - f. Temporary mulching, seeding, or other suitable stabilization shall be used to protect areas during construction or other land disturbance activities on site.
 - g. Topsoil, removed from the surface in preparation for grading and construction activities on Campus is to be stored on or near the site and protected from erosion while grading operations are underway, provided that such storage may not be located where it would cause suffocation of root systems of trees to be preserved. After completion of such grading, topsoil is to be restored to exposed cut and fill embankments of building pads so as to provide a suitable base of seeding and planting.
 - h. Sediment basins, sediment traps, or similar control measures shall be installed before extensive clearing and grading operations begin for site development.
 - i. Water or dust palliatives shall be applied to exposed earth services as necessary to control dust emissions.
 - j. Revegetation or stabilization of exposed earth surfaces shall take place as soon as possible.

B. Removals

1. Clear the site of trees, shrubs, and other vegetation, which is indicated to be removed.

2. Completely remove stumps, roots, and other debris to avoid problems with future utilities.
3. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.
4. Existing fills, soil containing debris, organics, pavement, or other unsuitable materials shall be excavated and removed prior to commencing grading operations. Demolition areas shall be cleared of old foundations, slabs, abandoned utilities, landscaping, and soils disturbed during the demolition process. Depressions or disturbed areas left from the removal of such material shall be replaced with compacted fill.
5. The limits and depths for removal of existing fill materials shall be evaluated by project soils engineer during grading.
6. Revegetation or stabilization of exposed earth surface shall take place as soon as possible.

C. Removal of Improvements

1. Remove above-grade and below-grade improvements necessary to permit construction and other work as indicated.
2. Remove from site and legally dispose of off-site, existing fill materials, soil debris, or other unsuitable materials prior to commencing grading operations.

3.2 EXCAVATION

- A. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown, within a tolerance of plus or minus 0.04 foot.
- B. Excavation for Planting Areas: Conform to cross-sections, elevations and dimensions shown, within a tolerance of plus or minus 0.10 foot.
- C. Excavation for Basin: Equipment used to excavate the proposed infiltration basin shall be staged outside the basin to avoid compaction of the basin soil. Conform to cross-sections, elevations and dimensions shown, within a tolerance of plus or minus 0.10 foot.

3.3 COMPACTION

- A. General: Fill materials to be compacted to at least 95 percent relative compaction, based on the maximum dry density from ASTM D1557.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than the percentages of maximum dry density specified in accordance with ASTM D1557-91 method of compaction.
- C. Moisture Control:

1. When moisture content of exposed scarified soil and/or fill material is below that sufficient to achieve recommended compaction, water shall be added to the soil and/or fill. While water is being added, soil shall be bladed, pulverized, and mixed to provide relatively uniform moisture content throughout the material.
2. When moisture content of exposed scarified soil and/or fill material is excessive, material shall be aerated by blading, reducent/pulverizing, sequential turning, or other methods. Fill placed in pavement areas shall be compacted at near optimum moisture content. Jetting is not permitted for compaction.

3.4 FILL

- A. In all excavations, use satisfactory excavated or borrow material sampled and tested by the District's Testing Laboratory.
- B. Fill excavations as promptly as Work permits, but not until completion of the following:
 1. Acceptance by District's Representative of construction below finish grade including, where applicable, waterproofing, damp-proofing, and drainage pipe.
 2. Examination, testing, approval and recording locations of underground utilities.
 3. Removal of concrete formwork.
 4. Removal of shoring and bracing and backfilling of voids with satisfactory materials.
 5. Removal of trash and debris.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
 7. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Continual dust control, as required by the District, and in accordance with County Air Pollution Control District's Standards shall be required for the project construction.

3.5 GRADING

- A. General: To provide support for building floor slabs, all existing fill and unsuitable natural soils shall be excavated and replaced as properly compacted fill.

- B. Compaction: After grading, compact subgrade surfaces to the depth and percentage of compaction for each area classification.
- C. Fill placement and grading operations shall be performed only under the observation of the District's Testing Laboratory.
- D. The exterior grades around building areas shall be sloped to drain away from the buildings to prevent ponding of water adjacent to foundations.
- E. Grading operation shall be conducted so as to prevent damaging effects of sediment product and dust on the site and adjoining properties.

3.6 BUILDING GEOGRID-REINFORCEMENT

- A. Building area geogrid reinforcement to be installed per manufacturer's recommendations and as described in the project geotechnical report.

3.7 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Transport excess excavated material and legally dispose of off site.

3.8 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: District's Testing Laboratory will observe, test and approve subgrades and fill layers before further construction Work can be performed. The District's Representative will determine the frequency of tests. Subgrade: Allow at least one field density test of subgrade to be made for every 2000 sq. ft. of paved area, but in no case less than 3 tests.
- B. Field examination and testing will be performed by the District's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the District's Representative advance notice of grading scheduling.
- C. Frequency of Tests for Trenching: As determined by the District's Representative.
- D. If in the opinion of the District's Representative, based on observations, subgrades or fills which have been placed are below specified density, provide corrective work as specified at no additional expense to the District, and pay for retesting of the soil.

3.9 PROTECTION

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape,

compact to required density and provide other corrective work as specified, with retesting, prior to further construction.

- D. Protect the proposed infiltration basin from heavy equipment traffic and stockpiles of earth or other construction materials during construction.

END OF SECTION

SECTION 31 23 33 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Excavating trenches for construction of utilities.
- B. Trench backfill materials.
- C. Backfilling and compacting requirements.

1.2 REFERENCES

- A. *City of San Buenaventura Standard Plans*, latest edition.
- B. *Standard Specifications for Public Works Construction (SSPWC)*, latest edition.
- C. Geotechniques (2025), "Geotechnical Study, Student Housing at SW Campus Lot, Ventura College" Project No. 1003.010.03, dated February 28.

