John F. Kennedy High School
Baseball, Softball, and Tennis Court Improvements
Sacramento City Unified School District

100% DSA Submittal

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PREPARED BY:

VERDE DESIGN

Project No. 2304200
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John F. Kennedy High School – Baseball, Softball, and Tennis Court Improvements

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SITE CLEARING AND DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Site clearing and demolition work and related activities as shown on the Drawings and specified herein. The general extent of the site clearing and demolition work includes, but is not necessarily limited to, the following:
   1. Demolition, removal and disposal of designated items.
   2. Careful removal, protection and re-installation of designated items.
   3. Careful removal and salvage of designated items.
   4. Disconnection and capping of existing utility and irrigation lines.
   5. Incidental demolition of abandoned utility and irrigation lines.
   6. Spraying until dead, clearing, and grubbing vegetated areas.
   7. Protection of existing plant material.
   8. Removal of designated trees and planting areas.

B. Related Requirements:
   1. Section 31 20 00 - Earth Moving
   2. Section 32 01 90 - Existing Tree Protection and Maintenance

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

1.04 ACTION SUBMITTALS

A. Product Data: Manufacturer's product information on herbicides to be used for approval prior to use.

1.05 INFORMATIONAL SUBMITTALS

A. Schedule: Indicate the proposed timeline for site clearing and demolition work including shut off times and capping of utility services on the project schedule.

1.06 QUALITY ASSURANCE

A. The Owner will obtain and pay for all permits required in connection with this work. Fees for the dumping of debris shall be paid for by the Contractor.

1.07 FIELD CONDITIONS

A. Dust Control:
   1. The Contractor shall prevent the formation of airborne dust on and around the project site with the use of sprinkled water or other means acceptable to the Owner's Representative. Non-compliance

with proper dust control measures may be grounds for issuance of a "stop work" order by the Owner until satisfactory measures are implemented.

B. Utility Services:
   1. Issue written notices of planned demolition operations to utility companies and coordinate site clearing and demolition improvements as requested by the utility companies.
   2. Existing power poles and lines serving existing occupied buildings shall remain. Arrange work in order to maintain utilities not designated for removal.
   3. Coordinate work in order to maintain utilities to temporary on-site facilities.

PART 2 - PRODUCTS

2.01 HERBICIDES

A. Herbicides shall conform to Owner's approved chemicals list.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Conform to applicable requirements of Section 01 45 00 - Quality Control.

B. Carefully identify limits of demolition and site clearing.

C. Mark project areas in coordination with the Owner's Representative and as necessary to clearly identify the interface of items to be removed and items remain.

3.02 PREPARATION

A. Protection:
   1. Make provisions and take necessary precautions to protect all existing items not designated for removal. An existing item or area damaged during construction operations shall be replaced or repaired to an "as-was" or better condition at no additional cost to the Owner and subject to the acceptance of the Owner's Representative.
   2. Erect barriers, fences, guard rails, enclosures, chutes, and shoring as necessary to protect personnel, structures, and utilities to remain.
   3. Provide warning signs and lighting as necessary for vehicular and personnel protection. Maintain warning signs during construction as required by applicable safety ordinances and as reasonably prudent.
   4. Coordinate arrangements for items to be salvaged and turned over to the Owner.
   5. Notify Underground Service Alert (USA), (800) 640-5137, and local utility companies to verify locations of existing utilities a minimum of 48 hours prior to beginning work.
   6. Provide tree protection fencing prior to commencing demolition and site clearing work.

B. Traffic Access:
   1. Ensure minimum interference with roads, streets, driveways, sidewalk and adjacent facilities.
   2. Do not close or obstruct streets, sidewalk, alleys or passageways without acceptance from the Owner's Representative or governing authorities as applicable.
   3. Provide approved alternate routes around closed or obstructed traffic ways as required by the Owner's Representative.
   4. Maintain access to adjacent existing buildings to ensure uninterrupted operations during demolition work.

3.03 DEMOLITION

A. General: Refer to the Drawings for extent of demolition and site clearing work.

B. Paving: Demolish paving in accordance with local noise ordinance regulations and as acceptable to the Owner's Representative.

C. Filling:
1. Completely fill below-grade areas and voids resulting from demolition work.
2. Install appropriate, acceptable fill material consisting of soil, gravel, or sand, free of trash and debris, stones over 6-inch diameter, roots, or other organic matter. Meet fill and compaction requirements specified and recommended by the Owner's Geotechnical Engineer.

D. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both the nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of response from Owner's Representative, rearrange selective demolition and site clearing schedule as necessary to continue overall job progress without delay.

3.04 CLEARING AND GRUBBING

A. Mow all existing turf areas to a height of 1 inch and remove cuttings.

B. Prior to site clearing, existing vegetation below 12 inches in height and turf areas to be removed shall be sprayed with a non-selective broad spectrum systemic herbicide for perennial vegetation and straight contact herbicide for annual vegetation in accordance with a licensed pest control advisor or herbicide manufacturers. recommendations.

C. Allow a sufficient period of time to ensure that all sprayed vegetation is dead. Refer to manufacturer's recommendations.

D. Irrigation heads, valves, and controllers shall be salvaged and provided to Owner.

E. Clear and strip vegetative material from soil surface and remove unless noted otherwise. Existing turf areas to be removed need not be stripped, but may be cross-ripped in two opposite directions and roto-tilled into the ground to a minimum 6-inch depth. Remaining clods of turf shall be no larger than 2 inches in diameter.

F. Clear/strip vegetative material from soil surface and remove unless noted otherwise. Existing turf areas to be removed need to be stripped to remove organic soil.

G. Contractor is responsible for stockpiling and protecting all topsoil needed for landscaping improvements. Refer to respective earthwork and landscape Specifications.

H. Utilities and Related Equipment:
1. The locations of existing utilities, as may be shown on the Drawings, are approximate. Should existing utilities not shown on the Drawings be encountered during construction operations, notify the Owner's Representative immediately, and re-direct work to avoid delay. The Owner's Representative will then determine what action, if any, is required.
2. Remove abandoned utilities as indicated and as uncovered by the work and terminate in a manner conforming to code.
3. Remove and salvage designated items and related equipment and deliver to a location acceptable to the Owner's Representative.

I. Underground Piping:

1. Existing storm drain and irrigation systems, as may be shown on the Drawings, shall be modified to allow for construction of new items and systems as a part of this project. Caution shall be exercised so as not to damage underground piping not scheduled for removal.
2. Remove underground piping as indicated or necessary and backfill to specified compaction density.
3. Existing piping abandoned but not removed shall be backfilled with slurry fill (grout), and ends shall be capped with concrete.
4. Manholes and lines scheduled for removal which connect to active systems shall have their active remaining portions capped, plugged, or blind-flanged as appropriate.
5. Materials used for pipe terminations and temporary connections shall be the same as the existing lines. Fittings and flanges shall be of weight and class suitable for the service in which used.

3.05 SALVAGE

A. Demolition:
   1. Materials or equipment to be demolished shall become the property of the Contractor except for items specified or noted on the Drawings to be salvaged for the Owner.
   2. Carefully remove items to be salvaged to avoid damage.
   3. Irrigation heads, valves and existing controller shall be salvaged and provided to Owner. Contractor shall clean and box items. Items shall be returned to Owner in accordance with instructions provided by the Owner.

B. Replacement: In the event items not scheduled to be demolished are damaged, promptly replace or repair such items to an as-was or better condition per the discretion of the Owner's Representative at no additional cost to Owner.

C. Materials scheduled for removal shall not be placed on view to prospective purchasers or sold on site.

3.06 CLEANING

A. Debris and Rubbish:
   1. Remove and transport debris and rubbish as it accumulates and dispose in a legal manner via recognized haul routes in accordance with Section 01 50 00 - Temporary Facilities and Controls in a manner that will prevent spillage on streets or adjacent areas.
   2. Remove tools, equipment and appliances used for demolition from the site upon completion of the work.
   3. Clean entire project area, adjacent streets, and pavements to a broom-clean, "stain-free" condition per the discretion of the Owner's Representative.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:
1. Section 01 33 00 – Submittal Procedures
2. Section 08 71 00 – Finish Hardware
3. Section 09 91 15 – Exterior Site Painting

1.03 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM- HMMA 803 or SDI A250.8.

1.04 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.05 SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, core descriptions, and finishes.

B. Installation Instructions: Manufacturer's written installation instructions for each type of product.

C. Shop Drawings: Include the following:
1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

E. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door & frame to permit air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

1. Ceco Door Products; an Assa Abloy Group company.
2. Door Components, Inc.
3. Curries Company; an Assa Abloy Group company.
4. Mesker Door Inc.
5. Pioneer Industries, Inc.; an Assa Abloy Group company
6. Security Metal Products Corp.; an Assa Abloy Group company
7. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.02 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door Schedule on drawings.
   b. Thickness: 1-3/4 inches.
   c. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.053 inch (16 gauge).
   d. Edge Construction: Model 2, Seamless.
   e. Core: Polyurethane.
3. Frames:
   a. Materials: Metallic-coated, steel sheet, minimum thickness of 0.067 inch (14 gauge).
   b. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.03 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
   1. Physical Performance: Level A according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door Schedule on drawings.
      b. Thickness: 1-3/4 inches
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gauge), with minimum A60 coating.
      d. Edge Construction: Model 2, Seamless.
      e. Core: Polyurethane.
         1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than R-11 when tested according to ASTM C 518.
   3. Frames:
      a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (14 gauge), with minimum A60 coating.
      b. Construction: Full profile welded. (Custom shape, see drawings for profile.)
   4. Exposed Finish: Prime.

2.04 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.05 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.06 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke- developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.07 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:
1. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
2. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
3. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide flat -head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        a) Three anchors per jamb up to 60 inches high.
        b) Four anchors per jamb from 60 to 90 inches high.
        c) Five anchors per jamb from 90 to 96 inches high.
        d) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow- metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.