1.3 SUBMITTALS

- A. Materials source.
- B. Sand equivalent test reports per ASTM D2419.
- C. Certificates.
- D. Drawings for shoring, bracing, sloping, or other provisions for worker protection for any excavation shall conform to the requirements of the CAL/OSHA Construction Safety Orders Requirements.

1.4 EXISTING UTILITIES

- A. Drawings show existing major underground utilities from reference drawings. Prior to excavation, the Contractor shall notify the District's Representative to obtain any additional information which may be applicable to the Work.
- B. Any incident of a utility being inadvertently damaged by the Contractor shall be immediately shutoff and then be immediately repaired by the Contractor at no cost to the District.
- C. Contractor to pothole all utility connections and verify exact size, location and material prior to beginning construction and notify engineer of any discrepancies.

PART 2 - MATERIALS

2.1 APPROVALS

- A. Imported material shall be approved by the District's Representative prior to being brought to the site. Provide a sample of the material in sufficient quantity for the District's Representative's use in evaluating the material.

2.2 TRENCH BACKFILL MATERIAL

- A. Sand bedding
 - 1. Sand bedding for on-site trench backfill shall have a sand equivalent (SE) of 30 or greater. The SE shall be evaluated during grading. Materials shall conform to Section 306-6 of the SSPWC and meet local governing agency requirements, whichever are more stringent.
 - 2. Sand bedding for trench backfill within the City right of way shall follow Std. Detail No. 112 of the City of San Buenaventura Standard Plans.
- B. Slurry Backfill shall be a two-sack slurry mix and shall conform to the requirements of Section 201 of the SSPWC for Backfill Slurry.
- C. Aggregate base course shall be per Plan.
- D. Topsoil removed from trenches shall be stockpiled at locations approved by the District's Representative.

2.3 SOURCE QUALITY CONTROL

- A. Inspection and testing shall be performed by the District's Representative.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.

3.2 TRENCH EXCAVATION

- A. All saw cutting shall be neat, straight cuts and shall conform to Section 401 of the SSPWC. All cuts shall be square unless otherwise specifically noted on plans.
- B. Prior to trench excavation in landscaped areas, grass and its root mat shall be stripped within excavation footprint and wasted offsite.
- C. Trench excavation shall conform to Section 306-3 of the SSPWC and the following requirements:

1. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe barrel. Suitable excavations shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustments to line and grade shall be made by scraping away or filling in with sand under the body of the pipe and not by wedging or blocking.
2. If the trench is excavated below the required grade, correct any part of the trench excavated below the grade, at no additional cost to the District. Place the backfill material over the full width of trench in compacted layers not exceeding 6 inches deep to the established grade with allowance for the pipe base. If shoring is required, the trenches shall be shored and braced in accordance with the Trench Construction Safety Orders of the Division of Industrial Safety.
3. When subgrade is encountered that in the opinion of the District's Representative is unsuitable for pipe support, the District's Representative may order the excavation to be carried to an approved depth below the bottom of the pipe and backfilled with sand, to the lines and grades shown on the drawings and specified by the District's Representative.
4. The minimum width of the trench at the top of the pipe zone shall be as indicated on the plans. The utility lines shall be centered in the trench. In the event of (1) actual physical interference between existing crossing subsurface utilities and the proposed utility lines and (2) vertical discrepancy in connecting proposed utility lines to existing utility system, a minimum clearance of 0.5 feet between the utility line and the crossing, interfering utility shall be provided, unless otherwise indicated on the plans.
5. Where existing utilities or tree roots are to be protected, trench excavation shall be by hand. No mechanical excavating equipment shall be used within 6 inches of any utility or root.
6. Trenching machinery may be used for excavations provided the specified trench width can be maintained.

3.3 TRENCH BACKFILL

- A. Pipe bedding and trench backfill materials: Suitable imported pipe bedding for utilities shall consist of material having a sand equivalent of at least 30. The sand backfill material shall be placed within the pipe zone that extends from the bottom of the pipe to at least 12 inches above the top of the pipe for the full width of the trench. The horizontal distance between the springline of the pipe and the side walls of the trench shall be such that bedding material can be properly placed and compacted below the haunches of the pipe. Pipe bedding and pipe zone backfill shall be compacted to at least 95 percent relative compaction. Backfill material placement shall conform to provisions of Sections 306-12 of the SSPWC.
- B. Trench backfill placed above the pipe zone shall consist of suitable onsite or imported soil. The trench backfill materials shall be compacted to at least 95 percent relative

compaction. Compaction shall be increased to a minimum of 95 percent of maximum dry density within structural fills within building areas. Mechanical compaction of trench backfill shall be performed and water consolidation (jetting) methods of compaction shall not be permitted. Trench backfill in landscape areas shall be compacted to a minimum of 95 percent relative compaction or per landscape specifications.

C. Trench Backfilling within City right of way shall conform to the requirements of Std. Detail No. 112/113 of the City of San Buenaventura Standard Plans:

1. During the process of laying pipe in trenches, sufficient material shall be carefully placed and hand tamped about the pipe to hold it firmly to established line and grade. Oversized material, broken rock or shale, if encountered, shall not be used for backfill.
2. No motor driven mechanical compacting equipment shall be used over pipelines until the backfill has been compacted to 12 inches over the crown of the pipe.
3. All backfill material shall be deposited in horizontal layers not exceeding the thickness specified in Section 306-12 of the SSPWC and not exceeding 8 inches in thickness. The distribution of materials shall be such that all material following compaction and consolidation will form a homogeneous mass free of voids, pockets, streaks or other imperfections. Backfilling shall be done with earth free from lumps, hardpan, chunks, paving material, organic matter or other deleterious substances.
4. Jetting of bedding or backfill material to obtain specific moisture content or for compaction shall not be permitted. If encountered, existing fill in the utility excavation shall be excavated and recompacted or removed and replaced with new fill materials per requirements of Section 2.2.
5. Compaction of all backfill material for trenches, pavements or structures, shall be per provisions of Sections 306-12 of the SSPWC. Appropriate warning detector tape shall be placed over all utilities.
6. Prior to final cleanup or resurfacing, the District's Representative shall take compaction tests in any backfill area and at any depth, with the Contractor providing equipment and operator to assist in such test. If any such compaction test fails, the Contractor shall correct such failure and pay for any retesting that is required. The District's Representative shall make as many tests as he feels is required to receive a satisfactory and acceptable job.

3.4 STOCKPILING

- A. Stockpiling of imported materials or excavated materials shall direct surface water away from approved stockpile site to prevent erosion.
- B. After stockpiles are removed, leave area in a clean and neat condition.

3.5 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by District's Representative.

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Aggregate base course for curbs, gutters, sidewalks, geogrid, and asphalt concrete paving.

1.2 RELATED SECTIONS

- A. Section 31 20 00 – Earthwork.
- B. Section 32 12 16 – Asphalt Concrete Paving
- C. Section 32 13 13 – Concrete Paving.

1.3 REFERENCES

- A. *Standard Specifications for Public Works (SSPWC)*, latest edition.
- B. *ASTM Standards*.
- C. *Geotechniques (2025)*, "Geotechnical Study, Student Housing at SW Campus Lot, Ventura College" Project No. 1003.010.03, dated February 28.
- D. *State Standard Specifications (SSS)*, Caltrans, latest edition.

1.4 SUBMITTALS:

- A. Submit material samples and reports in accordance with requirements of Owner.
- B. Submit samples in sufficient quantities for material testing.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate Base Material shall be Class 2 Aggregate Base conforming to SSS Section 26-1.02A or Crushed Miscellaneous Base (minimum R-value of 78) per SSPWC Section 200-2. Aggregate Base shall be free of organic materials and other deleterious substances.
- B. Aggregate Base materials used within building areas shall be free of asphaltic materials.
- C. Geotextile fabric under aggregate base course of asphalt concrete pavement shall be Mirafi 600X or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrate has been inspected; gradients and elevations are correct, and dry.

3.2 AGGREGATE BASE PLACEMENT

- A. Aggregate base placement shall conform to the provisions of the SSPWC, Section 301-2
- B. Level and contour surfaces to elevations and gradients indicated.
- C. Aggregate base shall be compacted to a minimum relative compaction of 95 percent. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- D. Where the required aggregate base thickness is 6 inches or less, the watered base may be spread and compacted in one layer. Where the required thickness is more than 6 inches, the aggregate base material shall be spread and compacted in 2 or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.
- E. Aggregate base course shall be dense and unyielding upon proof-rolling with full water truck.

3.3 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch.
- B. Scheduled Compacted Thickness shall conform to the provisions of the SSPWC Section 301-2.2.

3.4 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by the Owner's Testing Laboratory. Compaction testing will be performed in accordance with ASTM D1557, latest edition.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest at Contractor's expense.

END OF SECTION

SECTION 32 12 16 - ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Asphalt concrete paving for trench repair in paved areas.

1.2 RELATED SECTIONS

- A. Section 31 20 00 Earthwork.
- B. Section 32 11 23 Aggregate Base Courses.

1.3 REFERENCES

- A. *Standard Specifications for Public Works Construction (SSPWC)*, latest edition.
- B. *ASTM Standards*.
- C. Geotechniques (2025), "Geotechnical Study, Student Housing at SW Campus Lot, Ventura College" Project No. 1003.010.03, dated February 28.

1.4 SUBMITTALS

- A. Submit asphalt concrete mix design(s) for approval of the Owner's Representative.

1.5 TESTING AND INSPECTION

- A. Testing and inspection of asphalt pavement mix(es) and testing of placed stabilizing base course and asphalt pavement will be performed by the Owner's Testing Laboratory. Testing and inspection will be performed so as to minimize disruption of work.
- B. Allow the Owner's Testing Laboratory access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphaltic concrete mix.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide the aggregate base, and bituminous surface conforming to the requirements of the Standard Specifications for Public Works Construction (SSPWC).

2.2 PAVING MATERIALS

- A. Asphalt Concrete: Asphalt concrete material shall be C2-PG 64-10 per SSPWC Section 203-6. The grading and proportioning of aggregates shall be such that the combined mineral aggregate conforms to the specified requirements.
- B. Asphalt Emulsion: SSPWC Section 203-3, Grade SS-1h.
- C. Prime Coat: Grade SC-70 per SSPWC Section 203-2.
- D. Aggregates for base course shall conform to requirements of Specification Section 32 11 23, Aggregate Base Courses.

2.3 ASPHALT PAVEMENT MIX

- A. Combine mineral constituents in proportions to produce a mixture conforming to requirements of the SSPWC Section 203-6.
- B. Percentage by weight of asphalt cement in mixture shall be in accordance with SSPWC Section 203-6.
- C. Maintain thorough and uniform mixture.
- D. Bring asphalt and mineral constituents to required temperatures before mixing. Ensure aggregates are sufficiently dry so as not to cause foaming in mixture.

PART 3 – EXECUTION

3.1 GENERAL

- A. Execute Work in accordance with SSPWC Section 302.

3.2 PREPARATION

- A. Ensure grading of subgrade to required elevation. Subgrade preparation shall be per SSPWC Section 301.
- B. Before final rolling, shape entire section, add additional sub-soil if necessary, and compact subgrade to provide grades, elevation and cross-section indicated. Points of finished subgrade surface shall be within 0.04 foot of elevations indicated on the Drawings.