5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.08 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.09 ACCESSORIES

A. Metal Security Louvers: Provide louvers for door, where indicated, which comply with SDI 111C.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Anemostat; a Mestek company; PLSL.
      b. Air Louvers Inc.; 1500-ASG.
   2. Blade Type: Vision-proof, inverted Y.
   3. Metal and Finish: Hot-dip galvanized steel, Frame & Grille: minimum 0.096 inch thick (12 gauge), Louver Blades: minimum 0.040 inch thick (18 gauge), factory primed for paint finish.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

a. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable stops located on secure side of opening.
d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

C. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
1. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated.
2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
3. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

D. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 71 00

FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: "Finish Hardware" includes items known commercially as builders hardware which are required for swing, sliding and folding doors, except special types of unique and non- matching hardware specified in the same section as the door and door frame. Types of items in this section include (but are not necessarily limited to):
   1. Hinges
   2. Lock Cylinders and Keys
   3. Lock and latch sets
   4. Bolts
   5. Exit devices (panic hardware)
   6. Push/pull units
   7. Closers
   8. Overhead holders
   9. Miscellaneous door control devices
   10. Door trim units
   11. Protection plates
   12. Thresholds
   13. Weather-stripping

B. "Hardware groups" have been assigned to the various doors required for this Work, as described in the Door Schedule on the Drawings; the hardware groups are described in detail on the drawings.

C. Related Requirements:
   1. Section 01 33 00 – Submittal Procedures
   2. Section 08 11 13 – Hollow Metal Doors and Frames
   3. Section 32 31 13 – Chain Link Fencing

1.02 QUALITY ASSURANCE:

A. Manufacturer: Obtain each kind of hardware (latch and locksets, hinges, closers, etc) from only one manufacturer.

B. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or employs an experienced hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to District, Architect and Contractor.

C. Fire-rated Openings: Provide hardware for fire-rated openings in compliance with UL10B. Provide only hardware which has been tested and listed by UL for types and sizes of doors required and complies with requirements for door and door frame labels. In addition, manual locks shall comply with California State Standards (CSS) 12-33-2 and panic hardware shall comply with CSS 12-33-3.

D. Where emergency exit devices are required on fire-rated doors, provide supplementary marking on doors UL labels indicating "Fire Exit Hardware."

E. Group E lockable doors from the inside: Doors to classrooms and rooms with an occupancy of five or more persons shall be equipped with locks that are lockable from inside the space per 2019 CBC Section 1010.1.11. In addition, the locks shall conform to the specifications and requirements found in 2019 CBC Section 1010.1.9.

F. Accessibility Requirements: For door hardware on doors required to be accessible, comply with applicable provisions in CCR Title 24, Part 2, California Building Code – Accessibility Standards as enforced by DSA.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 pounds.

   2. Hand-activated hardware such as lever locksets, panic bars, and pull handles shall be mounted between 34" to 44" above finish floor or ground.

   3. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 pounds applied perpendicular to door.
      b. Exterior, Non-Fire-Rated Hinged Doors: 5 pounds applied perpendicular to door.

   4. Thresholds: The floor or landing shall not be more than ½ inch lower than the threshold of the doorway. Change in level between ¼ inch and ½ inch shall be beveled with a slope no greater than one unit vertical in two units horizontal (50 percent slope.

   5. Adjust door closers sweep periods (Delayed Action Feature) so that, from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum, measured to the leading edge of the door.

G. Hardware Coordination Meeting: During the course of the work but prior to ordering; contractor shall hold a meeting to review specific door hardware. This meeting shall review the hardware and key schedule along with specific information concerning location and function of each lockset. The meeting shall include the Architect, District Representative, District Locksmiths, General Contractor, Hardware Sub-contractor, and the manufacturer's representative.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

B. Hardware Schedule: Submit final hardware schedule confirming compliance as indicated herein. Hardware schedules are intended for coordination of work. Include the following:
   1. Name and manufacturer of each item.
   2. Fastenings and other pertinent information
   3. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
   4. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
   5. Mounting locations for hardware.
   6. Door and frame sizes and materials.
   7. Keying information.

1.04 PRODUCT HANDLING:

A. Packaging:
   1. Furnish all finish hardware with each unit clearly marked or numbered in accordance with the Hardware Schedule.
   2. Pack each item complete with all necessary pieces and fastener.
   3. Properly wrap and cushion each item to prevent scratches during delivery and storage.

B. Delivery:

1. Deliver all finish hardware to the installers in a timely manner to ensure orderly progress of the total work.

PART 2 - PRODUCTS

2.01 FASTENINGS:

A. General:
1. Furnish all finish hardware with all necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
2. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, and other anchors approved by the Architect, according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer.
3. Provide the products of the manufacturers listed, without substitutions, unless approved in advance, in writing, by Architect.

B. Design:
1. All fastenings shall harmonize with the hardware as to material and finish.

2.02 KEYING:

A. Construction Keying: Provide a method independent of the final keying system for securing the building during construction. Contractor must supply Schlage construction cylinders.

B. Final Keying System:
1. Schlage "Primus" System, Security Level Three, Type EP keyways using 20-700 controlled access cylinders as determined by District. Provide Interchangeable Cores (IC) at all panic devices and where called for in the Hardware Schedule. All cylinders/IC cores and Bitting Schedule shall be provided to District by Hardware Supplier at the time of delivery of the locks. Cylinders/IC Cores shall be Master Keyed by District's Hardware Department, using Schlage Primus System. After Keying all Cylinders/IC Cores shall be issued back to the General Contractor for Installation. This requires a coordination meeting with the GC, Hardware Supplier, Schlage Representative, District Locksmith, and Architect, to be scheduled by the GC within 3 weeks of the Notice to Proceed.
2. Key Blanks: Standard 6 pin bow key blank; tag to identify
   a. Supply 4 cut change keys for each different change key code.
   b. Supply 6 cut master keys for each different master key set.
   c. Supply 20 Emergency Keys
   d. Supply 500 EP Primus Blanks; one side embossed.
   e. Supply 100% additional Bitting Codes.

2.03 FINISH:

A. All finishes to be satin chromium plated, US 26 D, ANSI 626 unless otherwise indicated.

2.04 HARDWARE:

A. Locks/Locksets (All knobs are lever-type: Rhodes (Schlage), Newport (Corbin Russwin.)
1. Ornamental/Chain Link Gates: Panic, Corbin Russwin, ED8200 x P857 (Nightlatch function, Wing Pull P8) x M54 (sex nuts & bolts) with Schlage 20-757(IC) Rim Cylinder. Panic Device and Trims to receive BHMA 689 Silver Painted Finish.
2. Student/Public Toilets, ND95PD, Rhodes. Provide Schlage 20-765 Primus Cylinder.
3. Roll-up Door Cylinder. Provide Schlage 20-765 Primus Cylinder.

B. Hinges
1. Heavy duty hinges:
   a. HAGER, BB1199 Stainless, 4 ½ x 4 ½, Heavy Weight, High Frequency, Five- knuckle, four bearing, NRP, full-mortise butts, 1 ½ pair.

b. HAGER, BB1199 Stainless, 4 ½ x 4 ½, Heavy Weight, High Frequency, Five- knuckle, NRP, four bearing, full-mortise butts, 2 pair.
c. HAGER; BB1199 Stainless, 4 ½ x 4 ½, Heavy Weight, High Frequency, Five-knuckle, NRP, four bearing, full-mortise butts, 3 pair. (Double Doors)

2. Self-closing Hinges:
a. For gates up to 330 lbs and 5-feet wide: Heavy-duty self-closing hinge with hydraulic damping, ADA compliant (requiring maximum 5 lbs of operating force per CBC 11B-309.4); Locinox Mammoth Heavy Duty "Mammoth180" or accepted equal.
b. For gates up to 440 lbs and 6 and ½ -feet wide: Heavy-duty self-closing hinge with hydraulic damping, ADA compliant (requiring maximum 5 lbs of operating force per CBC 11B-309.4); Locinox Mammoth Ultra Heavy Duty "Mammoth-HD" or accepted equal.

C. Closers
1. NORTON, PR7500DA (Barrier Free, 90 degree opening with delayed closing, Painted Aluminum)
2. NORTON, PR7500DA (Barrier Free, 180 degree opening with delayed closing, Painted Aluminum)

D. Stops
1. Trimco, #1270CVSV – Stop, Wall
2. Trimco, #1209 – Stop, Floor (Interior)
3. Trimco, #1209HA – Stop, Walk (Exterior)
4. Trimco, #1260W – Wall Stop & Holder, Strike (Not for Fire Rated Applications)

E. Thresholds
1. Threshold, Pemko; 158 A (1/2" offset)
2. Threshold, Pemko; 272 A (6")
3. Threshold, Pemko; 2005-T (1/2" latching panic saddle)
4. Threshold (Storefront), Pemko; 2286A (Aluminum Floor Plate) and 195A (Aluminum Floor Plate Transition)

F. Miscellaneous
1. Lock Guard, BLP 107-630 3-1/4"x7" Latch Protection
2. Kick Plate, Trimco; KO050, 10", .050", Aluminum
3. Weather-strip, Pemko, 319 CR
4. Smoke Seal, Pemko, HSS2000xS88
5. Shoe, Pemko; 217AV (sweep)
6. Astragal, Pemko 305CN

PART 3 - EXECUTION:

3.01 DELIVERIES:

A. Stockpile all items sufficiently in advance to ensure their availability and make all necessary deliveries in a timely manner to ensure orderly progress of the total work.

3.02 INSTALLATION:

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect. Hand-activated hardware such as lever locksets, panic bars, and push-pull handles shall be 34" minimum and 44" maximum above finish floor or ground.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fittings required to install hardware onto or into surfaces which are later to be painted or finished in

another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the division 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation. **Provide steel stud backing in walls as necessary to provide proper anchorage for wall mounted hardware.**

D. Drill and countersink units, which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

3.03 ADJUST AND CLEAN:

A. Adjust and check each operating item of hardware and each door, to ensure proper operation of function of every unit. Replace units, which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Instruct District's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

C. Continued Maintenance Service: Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct District's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware, and deliver report to District with a copy to the Architect.