3.3 BASE COURSE

- A. Place aggregate base in accordance with requirements of Specification Section 32 11 23, Aggregate Base Courses and SSPWC Section 301 and to the thickness shown on the Drawings. Grade and compact in 6-inch layers to at least 95 percent of compaction (ASTM D1557).

3.4 MAINTENANCE

- A. Maintain the base course until the asphaltic pavement is in place. Maintenance shall include drainage, rolling, shaping and water as necessary to maintain the course in proper condition. Maintain sufficient moisture at the surface to prevent a dusty condition. Areas of completed base course that are damaged shall be conditioned, reshaped and re-compacted in accordance with the requirements of the Specifications without additional cost to the Owner.

3.5 TACK COAT

- A. Prior to the application of the asphalt concrete, a paint binder (tack coat) shall be applied to all surfaces of walkway, curbs, gutters, manholes and drainage structures which will be in contact with asphalt pavement per SSPWC Section 302-5.4.
- B. Coat surfaces of catch basins which are to remain free of asphalt with oil, or provide equivalent protection, to prevent asphalt adhesion.

3.6 PRIME COAT

- A. Prior to the application of the asphalt concrete, a prime coat shall be applied at a rate of 0.20 to 0.40 gallons per square yard.

3.7 ASPHALT CONCRETE

- A. Requirements: The bituminous concrete shall consist of mineral aggregate, uniformly mixed with bituminous material in a central plant in accordance with SSPWC Section 203-6. The percentage of asphalt binder shall be in accordance with SSPWC Section 203-6. The mixing plant and construction equipment shall conform to the requirements of SSPWC Sections 302-5 and 400-4.
- B. Placing: Deliver bituminous mixtures to the work site temperatures specified in SSPWC Section 302-5.5. Spread and place in accordance with SSPWC Section 302-5.5. Asphalt surface shall be fog-sealed.
- C. Compaction: Initial or breakdown rolling and the final rolling of the uppermost layer of the asphalt concrete shall be in accordance with SSPWC Section 302-5.6. Compaction by vehicular traffic shall not be permitted.

3.8 JOINING PAVEMENT

- A. Carefully make joints between old and new pavements or between successive days work in such manner as to ensure a continuous bond between old and new sections of the course in accordance with SSPWC Section 302.
- B. Expose and clean edges of existing pavement. Cut edge to straight, vertical surfaces. Paint all joints with a uniform coat of tack coat before the fresh mixture is placed. Prepare joints in the new pavement in accordance with SSPWC Section 302-5.7.

3.9 JOINING NON-PAVED AREAS

- A. Where paving will join landscape or other non-hardscape area a redwood header shall be installed.

3.10 TOLERANCES

- A. Flatness: Maximum variation of 1/8 inch when measured with a 10-foot straight edge.
- B. Variation from True Elevation: Within 1/4 inch.

3.11 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by the Owner's Testing Laboratory.
- B. Field inspection and testing will be performed by the Owner's Testing Laboratory. The Contractor shall cooperate with such testing and shall give the Owner's Representative advance notice of paving scheduling. Sufficient "Advance Notice" shall be determined by the Owner's Representative.
- C. If tests indicate materials do not meet specified requirement, replace material and retest at no additional cost to the Owner.
- D. Frequency of Test: As determined by the Owner's Testing Laboratory.

3.12 PROTECTION

- A. After placement, protect pavement from mechanical injury.

END OF SECTION

SECTION 32 13 13 - CONCRETE PAVING

PART 1 – GENERAL

1.1 SUMMARY

- A. Portland Cement Concrete (PCC) paving for curbs, gutters, sidewalks, parking lots, and driveway pavements.

1.2 RELATED SECTIONS

- A. Section 31 20 00 - Earthwork
- B. Section 32 11 23 - Aggregate Base Courses

1.3 REFERENCES

- A. *Standard Specifications for Public Works Construction (SSPWC)*, latest edition.
- B. *City of San Buenaventura Standard Plans*, latest edition.
- C. *State of California Department of Transportation Standard Specifications (SSS)*, Caltrans, latest edition.
- D. *American Concrete Institute (ACI) Standards*.
- E. Geotechniques (2025), "Geotechnical Study, Student Housing at SW Campus Lot, Ventura College" Project No. 1003.010.03, dated February 28.

1.4 PERFORMANCE REQUIREMENTS

- A. Concrete Pavement: Required compressive strength for concrete pavement shall be 3,500 psi at 28 days per Geotechnical Report.
- B. Surface Tolerances: Surface deviation shall not be in excess of 3/16 inch in 10 feet.
- C. Thickness Tolerances: Thickness shall not be ½ inch or more less than that specified for an average of no more than 30 percent of the area of the slab.
- D. Elevation Tolerances: Variation from indicated elevation within ¼ inch.
- E. Cracking: All cracking shall occur within cut or hand tooled control joints.

1.5 SUBMITTALS

- A. Product Data: Submit data on joint filler, admixtures, and curing compounds.

- B. Concrete Mix Design: Submit current mix design with aggregate gradation, cylinder compression test results, and mix proportioning prior to beginning work. Design shall not be dated prior to three years before start date, which is indicated on the Notice to Proceed.
- C. Delivery Tickets: Submit concrete delivery tickets, indicating mix I.D. number, time water was added, elapsed time from when water was added and concrete placed, and amounts of additional water added.
- D. Work Schedule: Submit schedule to allow at least 24-hour notice of work to be performed or concrete poured to allow for appropriate schedules for testing and inspection.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI, City of Ventura, and SSPWC Standards.
- B. Maintain one copy of each document on site.
- C. Obtain cementitious and aggregate materials from same source throughout.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F unless approved by Engineer, or surface is wet or frozen.
- B. Concrete placed in cold weather conditions shall be done in accordance with ACI 306.
- C. Concrete placed in hot weather conditions shall be done in accordance with ACI 305.

PART 2 – PRODUCTS

2.1 FORM MATERIALS

- A. Form Materials: As specified in Section 303-5.2 of the SSPWC.

2.2 REINFORCEMENT

- A. Reinforcing for concrete shall be grade 60 steel bars in accordance with SSPWC Section 201-2.

2.3 CONCRETE MATERIALS

- A. Concrete materials shall be 3500psi portland cement concrete with C gradation aggregate per SSPWC Section 201-1 for curbs, gutters and site paving. Water cement ratio not to exceed 0.5.

2.4 CONCRETE MIX

- A. Mix and deliver concrete in accordance with ASTM C94.
- B. Use accelerating admixtures in cold weather only when approved by the Engineer. Use of admixtures will not relax cold weather placement requirements.
- C. Use calcium chloride only when approved by the Engineer.
- D. Use set retarding admixtures during hot weather only when approved by the Engineer.

2.5 JOINT SEALANTS

- A. Refer to SSPWC Section 201-3 for sealing agents.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support imposed loads.
- B. Verify gradients and elevations of subgrade are correct.

3.2 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete. Compact subgrade material to a depth of 12 inches beneath aggregate base to 95 percent relative compaction.
- B. Coat surfaces of manhole, catch basin, and valve box frames with oil to prevent bond with concrete pavement.
- C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.4 REINFORCEMENT

- A. Place reinforcement as indicated on the Plans. Do not deviate from the required position.
- B. Place reinforcement to achieve pavement and curb alignment as detailed.
- C. Place, support, and secure reinforcement against displacement.
- D. Provide doweled joints as indicated at interruptions of concrete (construction joint) at curbs and gutter, and all longitudinal joints.

3.5 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301 and 304 and SSPWC Sections 302-6 and 303-5.
- B. Place concrete using mechanical screed, slipform or form paving type equipment, which will strike off, consolidate, and finish the pavement to the required cross section. A minimum 10-foot bull float or "bump cutter" shall be used following any paving equipment.
- C. Ensure reinforcement, inserts, embedded parts, formed joints, and manhole or valve box lids are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- E. Use a vibrator of proper speed and size to properly consolidate the concrete when screeding by hand.
- F. All curbs shall be poured monolithically.
- G. Premolded 0.25-inch thick expansion joints conforming to SSPWC Section 303-5.4.2 shall be placed at ends of all curb returns and around utility poles.
- H. Construct weakened plane joints conforming to SSPWC Section 303-5.4.3, 1-inch deep, at intervals not exceeding 10-feet.
- I. Score lines conforming to SSPWC, Section 303-5.5.3 shall be made in walks.

3.6 JOINTS

- A. Place weakened plane joints as indicated on the plans. Construct expansion joints along walls and buildings. Align curb, gutter, and sidewalk joints when at all possible.

- B. Joints shall be constructed by sawing concrete after it has set or by hand forming in the plastic concrete with an appropriate jointing tool. The transverse joints shall be hand tooled before the concrete has set.
- C. Sawing shall begin as soon as the concrete has hardened sufficiently as to not allow raveling and before uncontrolled cracking occurs. Sawing shall take place regardless of time of day or weather conditions to ensure proper joints.
- D. Saw cut contraction joints to the width and depth indicated.

3.7 FINISHING

- A. Portland cement concrete paving shall be finished per the landscape plans and details.
- B. Direction of Texturing: per landscape plans and details.

3.8 JOINT SEALING

- A. Proper cleaning and preparation of joints shall be completed prior to sealing operations, including but not limited to sandblasting per the sealant manufacturer's instructions. A clean joint shall be dry and have no visible signs of residual sealant or debris on the joint face, and will leave no residual cement powder or dust on your finger after rubbing the joint face.
- B. All joints, including between pavement and curb and gutter, shall be sealed with joint sealant and backer rod.
- C. Do not install sealant when temperature is below the dew point. If rain or other inclement weather occurs during joint preparation or sealing, all operations should cease and sufficient time must be allowed so that the joints are dry prior to starting or continuing the sealing operation.

3.9 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with ACI 301.
- B. Provide free access to Work and cooperate with appointed firm.
- C. Inspection and testing shall be performed by the Owner's Testing Laboratory.
- D. The Owner's Testing Laboratory will perform slump and compressive strength tests.
- E. Contractor shall maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.10 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, wind, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete.
- C. Apply curing compound to unformed surfaces immediately after finishing, not to exceed 300 SF per gallon.
- D. Remove forms only after concrete has attained sufficient strength to support all dead and live loads.
- E. Contractor shall provide barricading or personnel as necessary to protect freshly finished concrete from vandalism or other damage.
- F. Do not permit vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 33 10 00 - WATER UTILITIES
Private & Public

PART 1 – GENERAL

1.1 SUMMARY

- A. Pipe and fittings for site water lines.
- B. Valves.
- C. Fire Department Connection.
- D. Backflow preventer.

1.2 RELATED SECTIONS

- A. Section 31 20 00 Earthwork.
- B. Section 31 23 33 Trenching and Backfilling.

1.3 REFERENCES

- A. *American Water Works Association Standards (AWWA)*.
- B. *City of San Buenaventura Standard Plans*, latest edition.
- C. *Standard Specifications for Public Works Construction (SSPWC)*, latest edition.
- D. County of Ventura Environmental Health Standards.