END OF SECTION

SECTION 09 91 15

EXTERIOR SITE PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Painting and painter's finish on site and landscape improvements, except prefinished items and unless otherwise noted, as required to complete finishing of the Work. The Work includes the following specific items:
      a. Dugouts
      b. Backstop Baseboards

B. Items Not Included in This Section:
   1. Factory-prefinished items as specified in various Sections.
   2. Painting specified elsewhere and included in respective Sections, including but not necessarily limited to shop priming.

C. Related Requirements:
   1. Section 09 96 23 - Graffiti-Resistant Coatings

1.02 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Coordination: Perform painting work in proper sequence with work of other trades so as to avoid damage to finished work.

1.03 ACTION SUBMITTALS

A. Product Data: A complete list of materials proposed for use, together with manufacturer's technical information, including paint label analysis and application instructions.

B. Color Samples:
   1. Appropriately label and identify each sample, including location and application. Include name, color number, and gloss units.
   2. Wood: Prepare on type and quality of wood specified, 12 inches square or long, as applicable.
   3. Other Surfaces: Prepare on hardboard, 8 inches square.
   4. Each sample shall have stepped finish, clearly showing each coat and build-up of specified finish. Submit separate samples for each required gloss level.
   5. Resubmit samples as requested until required sheen, color, and texture are achieved.
   6. See also requirements for field samples below.

1.04 INFORMATIONAL SUBMITTALS

A. Statement of applicator qualifications.

1.05 CLOSEOUT SUBMITTALS

A. Extra stock as specified.

B. Specified warranty.

1.06 QUALITY ASSURANCE

A. Unsuitability of Specified Products: Claims concerning unsuitability of any material specified (or inability satisfactorily to produce the Work) will not be entertained, unless such claim is made, in writing, to Owner's Representative before beginning of application.

B. Single-Source Responsibility:
1. To the maximum extent practicable, select a single manufacturer to provide all materials required by this Section, using additional manufacturers to provide systems not offered by the selected principal manufacturer.
2. For each individual system:
   a. Provide primer and other undercoat paint produced by same manufacturer as finish coat.
   b. Use thinner within manufacturer's recommended limits.

C. Applicator Qualifications:
1. Not less than 5 years of documented experience in painting work similar in scope to work of this Project.
2. Maintain a crew of painters who are fully qualified to satisfy requirements of this Section.

D. Field Samples:
1. Request review, by the Owner's Representative, of first finished item of each finish type or color scheme required for color, texture, and workmanship.
2. For walls, finish a panel 8 feet square.
3. Modify selected colors, if requested by Owner's Representative, to achieve desired effect.
4. Use first acceptable surface or item as the Project standard for each color scheme.

E. Primers:
1. Provide finish coats that are compatible with prime paints used.
2. Review other Sections of these Specifications in which prime paints are to be provided in order to ensure compatibility of total coatings system for various substrates.
3. Upon request, furnish information to other Sections regarding characteristics of finish materials proposed for use.
4. Provide barrier coats over incompatible primers, or remove and re-prime as required.
5. Notify Owner's Representative, in writing, of any anticipated problems arising from using specified coating systems with substrates primed by other Sections.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original, new, unopened packages and containers bearing the manufacturer's name and label describing contents including the following information:
1. Name or title of material.
2. Manufacturer's stock number and date of manufacture.
3. Contents by volume for major pigment and vehicle constituents.
4. Thinning instructions.
5. Application instructions.
6. Color name and number.

B. Store materials in tightly covered containers. Maintain containers in a clean condition, free of foreign materials and residue.

C. Store materials at ambient temperature of between 45 degrees F minimum and 90 degrees F maximum, in a well-ventilated area.

D. Ensure that storage area is neat and orderly.

E. Take precautionary measures to prevent fire and health hazards.

1.08 FIELD CONDITIONS

A. Ambient Conditions:
   1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be stored and applied.
   2. Do not apply finish in areas where dust is being generated.

B. Cover or otherwise protect in progress and finished work of other trades, and surfaces not being painted concurrently or not to be painted.

1.09 WARRANTY

A. Color and Life of Film:
   1. At the end of 1 year, colors of surfaces shall have remained free from serious fading. Variations (if any) shall be uniform.
   2. Materials shall have their original adherence at end of 1 year. There shall be no evidence of blisters, running, peeling, scaling, chalking, streaks, or stains at end of this period.

1.10 EXTRA MATERIALS

A. At completion of the Work, deliver to Owner extra stock of paint of each color used in each coating material used.

B. Containers shall be full, tightly sealed, and clearly marked.

C. Provide the following quantities:
   1. Field Colors: One 5-gallon container.
   2. Accent Colors: One 1-gallon container.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Products are specified under "Paint Systems" in Part 3 below and are manufactured by Kelly-Moore Paints, unless otherwise indicated. Equivalent products manufactured by PPG, Benjamin Moore, Sherwin-Williams, or Dunn-Edwards are acceptable.

B. Materials selected for coating systems for each type surface shall be the product of a single manufacturer or shall be acceptable to manufacturer of finish coating for system.

C. If more than one quality level of product type is marketed, use material of highest quality.

2.02 COLORS

A. Colors shall be as scheduled on the Drawings. Scheduled colors may have manufacturer identifications other than the acceptable manufacturers listed above. The Drawing listing is solely for the purpose of conveying color information and does not imply manufacturer's approval or waiver of the requirement that all coatings be from the same manufacturer, unless a specific system is not available from the primary manufacturer.

B. Submit samples of selected colors as specified in Part 1 above.

C. Colors of paints, including shades of stain, shall match color chips on schedule.

2.03 MIXING AND TINTING

A. Deliver paints and stains ready mixed to jobsite.

B. Accomplish job mixing and job tinting only if required for adjustment to finish applied to field test areas to achieve color acceptable to Owner's Representative.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence, or quality of work and that cannot be put into acceptable condition through preparatory work as included in Article 3.02, "Preparation."

B. Do not proceed with surface preparation or coating application until conditions are suitable.

3.02 PREPARATION

A. General:
   1. Verify that surfaces to be painted are dry, clean, smooth, and free from deleterious materials.
   2. Protect hardware, exposed metals, and other surfaces that are not to be painted by masking, removal, or other means to ensure a neat job.

B. Wood - General:
   1. Cleaning and Sanding:
      a. Remove handling marks and effects of exposure to moisture with a thorough, final sanding over all exposed surfaces, using 150-grit or finer sandpaper.
      b. Clean and vacuum before applying sealer or finish.
   2. Wood to Receive Opaque Finish: Fill nail holes, cracks, open joints, and other defects with filler after priming coat has dried. Color shall match finish color.
   3. Wood to Receive Transparent Finish:
      a. Remove any material that would adversely affect penetration or appearance of finish.
      b. Do not seal wood surfaces to receive transparent finish.

C. Wood – New Exterior, Opaque Finish:
   1. Surfaces shall be dry and free of grease and splatters.
   2. Rough surfaces shall be sanded smooth.
   3. Fill nail holes, cracks, open joints, and other defects with filler after priming coat has dried. Exposed nail heads shall be spot primed.
   4. Avoid painting surfaces while exposed directly to hot sun.
   5. Smooth surfaces shall be sanded thoroughly to allow proper penetration and adhesion. Areas exhibiting tannic acid staining shall receive two coats of primer waiting 24 hours between coats. Sand and prime as soon as possible after installation to avoid UV degradation of unpainted wood surface.
   6. Mildew, if present, shall be removed by scrubbing with a commercial mildew wash in accordance with manufacturer's directions.

D. Wood - Existing Exterior, Opaque Finish:

1. Remove all blistered, peeling and scaling paint to a sound substrate by scraping, sanding, and wire brushing. Spot prime bare wood and exposed nail heads before applying overall coat of primer.
2. Surfaces that exhibit moderate to heavy chalk deposits shall be thoroughly cleaned to sound substrate by wire brushing, sanding, or power washing.
3. Loose and split sealants shall be removed and replaced.
4. Glossy surfaces shall be dulled by sanding. Crystalline deposits shall be removed by flushing with water from a hose.
5. Mildew, if present, shall be removed by scrubbing with a commercial mildew wash in accordance with manufacturer's directions.

E. Wood – New and Existing Exterior, Transparent Finish:
1. Surfaces shall be dry and free of grease and splatters.
2. Avoid coating surfaces while exposed directly to hot sun.
3. Mildew, if present, shall be removed by scrubbing with a commercial mildew wash in accordance with manufacturer's directions.
4. Comply with additional requirements of the coating manufacturer.

F. Metals:
1. Remove mill scale, rust, and corrosion.
2. Clean oils, grease, and dust from surfaces.
3. Touch up chipped or abraded areas in shop coatings, using appropriate primer.
4. Soluble Salts: Removal of soluble salts from bare metal and galvanized metal surfaces, both interior and exterior, is required prior to application of primer coats to preclude pre-mature coating failure and accelerated corrosion.
   a. Removal shall be in accordance with SSPC-Guide 15, "Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates."
   b. Abrasive blasting, where specified as a required surface preparation procedure, shall be performed after removal of soluble salts. Abrasive blasting is not an acceptable procedure for removal of soluble salts.
5. Previously Painted Metal: Prepare in accordance with recommendations of coating manufacturer based on condition of surfaces and the following:
   a. Remove loose paint, dirt, and chalk with scraper and strong detergent solution.
   b. Abrade shiny surfaces, such as baked enamel.
   c. Clean surfaces of dust from sanding and other foreign matter that could adversely affect adhesion or performance of coating system. Remove sanding dust with a clean, wet rag.
   d. Surfaces shall be clean, dry, smooth, and even.

G. Concrete:
1. Fill cracks and irregularities with Portland cement grout or patching mortar in order to provide uniform surface texture.
2. Surfaces shall not be painted until they have completely cured and have a stabilized moisture content but in no case less than 60 days from completion of surface.

H. Cement Plaster:
1. Fill cracks and irregularities with Portland cement grout or patching mortar in order to provide uniform surface texture.
2. Surfaces shall not be painted until they have completely cured and have a stabilized moisture content but in no case less than 60 days from completion of surface.

I. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions

J. Surfaces that cannot be prepared or painted as specified shall be immediately brought to the attention of the Owner's Representative, in writing.
1. Starting of work without such notification will be considered acceptance by the Contractor of surfaces involved.

2. Replace unsatisfactory work caused by improper or defective surfaces, as directed by Owner's Representative.

3.03 FACTORY FINISHING AND PRIMING

A. Pertinent Work and Requirements Specified Elsewhere: Review all Sections for products that are to be factory finished or factory (shop) primed.

B. Touch-up: Touch up abrasions in prime coat immediately after products arrive on jobsite and as required prior to application of finish coats.

3.04 APPLICATION

A. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.

B. Application:
1. Apply paint with suitable brushes, rollers, or spraying equipment.
2. Guardrails and other exposed metal requiring field finish painting shall be sprayed to the fullest extent conditions will permit. If brush or roller application is used, surface finish shall be subject to review by the Owner's Representative for complying with the appearance requirements specified herein.
3. Apply coatings in accordance with manufacturer's recommendations.
4. Rate of application shall be within limits recommended by paint manufacturer for surface involved.

C. Spray-Gun Application - Standard Coatings:
1. Spray-apply standard paints only with airless sprayer.
2. Apply in fine, even spray, without addition of thinner, using nozzle pattern suitable to surface being painted.
3. When necessary, follow by brushing to ensure uniform coverage and to eliminate wrinkling, blistering, and air holes.
4. If spraying becomes detrimental to equipment or objectionable to personnel, brush painting will be required.

D. Comply with recommendation of product manufacturer for drying time between succeeding coats.

E. Finish coats shall be smooth and free from brush marks, streaks, laps or pileup of paints, and skipped or missed areas.

F. Leave all parts of moldings and trim clean and true to details with no undue amount of paint in corners and depressions.

G. Make edges of paint adjoining other materials or colors clean and sharp, with no overlapping.

H. Refinish whole area where portion of finish is not acceptable.

3.05 CLEANING

A. Touch up and restore finish where damaged.

B. Remove spilled, splashed, or spattered paint from all surfaces. Do not mar surface finish of item being cleaned.

C. Leave storage space clean and in condition required for equivalent spaces in Project.

3.06 PAINT SYSTEMS

A. General:
1. This Specification shall serve as guide and is meant to establish procedure and quality. Confer with the Owner's Representative to determine exact finish desired.
2. Number of coats scheduled is minimum. Additional coats shall be applied at no additional cost as required to hide base material completely, produce uniform color, and provide required and satisfactory finish.

B. Acceptance of Final Colors: Final coat of paint shall not be applied until colors have been accepted by the Owner's Representative.

C. Gloss and Sheen Ratings: It is recognized that manufacturer's use various identifiers for the sheen of their paints. The sheen rating of applied paint, therefore, shall be identified as a Gloss Level and generally fall within the following limits established by the Master Painters Institute, Inc. (MPI) Standards and ASTM D523. Not all of the Gloss Levels are necessarily scheduled or used on this Project.
1. Gloss Level 1: Matte or Flat; not more than 5 units at 60 degrees and 10 units at 85 degrees.
2. Gloss Level 2: Velvet or Low Sheen; not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees.
3. Gloss Level 3: Eggshell; 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
4. Gloss Level 4: Satin; 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
5. Gloss Level 5: Semi-gloss; 35 to 70 units at 60 degrees.
6. Gloss Level 6: Gloss; 70 to 85 units at 60 degrees.

D. Clarification of System Terminology:
1. Exterior paint Systems are specified and identified herein by initial letters "EXT."
2. Initial numbers for each System identify the substrate to be coated.
3. Letter following substrate numbers identify the general finish coat chemistry summarized as follows:

CODE	DESCRIPTION
A	Standard acrylic
B	Standard alkyd
C	Semi-transparent stain
D	Semi-solid stain
H	High performance polyurethane
M	Premium performance acrylic polymer
T	Fluoropolymer

4. Hyphenated suffix identifies the topcoat gloss levels.

E. Exterior Painting Systems:

EXT 4.2A-1
Latex on Concrete Unit Masonry - Gloss Level 1

1 coat		"Bloxfil" 4000	Heavy-duty Block Filler
2 coats		2200-XXXX	100% Acrylic Flat

EXT 5.1A-5
Acrylic over Waterborne Primer on Ferrous Metal - Gloss Level 5

1 coat		4020-1000	Metal Primer (If Not Shop Primed)
2 coats		4206-XXXX	Acrylic Semi-gloss

EXT 5.3-5
Acrylic over Waterborne Primer on Galvanized Metal – Gloss Level 5

Pretreatment (SSPC SP-1)		Devprep 88	Heavy-duty cleaner
1 coat		4020-1000	Primer
2 coats		2406-XXXX	100% Acrylic Semi-gloss

EXT 6.3A-4
Acrylic on Dressed Lumber - Gloss Level 3

1 coat	2000-1000	100% Acrylic Primer
2 coats	2402 XXXXV	100% Acrylic Satin Enamel

END OF SECTION

SECTION 09 96 23

GRAFFITI-RESISTANT COATINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Liquid-applied sacrificial surface sealer for all exterior masonry and concrete wall surfaces that will prevent penetration of staining mediums and allow easy removal and reapplication.

B. Related Requirements:
   1. Section 32 32 15 – Landscape Concrete.
   2. Section 32 32 20 – Landscape Concrete Masonry.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

1.03 ACTION SUBMITTALS

A. Product Data: Manufacturer's specifications, installation instructions, and general recommendations for specified coating materials. Include instructions and recommendations for cleaning and preparation of concrete surfaces, coating and recoating application techniques, equipment to be used, coverage rates, accessory materials, and special removal procedures.

B. Samples: 12-inch-square of each substrate to receive graffiti-resistant coating, with coating applied to half of each sample.

1.04 INFORMATIONAL SUBMITTALS

A. Statement of applicator qualifications.

B. Letter documenting work has been applied in compliance with specifications and manufacturer's written instructions and that specified field testing has been satisfactory.

1.05 CLOSEOUT SUBMITTALS

A. Extended warranty.

B. Maintenance materials.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: Approved in writing by the manufacturer with documented experience in application of similar graffiti-resistant coatings.

B. Mockup:
   1. Treat and evaluate a minimum eight square foot area of completed wall at the Project site for product adhesion, compatibility, and appearance.
   2. Apply and remove graffiti to a portion of the mock-up to the satisfaction of the Owner's Representative.

3. Application shall not continue unless mockup is acceptable to Owner's Representative.

C. Do not apply specified coatings when surfaces or ambient air temperature is below 45-degree F, over 90 degrees F, or expected to drop below freezing during the 24-hour period following application.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store materials at site in protected location, and away from flame, excessive heat, at temperatures above 40 degrees F.

1.08 MAINTENANCE

A. At completion of the Work, deliver to Owner specified cleaning and application solution sufficient to clean and recoat a minimum of 500 square feet of coated wall surface.

B. Stock shall be in factory sealed and clearly labeled containers.

C. Stock shall be delivered and stored as directed by the Owner.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

A. The coating shall not darken, stain, or discolor substrate surfaces.

B. The coating shall be non-yellowing.

2.02 MATERIALS

A. Graffiti-Resistant Coating System: "Defacer Eraser" SC-1 by Prosoco, or equal meeting governing VOC requirements.

B. Application Equipment: Medium-to-large-capacity airless sprayer and hoses or other equipment as recommended by the coating manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are dry, clean, and free of dust, dirt, grime, oils, alkali or acid residues, and other contaminants or compounds unacceptable to the graffiti-resistant coating manufacturer.

3.02 PREPARATION

A. Clean and prepare substrates in accordance with graffiti-resistant coating manufacturer's instructions.

B. Test for moisture content in accordance with manufacturer's instructions to ensure that surface is sufficiently dry.

C. Protect adjacent surfaces not to receive coating from spillage or blow-over.

D. Cover adjoining and nearby surfaces of metal and glass as required.

3.03 APPLICATION

A. Apply graffiti-resistant coating following manufacturer's recommendations for number of coats and their application.

B. Avoid runs or applying coating to heavily as this will impair transparency of cured material. Excessive coating will turn milky when it gets wet after curing.

C. Runs or sags on masonry surface shall be immediately brushed out using a clean, soft brush.

D. Clean spillage from horizontal surfaces immediately after spillage.

END OF SECTION

SECTION 26 05 10

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this Section consists of providing all required labor, supervision, materials and equipment to satisfactorily complete all electrical installations that are shown on the Drawings, included in these specifications, or otherwise needed for a complete and fully operating facility.

B. Furnish and install all required in-place equipment, conduits, conductors, cables and any miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

1.02 RELATED WORK

A. This Section provides the basic Electrical Requirements which supplement the General Requirements of Division 1 and apply to all Sections of Division 26.

1.03 SUBMITTALS

A. As specified in Division 1. Submit to the Architect shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system specified. Information to be submitted includes manufacturer's descriptive literature of cataloged products, equipment, drawings, diagrams, performance and characteristic curves as applicable, test data and catalog cuts. Obtain written approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review. Furnish manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Industry and Technical Society Publication References, and years of satisfactory service of each item required to establish contact compliance. Photographs of existing installations and data submitted in lieu of catalog data are not acceptable and will be returned without approval.

B. Organize submittals for equipment and items related to each specification section together as a package.

C. Proposed substitutions of products will not be reviewed or approved prior to awarding of the Contract.

D. Substitutions shall be proven to the Architect or Engineer to be equal or superior to the specified product. Architect’s decision is final. The Contractor shall pay all costs incurred by the Architect and Engineer in reviewing and processing any proposed substitutions whether or not a proposed substitution is accepted.

E. If a proposed substitution is rejected, the contractor shall furnish the specified product at no increase in contract price.

F. If a proposed substitution is accepted, the contractor shall be completely responsible for all dimensional changes, electrical changes, or changes to other work which is a result of the substitution. The accepted substitution shall be made at no additional cost to the owner or design consultants.