1.4 SUBMITTALS

- A. Submit the following:
 - 1. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - 3. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Turn over to the project manager one set of drawings with all deviations from the plans shown in neat, clean and readable red ink.
 - 4. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

5. Disinfection Report:
 - a. Type and form of disinfectant used.
 - b. Date and time of disinfectant injection start and time of completion.
 - c. Test locations.
 - d. Name of person collecting samples.
 - e. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
 - f. Date and time of flushing start and completion.
 - g. Disinfectant residual after flushing in ppm for each outlet tested.
6. Bacteriological Report:
 - a. Date issued, project name, and testing laboratory name, address, and telephone number.
 - b. Time and date of water sample collection.
 - c. Name of person collecting samples.
 - d. Test locations.
 - e. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
 - f. Coliform bacteria test results for each outlet tested.
 - g. Certify water conforms, or fails to conform, to bacterial standards of AWWA C651 Section 7.1 Standard Conditions
7. Water Quality Certificate: Certify water conforms to quality standards of City of Ventura, suitable for human consumption.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record installed locations of piping mains, valves, connections, fire hydrant, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with City of Ventura Standards, County of Ventura Standards, AWWA, Standard Specifications for Public Works Construction, California Fire Code Chapters 5 & 33 and NFPA 24.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.7 QUALIFICATIONS

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three years experience.
- B. Testing Firm: Company specializing in testing potable water systems, certified by State of California.
- C. Submit bacteriologist's signature and authority associated with testing.

1.8 DELIVERY AND STORAGE

- A. Deliver and store valves in shipping containers with labeling in place.

PART 2 – PRODUCTS

2.1 PIPE

- A. Joints: Mechanical joints shall be used for the waterline construction unless otherwise shown on plans and standard details. Gaskets for mechanical joints shall be rubber conforming to ANSI A21.11 and AWWA C111.
- B. Fittings: Fittings for pipe size 4-inch diameter and larger shall be ductile iron rated for 250 psi working pressure. Mechanical joint fittings shall conform to AWWA C110/ANSI 21.10 or AWWA C153/ANSI A21.53. (short body style, not approved). Lining for fittings shall be Plastic Engineering P.E.I. 100 epoxy to a minimum thickness of 10 mils. Fittings shall be wrapped with 6 mil. polyethylene sheet. Grease all underground nuts and bolts before wrapped with the polyethylene sheet.
- C. Materials:
 - 1. Polyvinyl chloride (PVC) AWWA C900 Class 235 (4" diameter pipe).
 - 2. Polyvinyl chloride (PVC) AWWA C900 Class 305 (6" diameter pipe).
 - 3. Polyvinyl chloride (PVC) Schedule 40 (2" diameter pipe).

2.2 GATE VALVES

- A. Conform to AWWA C-509.
- B. All gate valves to be resilient wedge gate valves.

2.3 BACKFLOW PREVENTER AND FIRE DEPARTMENT CONNECTION

- A. Fire water line double check detector backflow preventer and Fire Department Connection shall be Zurn 350 DA per the Plans.
- B. Domestic backflow preventer shall be lead free and USC approved. Domestic backflow preventer shall be Zurn 375AST Reduced Pressure Backflow Preventer per the plans.
- C. Irrigation backflow preventer shall be an RPZ backflow preventer per the plans, modified without a meter.

2.4 ACCESSORIES

- A. Concrete for Thrust Blocks shall have a minimum 28-day compressive strength of 2,500 psi.
- B. Thrust blocks shall be constructed to bear against undisturbed earth and shall not bear against adjacent pipe, fittings, or valves. Where concrete must be poured around adjacent pipe, a block out or a short pipe length shall be used such that a flexible joint exists within 12 inches of each side of thrust block, unless indicated otherwise on the plans. Concrete shall not be allowed to set in contact with pipe surfaces or to enter or come in contact with any joint.
- C. Appropriate warning detector tape shall be placed over all utilities.
 - 4. Underground detectable warning tape shall be placed over all non-metallic underground utilities.
 - 5. 12-gauge copper continuous location wire shall be placed on all water mains.
- D. Corrosion-Protection Encasement for Piping
 - 1. Encasement for Underground Metal Piping and Fittings: AWWA C105, Polyethylene film, 10 mil minimum thickness, tube or sheet. Plastic wrap shall be clear or black. Purple wrap shall not be used.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Maintenance records in accordance with NFPA 25.
- B. Verify the existing water main sizes, class of pipes, and locations as indicated.
- C. Verify piping system has been cleaned, inspected, and pressure tested.
- D. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.2 PREPARATION

- A. Remove scale and dirt, on inside and outside, before assembly.
- B. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Specification Section 31 23 33, Trenching and Backfilling. Hand trim excavation for accurate placement of pipe to elevations indicated.

- B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, compact to a minimum of 95 percent relative compaction.
- C. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers to protect the pipe. Jetting is not permitted to obtain required compaction.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Route pipe in straight line.
- B. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- C. Install access fittings to permit disinfection of water system.
- D. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main.
- E. Protect metal restrained joint components against corrosion by applying a bituminous coating by coating with non-oxide corrosion resistant greased 10 mil plastic wrap.
- F. Establish elevations of buried piping to ensure cover conforming to District Standards. The minimum cover from the finish grade to the top of pipe is 36 inches for potable and fire waterline, any shallower cover to clear with the existing utility crossings shall be reviewed and approved by the District's Representative.
- G. Install 12-gauge copper continuous location wire over top of pipe.
- H. Backfill trench in accordance with Specification Section 31 23 33, Trenching and Backfilling.
- I. Maintain separation of water main from sewer piping in accordance with the State Department of Health Services, Criteria for the Separation of Water Mains and Sanitary Sewers (Section 64630, Title 22 California Administrative Code), and State Regional Water Quality Control Board.
- J. All pipe laid in trench which is to be left for further extension (i.e., end of work day) shall have its open end covered to protect from possible rodent intrusion.

3.5 INSTALLATION - VALVES

- A. Set valves on solid bearing per City of Ventura Standard Plans & Specifications.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.
- C. Install brass valve 1 ½" diameter tags and imprint valve number per District.