G. If a proposed substitution is accepted after bid, the contractor should be required to show the credit due to the owner.

1.04 QUALITY ASSURANCE

A. Codes: All electrical equipment and materials, including installation and testing, shall conform to the latest editions following applicable codes:

1. California Electrical Code (CEC).

2. Occupational Safety and Health Act (OSHA) standards.

3. All applicable local codes, rules and regulations.

4. Electrical Contractor shall posses a C-10 license and all other licenses as may be required. Licenses shall be in effect at start of this contract and be maintained throughout the duration of this contract.

B. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.

C. Standards: Equipment shall conform to applicable standards of American National Standards Institute (ANSI), Electronics Industries Association (EIA), Institute of Electrical and Electronics Engineers (IEEE), and National Electrical Manufacturers Association (NEMA).

D. Underwriter Laboratories (UL) listing is required for all equipment and materials where such listing is offered by the Underwriters Laboratories. Provide service entrance labels for all equipment required by the NEC to have such labels.

E. The electrical contractor shall guarantee all work and materials installed under this contract for a period of one (1) year from date of acceptance by owner.

F. All work and materials covered by this specification shall be subject to inspection at any and all times by representatives of the owner. Work shall not be closed in or covered before inspection and approval by the owner or his representative. Any material found not conforming with these specifications shall, within 3 days after being notified by the owner, be removed from premises; if said material has been installed, entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the contractor.

1.05 DRAWINGS

A. Drawings: The electrical Drawings shall govern the general layout of the completed construction.

1. Locations of equipment, panels, pullboxes, conduits, stub-ups, ground connections are approximate unless dimensioned; provide and verify locations with the Architect prior to installation.

2. Review the Drawings and Specification Divisions of other trades and perform the electrical work that will be required for those installations.

3. Should there be a need to deviate from the Electrical Drawings and Specifications, submit written details and reasons for all changes to the Architect for approval.

4. The general arrangement and location of existing conduits, piping, apparatus, etc., is approximate. The drawings and specifications are for the assistance and guidance of the

contractor, exact locations, distances and elevations are governed by actual field conditions. Accuracy of data given herein and on the drawings is not guaranteed. Minor changes may be necessary to accommodate work. The contractor is responsible for verifying existing conditions. Should it be necessary to deviate from the design due to interference with existing conditions or work in progress, claims for additional compensation shall be limited to those for work required by unforeseen conditions as determined by the Architect.

5. All drawings and divisions of these specifications shall be considered as whole. This contractor shall report any apparent discrepancies to the Architect prior to submitting bids.

6. The contractor shall be held responsible to have examined the site and compared it with the specifications and plans and to have satisfied himself as to the conditions under which the work is to be performed. He shall be held responsible for knowledge of all existing conditions whether or not accurately described. No subsequent allowance shall be made for any extra expense due to failure to make such examination.

1.06 CLOSEOUT SUBMITTALS

A. Manuals: Furnish manuals for equipment where manuals are specified in the equipment specifications or are specified in Division 1.

1.07 COORDINATION

A. Coordinate the electrical work with the other trades, code authorities, utilities and the Architect.

B. Provide and install all trenching, backfilling, conduit, pull boxes, splice boxes, etc. for all Utility Company services to the locations indicated on the Drawings. All materials and construction shall be in accordance with the requirements for all the Utility Companies. The contractor shall be responsible for completing the (N) service per PG&E's Greenbook current standards and substructure package. Prior to performing any work, the Electrical Contractor shall coordinate with the various Utility Companies to verify that all such work and materials shown on the Drawings are of sufficient sizes and correctly located to provide services on the site. The contractor shall obtain, provide and coordinate all requirements noted in PG&E's substructure package to successfully complete new service. The Electrical Contractor shall verify with all the Utility Companies that additional contractor furnished and installed work is not required. If additional work, materials, or changes are required by any of the Utility Companies, the Electrical Contractor shall advise the Architect of such changes and no further work shall then be performed until instructed to do so by the Architect.

C. Utility Company charges shall be paid by the Owner.

D. Contractor shall pay all inspection and other applicable fees and procure all permits necessary for the completion of this work.

D. Where connections must be made to existing installations, properly schedule all the required work, including the power shutdown periods.

E. When two trades join together in an area, make certain that no electrical work is omitted.

1.08 JOB CONDITIONS

A. Operations: Perform all work in compliance with Division 1

1. Keep the number and duration of power shutdown periods to a minimum.

2. Show all proposed shutdowns and their expected duration on the construction schedule. Schedule and carry out shutdowns so as to cause the least disruption to operation of the Owner's facilities.

3. Carry out shutdown only after the schedule has been approved, in writing, by the owner. Submit power interruption schedule 15 days prior to date of interruption.

B. Construction Power: Unless otherwise noted in Division 1 of these specifications, contractor shall make all arrangements and provide all necessary facilities for temporary construction power from the owner's on site source. Energy costs shall be paid for by the Owner

C. Storage: Provide adequate storage for all equipment and materials which will become part of the completed facility so that it is protected from weather, dust, water, or construction operations.

1.09 DAMAGED PRODUCTS

A. Notify the Architect in writing in the event that any equipment or material is damaged. Obtain approval from the Architect before making repairs to damaged products.

1.10 LOCATIONS

A. General: Use equipment, materials and wiring methods suitable for the types of locations in which they are located.

B. Dry Locations: All those indoor areas which do not fall within the definition below for Wet Locations and which are not otherwise designated on the Drawings.

C. Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Drawings.

1.11 SAFETY AND INDEMNITY

A. The Contractor is solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continually and not be limited to normal working hours. The contractor shall provide and maintain throughout the work site proper safeguards including, but not limited to, enclosures, barriers, warning signs, lights, etc. to prevent accidental injury to people or damage to property.

B. No act, service, drawing review or construction review by the Owner, the Engineer or their Consultants is intended to include reviews of the adequacy of the Contractors safety measures in or near the construction site.

C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify, and defend the Owner, the Engineer, their consultants, and each of their officers, agents and employees from any and all liability claims, losses, or damage arising out of or alleged to arise from bodily injury, sickness, or death of a person or persons and for all damages arising out of injury to or destruction of property arising directly or indirectly out of or in connection with the performance of the work under this Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the construction contract documents, but not including liability that may be due to the sole negligence of the Owner, the Engineer, their Consultants or their officers, agents and employees.

D. The project work area does not contain asbestos materials. However, if a work area is encountered that does contain asbestos materials, the contractor is advised to coordinate with the owner and it's asbestos abatement consultant all measures necessary to provide installation of

conduit, and hangers. All asbestos containing materials related work shall conform to the directions given by the owner. Nothing herein shall be construed to create a liability for American Consulting Engineers regarding asbestos abatement measures.

1.12 ACCESS PANELS AND DOORS

A. The Contractor shall install access panels as required where floors, walls or ceilings must be penetrated for access to electrical, control, fire alarm or other specified electrical devices. The minimum size panel shall be 14" x 14" in usable opening. Where access by a service person is required, minimum usable opening shall be 18" x 24".

B. All access doors installed lower than 7'-0" above finished floor and exposed to public access shall have keyed locks.

C. Where specific information or details relating to access panels differ from these specifications, shown on drawings and or details or on other Divisions of work, these requirements shall supersede these specifications.

D. Approved Manufacturers: Subject to compliance with requirements under Architectural Specifications, Milcor, Karp, Nystrom or Cesco.

1. Milcor Style K (plaster)

2. Milcor Style DW (gypsum board)

3. Milcor Style M (masonry)

4. Milcor Style "Fire Rated" where required.

PART 2 - PRODUCTS

2.01 STANDARD OF QUALITY

A. Products that are specified by manufacturer, trade name or catalog number establish a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are approved by the Architect prior to installation.

B. Material and Equipment: Provide materials and equipment that are new and are current products of manufacturers regularly engaged in the production of such products. The standard products shall have been in satisfactory commercial or industrial use for two years prior to bid opening. The two-year period includes use of equipment and materials of similar size under similar circumstances. For uniformity, only one manufacturer will be accepted for each type of product.

C. Service Support: Submit a certified list of qualified permanent service organizations including their addresses and qualification for support of the equipment. These service organizations shall be convenient to the equipment installation and able to render service to the equipment on a regular and emergency basis during the warranty period of the contract.

D. Manufacturer's Recommendations: Where installation procedures are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendation shall be cause for rejection of the equipment or material.

2.02 NAMEPLATES

A. For each piece of electrical equipment, provide a manufacturer's nameplate showing his name, location, the pertinent ratings, the model designation, and shop order number.

B. Identify each piece of equipment and related controls with a rigid laminated engraved plastic nameplate. Unless otherwise noted, nameplates shall be melamine plastic 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 0.5 by 2.5 inches unless otherwise noted. Where not otherwise specified, lettering shall be a minimum of 0.25 inch high normal block style. Engrave nameplates with the inscriptions indicated on the Drawings and, if not so indicated, with the equipment name. Securely fasten nameplates in place using two stainless steel or brass screws.

C. Contractor to provide rigid laminated engraved plastic nameplate for all signal terminal cabinets, fire alarm terminal cans, electrical disconnect switches (fused or non-fused) and data/voice cabinets. Provide and secure as noted above.

2.03 FASTENERS

A. Fasteners for securing equipment to walls, floors and the like shall be either hot-dip galvanized after fabrication or stainless steel.

2.04 FINISH REQUIREMENTS

A. Equipment: Refer to each electrical equipment section of these Specifications for painting requirements of equipment enclosures. Repair any final paint finish which has been damaged or is otherwise unsatisfactory, to the satisfaction of the Architect.

B. Wiring System: In finished areas, paint all exposed conduits, boxes and fittings to match the color of the surface to which they are affixed.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Ensure that all equipment and materials fit properly in their installation.

B. Perform any required work to correct improperly fit installation at no additional expense to the owner.

C. All electrical equipment and materials shall be installed in a neat and workmanship manner in accordance with the NECA Standard of Installation Manual and Workmanship of the entire job shall be first class in every respect.

3.02 EQUIPMENT INSTALLATIONS

A. Provide the required inserts, bolts and anchors, and securely attach all equipment and materials to their supports.

B. Do all the cutting and patching necessary for the proper installation of work and repair any damage done.

C. Earthquake restraints: all electrical equipment, including conduits over 2 inches in diameter, shall be braced or anchored to resist a horizontal force acting in any direction as per Title 24, part 2, table 16a-o, part 3.

D. Structural work: All core drilling, bolt anchor insertion, or cutting of existing structural concrete shall be approved by a California registered structural consulting engineer prior to the execution of any construction. At all floor slabs and structural concrete walls to be drilled, cut or bolt anchors inserted, the contractor shall find and mark all reinforcing in both faces located by means of x-ray, pach-ometer, or prof-ometer. Submit sketch showing location of rebar and proposed cuts, cores, or bolt anchor locations for approval.

3.03 FIELD TESTS

A. Test shall be in accordance with Acceptance testing specifications issued by the National Electrical Testing Association (NETA).

B. Perform equipment field tests and adjustments. Properly calibrate, adjust and operationally check all circuits and components, and demonstrate as ready for service. Make additional calibration and adjustments if it is determined later that the initial adjustments are not satisfactory for proper performance. Perform equipment field test for equipment where equipment field tests are specified in the equipment Specifications. Give sufficient notice to the Architect prior to any test so that the tests may witnessed.

C. Provide instruments, other equipment and material required for the tests. These shall be of the type designed for the type of tests to be performed. Test instrument shall be calibrated by a recognized testing laboratory within three months prior to performing tests.

D. Operational Tests: Operationally test all circuits to demonstrate that the circuits and equipment have been properly installed and adjusted and are ready for full-time service. Demonstrate the proper functioning of circuits in all modes of operation, including alarm conditions.

E. Re-testing will be required for all unsatisfactory tests after the equipment or system has been repaired. Re-test all related equipment and systems if required by the Architect. Repair and re-test equipment and systems which have been satisfactorily tested but later fail, until satisfactory performance is obtained.

F. Maintain records of each test and submit five copies to the Architect when testing is complete. All tests shall be witnessed by the Architect. These records shall include:

1. Name of equipment tested.

2. Date of report.

3. Date of test.

4. Description of test setup.

5. Identification and rating of test equipment.

6. Test results and data.

7. Name of person performing test.

8. Owner or Architect's initials.

G. Items requiring testing shall be as noted in the additional electrical sections of these specifications.

3.04 CLEANING EQUIPMENT

A. Thoroughly clean all soiled surfaces of installed equipment and materials.

3.05 PAINTING OF EQUIPMENT

A. Factory Applied: Electrical equipment shall have factory applied painting system which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test and the additional requirements specified in the technical section.

B. Field Applied: Paint electrical equipment as required to match finish of adjacent surfaces.

3.06 RECORDS

A. Maintain one copy of the contract Drawing Sheets on the site of the work for recording the "as built" condition. After completion of the work, the Contractor shall carefully mark the work as actually constructed, revising, deleting and adding to the Drawing Sheets as required. The following requirements shall be complied with:

1. Cable Size and Type: Provide the size and type of each cable installed on project.

2. Substructure: Where the location of all underground conduits, pull boxes, stub ups and etc. where are found to different than shown, carefully mark the correct location on the Drawings. Work shall be dimensioned from existing improvements.

3. Size of all conduit runs.

4. Routes of concealed conduit runs and conduit runs below grade.

5. Homerun points of all branch circuit.

6. Location of all switchgear, panels, MCC, lighting control panels, pullcans, etc.

7. Changes made as a result of all approved change orders, addendums, or field authorized revisions.

8. As Builts: At the completion of the Work the Contractor shall review, certify, correct and turn over the marked up Drawings to the Architect for his use in preparing "as built" plans.

9. As Built drawings for fire alarm, data, telephone, CATV/Video, intercom and clock shall also be recorded. Upon completion “As-built” documentation showing actual devices locations and devices identification as installed and labeled, including fire alarm, data, telephone, CATV/Video and int/clock wiring layout. “As-built” shall include; for example , fire alarm equipment location showing all monitor modules and end of line resistor locations. The contractor shall provide one set drawings documents and the other set in electronic CAD file representing actual as-builts. CAD files shall be AutoCAD 14 format. Obtaining CAD files from the Architect/District shall require contractor to sign CAD release form.

10. As built Drawings shall be delivered to the Architect within ten (10) days of completion of construction.

3.07 CLEAN UP

A. Upon completion of electrical work, remove all surplus materials, rubbish, and debris that accumulated during the construction work. Leave the entire area neat, clean, and acceptable to the Architect.

3.08 MECHANICAL AND PLUMBING ELECTRICAL WORK

A. The requirements for electrical power and/or devices for all mechanical and plumbing equipment supplied and/or installed under this Contract shall be coordinated and verified with the following:

1. Mechanical and Plumbing Drawings.

2. Mechanical and Plumbing sections of these Specifications.

3. Manufacturers of the Mechanical and Plumbing equipment supplied.

B. The coordination and verification shall include the voltage, ampacity, phase, location and type of disconnect, control, and connection required. Any changes that are required as a result of this coordination and verification shall be a part of this Contract.

C. The Electrical Contractor shall furnish and install the following for all mechanical and plumbing equipment:

1. Line voltage conduit and wiring.

2. Disconnect switches.

3. Manual line voltage controls.

D. Automatic line voltage controls and magnetic starters unless otherwise noted, shall be furnished by the Mechanical and/or Plumbing Contractor and installed and connected by the Electrical Contractor. All line voltage control wiring installed by the Electrical Contractor shall be done per directions from the Mechanical and/or Plumbing Contractor.

E. All low voltage control wiring for Mechanical and Plumbing equipment shall be installed in conduit. Furnishing, installation and connection of all low voltage conduits, boxes, wiring and controls shall be by the Mechanical and/or Plumbing Contractor.

F. Manual motor starters, where required, shall have toggle type operators with pilot light and melting alloy type overload relays, SQUARE D COMPANY, Class 2510, Type FG-1P (surface) or Type FS-1P (flush) or ITE, WESTINGHOUSE or GENERAL ELECTRIC equal.

3.09 ACCESS DOORS

A. The Electrical Contractor shall furnish and install access doors wherever required whether shown or not for easy maintenance of electrical systems: As an example, fire alarm devices, controls, junction boxes, etc. Access doors shall provide for complete access to equipment for both removal and replacement of equipment.

END OF SECTION

SECTION 26 05 11

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. General - Remove all material designated to be removed on the drawings and that is surplus to the needs of the system as may be designated by the Owner's Representative. Specific work shall be provided as specified below:

B. Remove Existing Equipment - Electrical Equipment to be removed shall include but not be limited to switchboards, panel boards, concrete foundations, equipment supports, lighting fixtures, conductors, conduit, raceway and other items as shown on the drawings or specified.

C. Clean Surface Areas - Clean all floors, streets, sidewalks, driveways, parking lots and landscaped areas of all trash and debris deposited as a result of the work. Clean daily and maintain the property free of trash and debris.

1.02 STANDARDS AND CODES

A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.

1. California Electrical Code (CEC).

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 DISPOSAL

A. Except where specifically noted otherwise on the drawings or elsewhere in these specifications, the contractor assumes ownership of all material removed from the project site and assumes all responsibility for its proper disposal.

3.02 CLEANUP

A. Contractor shall maintain the work site in a neat and orderly state. Contractor shall remove demolition material from the job site daily. No demolition material shall be left on the job site after working hours without written approval from the Owner's Representative.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE WIRE AND CABLE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this Section consists of providing all wire and cable rated 600 volts or less, including splices and terminations, as shown on the Drawings and as described herein.

1.02 RELATED WORK

A. See the following Specification Section for work related to the work in this Section:

1. Section 26 05 33 - Conduits, Raceways and Fittings.

2. Section 26 05 34 - Junction and Pull Boxes.

1.03 SUBMITTALS

A. In accordance with Division 1.

B. Submit complete material list with the manufacturer's specifications and published descriptive literature for all materials proposed for use.

1.04 QUALITY ASSURANCE

A. Field tests shall be performed as specified in paragraph 3.04 of this Section.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Conductors shall be copper, type THHN/THWN/MTW oil and gasoline resistant, 600 volt rated insullation. Minimum power and control wire size shall be No. 12 AWG unless otherwise noted.

B. Conductors shall be stranded except that sizes #10 and smaller for receptacle circuits shall be solid and of the sizes indicated.

C. Minimum power and control wire size shall be No. 12 AWG unless otherwise noted.

D. All conductors used on this Project shall be of the same type and conductor material.

2.02 CABLES

A. All individual conductors shall be copper with type THHN/THWN, 600 volt rated insulation.

B. Insulation Marking - All insulated conductors shall be identified with printing colored to contrast with the insulation color.

C. Color Coding - As specified in paragraph 3.03.

D. Special Wiring - Where special wiring is proposed by an equipment manufacturer, submit the special wiring requirements to the Owner's Representative and, if approved, provide same. Special wire shall be the type required by the equipment manufacturer.

E. Other Wiring - Wire or cable not specifically shown on the Drawings or specified, but required, shall be of the type and size required for the application and as approved by the Owner's Representative.

F. Manufacturer - Acceptable manufacturers including Cablec, Southwire, or equal.

2.03 TERMINATIONS

A. Manufacturer - Terminals as manufactured by T&B, Burndy or equal.

B. Cable Termination for Copper - Crimp style two hole NEMA spade terminals designed and rated for copper cable.

C. Wire Terminations - Crimp on ring-tongue terminals, insulated sleeve, of proper size for the wire used.

D. End Seals - Heat shrink plastic caps of proper size for the wire on which used.

2.04 TAPE

A. Tape used for terminations and cable marking shall be compatible with the insulation and jacket of the cable and shall be of plastic material.