3.6 SERVICE CONNECTIONS

- A. Not Used

3.7 PRESSURE TEST OF WATER PIPING SYSTEM

- A. Water piping system shall be pressure tested for 2 hours at 200 psi, with no allowable drop in water pressure.
- B. All leakage tests shall be completed and approved prior to placing of permanent resurfacing.
- C. Pressure test shall be witnessed by District's inspector.

3.8 DISINFECTION AND BACTERIA TESTING OF WATER PIPING SYSTEM

- A. Water piping system shall be disinfected and flushed per AAWA Section C651.
- B. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
- C. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
- D. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

3.9 TEST RECORDS

- A. Records shall be in accordance with NFPA 13 & 24. Records shall be made of each piping system installation during the test. These records shall include:
 - 1. Date of test.
 - 2. Description and identification of piping tested.
 - 3. Test fluid.
 - 4. Test pressure.
 - 5. Remarks to include such items as:
 - a. Leaks (type, location).
 - b. Repairs made on leaks.

6. Certification by Contractor and signed acknowledgment by the District's Representative.

3.10 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by District's Representative.
- B. Perform pressure test on potable water distribution system in accordance with City of Ventura Standard Plans & Specifications except that there is no allowable leakage for the duration of the test.
 1. Slowly bring piping to test pressure and allow system to stabilize prior to conducting leakage test. Do not open or close valves at differential pressures above rated pressure.
 2. Examine exposed piping, fittings, valves, hydrants, and joints carefully during hydrostatic pressure test. Repair or replace damage or defective pipe, fittings, valves, hydrants, or joints discovered, following pressure test.

END OF SECTION

SECTION 33 30 00 - SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Site sanitary sewerage piping, fittings, accessories and bedding.
- B. Cleanouts.

1.2 RELATED SECTIONS

- A. Section 31 20 00 - Earthwork.
- B. Section 31 23 33 - Trenching and Backfilling.

1.3 REFERENCES

- A. *City of San Buenaventura Standard Plans*, latest edition.
- B. *Standard Specifications for Public Works Construction (SSPWC)*, latest edition.
- C. *Standard Plans for Public Works Construction (SPPWC)*, latest edition.
- D. Geotechniques (2025), "Geotechnical Study, Student Housing at SW Campus Lot, Ventura College" Project No. 1003.010.03, dated February 28.

1.4 SUBMITTALS

- A. Submit:
 - 1. Product Data: Provide data indicating pipe, pipe accessories and appurtenances, and manhole covers.
 - 2. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.
 - 3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - 4. Manufacturer's Certificate: Certify that installers are certified for installing plastic pipe.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit Record Drawings: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 REGULATORY REQUIREMENTS

- A. Conform to California Title 24 (CCR) Part 5, latest edition, for installation of the Work of this section.
- B. Minimum separation distance and requirements between water, reclaimed water and sewer pipes per the State of California, Department of Health Services shall be established.

PART 2 – PRODUCTS

2.1 SEWER PIPE MATERIALS AND ACCESSORIES

- A. Polyvinyl Chloride (PVC) Pipe for Gravity Sewer: ASTM 3034-SDR35 Ring-Tite Polyvinyl Chloride (PVC) gravity sewer pipe and fittings; inside nominal diameter as indicated on Drawings. PVC pipe shall use "locked-in" rubber sealing ring conforming to ASTM D-3212. Joints using flexible Elastomeric Seals. Minimum pipe stiffness at 5 percent deflection shall be 46 psi for all sizes when tested in accordance with ASTM Method of Test D2412.
- B. Appropriate warning detector tape shall be placed over all utilities.
 - 1. Underground detectable warning tape shall be placed over all non-metallic underground utilities.

2.2 CURED IN PLACE PIPE (CIPP) LINING

- A. CIPP must comply with ASTM D5813 and ASTM F1743. Liner shall have minimum thickness per ASTM F1216, rounded up per manufacturer's recommendation. Liner shall have uniform thickness.
- B. Resin must be thermosetting, corrosion-resistant, and suitable for sewer environments.

2.3 MANHOLES

- A. Form and cast-in-place, Class 560-C-3250 concrete base pad, with provisions for sewer pipe end section in accordance with City of Ventura Standard Detail 201, No. 2.
- B. Frame and cover shall be Pamrex-24 with stainless steel locking assembly or approved equal, lettered with a 1-1/2 inch "S" in the center per City of Ventura Standard Detail 201.

2.4 CLEANOUTS

- A. Form and cast-in-place, Class 450-C-2000 concrete base pad, with provisions for sewer pipe end section in accordance with SPPWC Standard Detail No. 204-2.

- B. Frame and cover shall be cast-iron Alhambra Foundry Model A-1240 or equal, lettered "SEWER".

2.5 BEDDING MATERIALS

- A. Bedding: Bedding materials shall be sand or with a minimum Sand Equivalent (S.E.) of 30.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with granular fill.
- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Specification Section 31 23 33, Trenching and Backfilling. Hand-trim excavation for accurate placement of pipe to elevations indicated on drawings.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6-inches compacted depth, compact to minimum 95% relative density.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings and accessories in accordance with manufacturer's instructions.
- B. Sewer pipeline shall be placed from downstream to upstream beginning at the downstream connection to the existing sewers.
- C. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

- D. Install bedding along sides and over top of pipe to minimum compacted thickness of 12 inches; compacted to 95 percent density.
- E. Refer to Specification Section 31 23 33, Trenching and Backfilling for trenching requirements. Do not displace or damage pipe when compacting.
- F. Install continuous trace wire over top of pipe.
- G. Connect to building sanitary sewer lateral at 5-foot outside of edge of building.
- H. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers to protect the pipe.

3.5 INSTALLATION – CURED IN PLACE PIPE (CIPP)

- A. Install and cure liner per manufacturer's recommendations and applicable ASTM standards.

3.6 INSTALLATION – MANHOLES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Establish elevations and pipe inverts for inlets and outlets as indicated on plans.
- C. Mount lid and frame level in grout, secured to cone section to elevation indicated on drawings.