PART 3 - EXECUTION

3.01 CABLE INSTALLATION

A. Clean Raceways - Clean all raceways prior to installation of cables as specified in Section 26 05 33 - Conduits Raceway and Fittings.

B. Cable Pulling - Exercise care in pulling wires and cables into conduit or wireways so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables. Only soapstone, talc, or UL listed pulling compound will be permitted. The raceway construction shall be complete and protected from the weather before cable is pulled into it. Swab conduits before installing cables and exercise care in pulling, to avoid damage to conductors.

C. Bending Radius - Cable bending radius shall be per applicable code. Install feeder cables in one continuous length.

D. Equipment Grounding Conductors - Provide an equipment grounding conductor, whether or not it is shown on the Drawings, in all conduits or all raceways.

E. Panelboard Wiring - In panels, bundle incoming wire and cables which are No. 6 AWG and smaller, lace at intervals not greater than 6 inches, neatly spread into trees and connect to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Perform lacing with plastic cable ties or linen lacing twine. Where plastic panel wiring duct is provided for cable runs, lacing is not necessary when the cable is properly installed in the duct.

F. Provide #10awg conductors for all 20 amp 120v branch circuits over 100 feet.

3.02 CABLE TERMINATIONS AND SPLICES

A. Splices - UL Listed wirenuts.

B. Terminations - Shall comply with the following:

1. Make up and form cable and orient terminals to minimize cable strain and stress on device being terminated on.

2. Burnish oxide from conductor prior to inserting in oxide breaking compound filled terminal.

3.03 CIRCUIT AND CONDUCTOR IDENTIFICATION

A. Color Coding - Provide color coding for all circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. Ungrounded conductor colors shall be as follows:

VOLTAGE	208/120V	480/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

B. Color coding shall be in the conductor insulation for all conductors #10 AWG and smaller; for larger conductors, color shall be either in the insulation or in colored plastic tape applied at every location where the conductor is readily accessible.

C. Circuit Identification - All underground distribution and service circuits shall be provided with plastic identification tags in each secondary box and at each termination. Tags shall identify the source panel and transformer of the circuit and the building number(s) serviced by the circuit.

3.04 FIELD TESTS

A. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show an insulation resistance between phase conductors and ground of not less than the requirements of the CEC. All circuits shall be tested for proper neutral connections.

B. Cables are required to have a megger testing completed with a report of results submitted to the Engineer for approval.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section consists of furnishing, installing, connection and testing of all grounding systems as specified herein and as shown on the Drawings.

1.02 RELATED WORK

A. See the following specification sections for work related to work in this section.

1. Section 26 05 10- Electrical General Requirements.

2. Section 26 05 19- Low Voltage Wire and Cable

1.03 SUBMITTALS: In accordance with Section 26 05 10 Submittals.

A. Submit manufacturer's literature for review.

1.04 STANDARDS AND CODES

A. American Society for Testing and Materials (ASTM) Publication:

1. B8-1986, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

2. B228-1988, Copper Clad Steel Conductors Specification.

B. The latest editions following applicable codes:

1. California Electrical Code (CEC).

2. Occupational Safety and Health Act (OSHA) standards.

3. All applicable local codes, rules and regulations.

1.05 QUALITY ASSURANCE

A. Each and every concealed connection must be inspected by the Owner's Representative before it is covered up by the Contractor.

PART 2 - PRODUCTS

2.01 GENERAL

A. The grounding system shall consist of the grounding conductors, ground bus, ground fittings and clamps, and bonding conductors as shown on the Drawings and as required by codes and local authorities.

2.02 SYSTEM COMPONENTS

A. Ground Rods: Ground rods shall be cone pointed copper clad Grade 40 HS steel rods conforming to ASTM B228. The welded copper encased steel rod shall have a conductivity of not less than 27% of pure copper. Rods shall be not less than 3/4-inch in diameter and ten feet long, unless otherwise indicated. Rods longer than ten feet shall be make up of ten foot units joined together with threaded couplings. The manufacturer's trademark shall be stamped near the top.

B. Ground Conductors: Buried conductors shall be medium-hard drawn bare copper; other conductors shall be soft drawn copper. Sizes over No. 6 AWG shall be stranded conforming to ASTM B8. In all conduit runs, a green insulated copper ground wire, sized to comply with codes, shall be installed.

C. Ground Connections: Exposed ground connections shall be high copper alloy bolted pressure types or exothermically welded type as notes. Buried connections shall be either exothermically welded type or approved compression types for connection of copper to copper or copper to steel, as required. Lug for attachment of cables to steel enclosures shall be of the binding post type with a 1/2-13NC stud. Each post shall accommodate cables from #4 AWG to #2/0 AWG.

D. Ground Rod Boxes: Boxes shall be nine-inch diameter precast concrete units with cast iron traffic covers. Units shall be 12 inches deep. Covers shall be embossed with the wording "Ground Rod".

E. Ground Bus: 2" x 1/4" x (length as specified on drawings) copper busbar. Provide isolation stand off bushings. Provide drilled and tapped 3/8" diameter holes on 2 foot centers. Provide "ALCU" lugs and bronze bolts. Connect busbar to main grounding system and bond to metallic domestic cold water pipe with #8 ground conductor.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground all equipment, including, but not limited to, panel boards, terminal cabinets and outlet boxes, for which a ground connection is required per the NEC, even though not specifically shown on the Drawings.

B. The ground pole of receptacles shall be connected to their outlet boxes by means of a copper ground wire connecting to a screw in the back of the box.

C. Provide a ground rod box for each ground rod so as to permit ready access for the connection and/or removal of any pressure connectors to facilitate testing.

D. Where ground rods must be driven to depths over ten feet, increase rod diameter used, sufficiently to prevent the rod from bending or being damaged.

E. Make embedded or buried ground connections, taps and splices with exothermically welded connections or approved compression type connectors.

F. Make connections of grounding conductors to equipment ground buses and enclosures using binding post type connectors.

G. Effectively bond structural steel for buildings to the grounding system, "UFER" ground.

H. Install a ground rod in each primary handhole. Connect the ground conductor installed for each primary duct bank to the ground rod in each handhole. Bond metal conduits to handhole ground rod.

3.02 TESTING

A. Conduct ground resistance tests using a ground resistance tester with a scale reading of 25 ohms maximum.

B. Test methods shall conform to IEEE Standard 81 using the three electrode method. Conduct test only after a period of not less than 48 hours of dry weather.

C. Take resistance readings for each ground rod individually and for each system as a whole without benefit of chemical treatment or other artificial means. Ground resistance readings shall not exceed 25 ohms. If readings are not to the Contracting Officer's approval, provide lengthened or additional ground rods (maximum of two additional rods).

D. Furnish to the Owner's Representative a test report with recorded data of each ground rod location and each system.

END OF SECTION

SECTION 26 05 33

CONDUITS, RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section consists of furnishing and installing conduits, raceways and fittings as shown on the Drawings and as described herein.

1.02 RELATED WORK

A. See the following specification sections for work related to the work in this section:

1. Section 26 05 35 - Underground Ducts.
2. Section 26 05 19 - Low Voltage Wire and Cable.
3. Section 26 05 34 - Junction and Pull Boxes

1.03 SUBMITTALS

A. As specified in Division 1.

1. Catalog Data: Provide manufacturer's descriptive literature.
2. Single Submittal: A single complete submittal is required for all products covered by this Section.

PART 2 - PRODUCTS

2.01 CONDUITS, RACEWAYS

A. Electrical Metallic Tubing (EMT) shall be hot-dip galvanized after fabrication. Couplings shall be compression or setscrew type.

B. Flexible Conduit: Flexible metal conduit shall be galvanized steel.

C. Liquid Tight Flexible Metal Conduit (LFMC) shall be galvanized steel strip helically wound with nylon sealing cord with smooth surface flexible PVC covering.

D. Galvanized Rigid Steel Conduit (GRS) shall be hot-dip galvanized after fabrication. Couplings shall be threaded type.

E. Rigid Non-metallic Conduit: Rigid non-metallic conduit shall be PVC Schedule 40 (PVC-40) or NEMA Type EPC-40) conduit approved for underground use and for use with 90°C wires.

F. The use of “MC Cable shall not be permitted without written approval.

2.02 CONDUIT SUPPORTS

A. Supports for individual conduits shall be galvanized malleable iron one-hole type with conduit back spacer.

B. Supports for multiple conduits shall be hot-dipped galvanized Unistrut or Superstrut channels, or approved equal. All associated hardware shall be hot-dip galvanized.

C. Supports for EMT conduits shall be galvanized pressed steel single hole straps.

D. Clamp fasteners shall be by wedge anchors. Shot in anchors shall not be allowed.

2.03 Fittings

A. Provide threaded-type couplings and connectors for rigid steel conduits. Provide compression (watertight) steel type (die-cast zinc or malleable iron type fittings not allowed), or setscrew type for EMT. Provide threaded couplings and Meyers hubs for rigid steel conduit exposed to weather.

B. Fittings for flexible conduit shall be Appleton, Chicago, IL, Type ST, O-Z Gedney Series 4Q by General Signal Corp., Terryville, CT, T & B 5300 series, or approved equal.

C. Fittings for liquid tight flexible metal conduit shall be by Appleton, O-Z Gedney or Thomas and Betts. Fittings shall be zinc plated malleable iron or aluminum.

D. Fittings for use with rigid steel shall be galvanized steel or galvanized cast ferrous metal; access fittings shall have gasketed cast covers and be Crouse Hinds Condulets, Syracuse, NY, Appleton Unilets, Chicago, IL, or approved equal. Provide threaded-type couplings and connectors; setscrew type and compression-type are not acceptable.

E. Fittings for use with rigid non-metallic conduit shall be PVC and have solvent-weld-type conduit connections.

F. Union couplings for conduits shall be the Erickson type and shall be Appleton, Chicago, IL, Type EC, O-Z Gedney 3-piece Series 4 by General Signal Corp., Terryvile, CT, or approved equal. Threadless coupling shall not be used.