3.7 INSTALLATION – CLEANOUTS

- A. Refer to SPPWC standard plan 204-2.
- B. Form bottom of excavation clean and smooth to correct elevation.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated on plans.
- D. Mount lid and frame level in grout, secured to cone section to elevation indicated on drawings.

3.8 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed by the District's Testing Laboratory.
- B. Request inspection prior to, and immediately after placing bedding.
- C. Compaction testing will be performed in accordance with ASTM D1557 by the District's Testing Laboratory.

- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to the District.

3.9 FIELD TESTS ON INSTALLED SEWER PIPE

- A. Preliminary Tests: The Contractor may perform any tests desired which are not harmful to the lines before backfilling is completed.
- B. Cleaning: Before final tests are performed for acceptance of any sewer pipe, clean the pipe by inflatable rubber ball method.
- C. Perform air pressure test per SSPWC Section 306-7.8.
- D. Repairs, if necessary: If the leakage or infiltration is greater than the amount specified, the pipe shall be overhauled and re-laid if necessary by the Contractor, at its own expense, until the joints will hold satisfactorily.
- E. Regardless of the results of the above tests, any visible evidence of individual leaks shall be corrected by the Contractor to the satisfaction of the District Representative.
- F. Cleaning Sewer: After all backfilling, compaction testing and paving is completed, sewer lines shall be cleaned by Inflatable Rubber Ball Method, flushed and cleaned, before acceptance by the District Representative and connection to their sewer system is made.
- G. The Contractor shall furnish all sewer line plugs necessary for blocking off all lines as required by the District Representative until final acceptance.

3.10 PROTECTION

- A. Protect finished installation.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is complete.

END OF SECTION

SECTION 33 40 00 - STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Site storm drainage piping, fittings, accessories, and bedding.
- B. Hydrodynamic Separators
- C. Catch basins.

1.2 RELATED SECTIONS

- A. Section 31 20 00 – Earthwork.
- B. Section 31 23 33 – Trenching and Backfilling.

1.3 REFERENCES

- A. *Standard Specifications for Public Works Construction (SSPWC)*, latest edition.
- B. *Caltrans Standard Plans*, latest edition.
- C. *Caltrans Standard Specifications*, latest edition.

1.4 SUBMITTALS

- A. Submit the following:
 - 1. Product Data: Provide data indicating pipe, pipe accessories and catch basin grates.
 - 2. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
 - 3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - 4. Layout diagram for storm drain components per plan.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit record drawings. Accurately record locations of pipe runs, connections, catch basins, structures, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 FIELD MEASUREMENTS

- A. Verify that field measurements and elevations are as indicated on drawings.
- B. Complete pothole work per plans and notify the Owner of any discrepancy prior to commencing construction

1.7 COORDINATION

- A. Coordinate the work with connection to existing storm drain mains, and trenching.

PART 2 – PRODUCTS

2.1 PIPE MATERIALS

- A. Corrugated High Density Polyethylene (HDPE) Pipe and Fittings
 - 1. HDPE Drainage Pipe and Fittings, NPS 4 to NPS 10: AASHTO M252, Type S, with bell-and-spigot ends. Gasketed joints shall be water-tight per ASTM D3212.
 - 2. HDPE Drainage Pipe and Fittings, NPS 12 to NPS 60: AASHTO M294, Type S, or ASTM F2306 with bell-and-spigot ends. Gasketed joints shall be water-tight per ASTM D3212

2.2 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required. Fittings shall be watertight.
- B. Appropriate warning detector tape shall be placed over all utilities.
 - 1. Underground detectable warning tape shall be placed over all non-metallic underground utilities.

2.3 CATCH BASINS

- A. Precast catch basins shall include traffic-rated and pedestrian-rated grate, as manufactured by Pre-Con or approved equal.

2.4 METAL

- A. All exposed metal parts are to be galvanized in accordance with SSPWC Section 210-3 unless otherwise directed.

2.5 CONCRETE

- A. Catch basins shall be Class 560-C-3250 Portland Cement Concrete per SSPWC Section 201-1.
- B. Concrete flared end section shall comply with Section 70-5.02 of the Caltrans Standard Specifications and Caltrans Standard Plan No. D94B.

2.6 BEDDING MATERIALS

- A. Bedding materials shall be sand with a minimum Sand Equivalent (S.E.) of 30.

2.7 RIPRAP AND FILTER FABRIC

- A. Rock for outlet riprap shall comply with SPPWC Section 200-1.6.
- B. Filter fabric shall be Mirafi 180-N or approved equal.

2.8 HYDRODYNAMIC SEPARATORS

- A. Hydrodynamic separators to be provided by Contech as specified on the plans.
- B. Units to be installed per manufacturer's recommendations

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with compacted bedding material.
- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Place sand bedding material in trench bottom, level materials in continuous layer. Bedding shall be 6-inch minimum thickness, compact to 95% relative dry density.

- B. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions.
- B. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Install sand backfill along sides and over top of pipe. Provide sand backfill over top of pipe to minimum compacted thickness of 12 inches, compacted to 95% relative dry density.
- D. Do not displace or damage pipe when compacting.
- E. The compaction of the backfill material along the sides and one foot above the pipe shall be done with hand tampers or equal to protect the pipe.

3.5 INSTALLATION - CATCH BASINS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Establish elevations and pipe inverts for inlets and outlets as indicated on drawings.
- C. Compact top 12-inch of native materials below the bottom of catch basins to minimum 95% of relative density.

3.6 FIELD QUALITY CONTROL

- A. Inspection and testing shall be performed by the Owner's Testing Laboratory.
- B. Request inspection prior to and immediately after placing backfill cover over pipe.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to the Owner.

3.7 PROTECTION

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

END OF SECTION