G. Bushings

1. Bushings shall be the insulated type.
2. Bushings for rigid steel shall be insulated grounding type, O-Z Gedney Type HBLG, Appleton Type GIB, or approved equal.

H. Conduit Sealants

1. Fire Retardant Types: Fire stop material shall be reusable, non-toxic, asbestos-free, expanding, putty type material with a 3-hour rating in accordance with UL Classification 35L4 or as specified on the Drawings.

PART 3 - EXECUTION

3.01 CONDUIT, RACEWAY AND FITTING INSTALLATION

A. For conduit runs exposed to weather provide rigid metal (GRS).

B. For conduit run underground, in concrete or masonry block walls and under concrete slabs, install minimum ¾" size nonmetallic (PVC) with PVC elbows. Where conduits transition from underground or under slab to above grade install wrapped rigid metal (GRS) elbows and risers.

C. For conduit runs concealed in steel or wood framed walls or in ceiling spaces or exposed in interior spaces above six feet over the finished floor, install EMT.

D. Interior conduits installed exposed on the wall below six feet shall be galvanized rigid steel (GRS).

E. Flexible metal conduit shall be used only for the connection of recessed lighting fixtures and motor connections unless otherwise noted on the Drawings. Liquid-tight steel flexible conduit shall be used for motor connections.

F. The minimum size raceway shall be 3/4-inch unless indicated otherwise on the Drawings.

G. Installation shall comply with the CEC.

H. From pull point to pull point, the sum of the angles of all of the bends and offset shall not exceed 270 degrees.

I. Conduit Supports: Properly support all conduits as required by the NEC. Run all conduits concealed except where otherwise shown on the drawings.

1. Exposed Conduits: Support exposed conduits within three feet of any equipment or device and at intervals not exceeding NEC requirements; wherever possible, group conduits together and support on common supports. Support exposed conduits fastened to the surface of the concrete structure by one-hole clamps, or with channels. Use conduit spacers with one-hole clamps.
   a. Conduits attached to walls or columns shall be as unobtrusive as possible and shall avoid windows. Run all exposed conduits parallel or at right angles to building lines.
   b. Group exposed conduits together. Arrange such conduits uniformly and neatly.
2. Support all conduits within three feet of any junction box, coupling, bind or fixture.
3. Support conduit risers in shafts with Unistrut Superstrut, or approved equal, channels and straps.

H. Moisture Seals: Provide in accordance with NEC paragraphs 230-8 and 300-5(g).

I. Where PVC conduit transitions from underground to above grade, provide rigid steel 90's with risers. Rigid steel shall be half-lap wrapped with 20-mil tape and extend minimum 12" above grade.

J. Provide a nylon pull cord in each empty raceway.

K. Provide galvanized rigid steel factory fittings for galvanized rigid steel conduit.

L. Slope all underground raceways to provide drainage; for example, slope conduit from equipment located inside a building to the pull box or manhole located outside the building.

M. Conduits shall be blown out and swabbed prior to pulling wires.

END OF SECTION

SECTION 26 05 34

JUNCTION AND PULL BOXES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this Section consists of providing all required labor, supervision, materials and equipment to satisfactorily complete all electrical installations shown on the drawings, included in these Specification, or otherwise needed for a complete and fully operating facility. The work shall include but not be limited to the following:

B. Furnish and install all required material, supports and miscellaneous material for the satisfactory interconnection of all associated electrical systems.

1.02 RELATED WORK

A. See the following specification sections for work related to the work of this section.

1. Section 26 05 10 - General Electrical Requirements.

2. Section 26 05 33 - Conduits, Raceway and Fittings.

3. Section 26 05 19 - Low Voltage Wire and Cable.

1.03 STANDARDS AND CODES

A. Submit in accordance with the requirements of Section 16010: Electrical General Provisions, the following items:

1. Pull boxes larger than 6"x 6"x 4".

PART 2 - PRODUCTS

2.01 OUTLET BOXES, JUNCTION AND PULL BOXES

A. Standard Outlet Boxes: Galvanized, one-piece die formed or drawn steel, knock-out type of size and configuration best suited to the application indicated on the Drawings. Minimum box size shall be 4 inches square by 1-1/2 inches deep with mud rings as required.

B. Switch boxes: Minimum box size shall be 4 inches square by 1-1/2 inches deep with mud rings as required. Install multiple switches in standard gang boxes with raised device covers suitable for the application indicated.

C. Conduit bodies: Cadmium plated, cast iron alloy. Conduit bodies with threaded conduit hubs and neoprene gasketed, cast iron covers. Bodies shall be used to facilitate pulling of controls or to make changes in conduit direction only. Splices are not permitted in conduit bodies. Crouse-Hinds Form 8 Condulets, Appleton Form 35 Unilets or equal.

D. Sheet Metal Boxes: Use standard outlet or concrete ring boxes wherever possible; otherwise use a minimum 16 gauge galvanized sheet metal, NEMA I box sized to Code requirements with covers secured by cadmium plated machine screws located six inches on centers. Circle AW Products, Hoffman Engineering Company or equal.

E. lush Mounted Pull boxes and Junction boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

PART 3 - EXECUTION

3.01 OUTLET BOXES

A. General

1. All outlet boxes shall finish flush with building walls, ceilings and floors except in mechanical and electrical rooms above accessible ceiling or where exposed work is called for on the Drawings.

2. Install raised device covers (plaster rings) on all switch and receptacle outlet boxes installed in masonry or stud walls or in furred, suspended or exposed concrete ceilings. Covers shall be of a depth to suit the wall or ceiling finish.

3. Leave no unused openings in any box. Install close-up plugs as required to seal openings.

B. Box Layout

1. Outlet boxes shall be installed at the locations and elevations shown on the drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.

2. Locate switch outlet boxes on the latch side of doorways.

3. Outlet boxes shall not be installed back to back nor shall through-wall boxes be permitted.

4. For outlets mounted above counters, benches or backsplashes, coordinate location and mounting heights with built-in units. Adjust mounting height to agree with required location for equipment served.

C. Supports

1. Outlet Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on specified box supports.

2. Fixture outlet boxes installed in suspended ceiling of gypsum board or lath and plaster construction shall be mounted to 16 gauge metal channel bars attached to main ceiling runners.

3. Fixture outlet boxes installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structure above where pendant mounted lighting fixture are to be installed on the box.

4. Fixture Boxes above tile ceilings having exposed suspension systems shall be supported directly from the structure above.

5. Outlet and / or junction boxes shall not be supported by grid or fixture hanger wires at any locations.

3.02 JUNCTION AND PULL BOXES

A. General

1. Install junction or pull boxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Note that these boxes are not shown on the Drawings.

2. Locate pull boxes and junction boxes in concealed locations above removable ceilings or exposed in electrical rooms, utility rooms or storage areas.

3. Install raised covers (plaster rings) on boxes in stud walls or in furred, suspended or exposed concrete ceilings. Covers shall be of a depth to suit the wall or ceiling finish.

4. Leave no unused openings in any box. Install close-up plugs as required to seal openings.

5. Identify circuit numbers and panel on cover of junction box with black marker pen.

B. Box Layouts

1. Boxes above hung ceilings having concealed suspension systems shall be located adjacent to openings for removable recessed lighting fixtures.

C. Supports

1. Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on specified box supports.

2. Boxes installed in suspended ceilings of gypsum board or lath and plaster construction shall be mounted to 16 gauge metal channel bars attached to main ceiling runners.

3. Boxes installed in suspended ceilings supporting acoustical tiles or panels shall be supported directly from the structure above.

4. Boxes mounted above suspended acoustical tile ceilings having exposed suspension systems shall be supported directly from the structure above.

END OF SECTION

SECTION 26 05 35

UNDERGROUND DUCTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section consists of furnishing and installing raceways, raceway spacers and encasing material with necessary excavation for underground ducts.

B. Encasement - Encasement shall be sand for all other raceways.

C. Where required - All raceways, where run underground in and excavation shall be installed in compliance with the requirements of this Section. Conduits run underground without encasement shall be as indicated in the Drawings.

1.02 RELATED WORK

A. See the following specification sections for work related to the work of this section.

1. Section 26 05 33 - Conduit Raceway and Fittings

1.03 STANDARDS AND CODES

A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.

B. National Fire Protection Association (NFPA), National Electrical Code (NEC) - Latest Revision:
1. Underground Installations NEC - Article 300
2. Rigid Nonmetallic Conduit NEC - Article 347

C. California Electrical Code (CEC).

D. Construction of Underground Electric Supply and Communication Systems, State of California Public Utilities Commission, General Order No. 128.

1.04 SUBMITTALS

A. As specified in Division 1 and Section 26 05 10.

B. Catalog Data: Provide manufacturer's descriptive literature.

C. Single Submittal: A single complete submittal is required for all products covered by this Section.

PART 2 - PRODUCTS

2.01 RACEWAYS

A. As specified in Section 26 05 33 Conduits, Raceways and Fittings.

2.02 SPACERS

A. Molded plastic as furnished by the raceway manufacturer, to cradle and position the raceways in the excavation for placing the encasement.

B. Shape to accurately fit the raceway, provide the correct raceway spacing, to interlock in place and stack.

PART 3 - EXECUTION

3.01 RACEWAY

A. Install raceways in spacers. Spacers installed at intervals of five feet and within one inch each side of all bends and joints.

B. Solvent weld connections.

END OF SECTION

SECTION 26 05 44

IN GRADE PULL BOXES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section consists of providing all labor, supervision, tools, materials, and performing all work necessary to furnish and install pre-cast concrete vaults, and pull boxes with necessary excavation.

1.02 RELATED WORK

A. See the following specification sections for work related to the work of this section.
1. 31 23 00 Excavation and Backfill.
2. 32 13 13 Portland Cement Concrete.
3. 26 05 43 Underground Ducts.

1.03 STANDARDS AND CODES

A. Work and material shall be in compliance with and according to the requirements of the latest revision of the following standards and codes.
1. National Fire Protection Association (NFPA), National Electrical Code (NEC) - Latest Revision.
2. California Electrical Code (CEC).
3. American Society for Testing and Materials (ASTM):
a. A 185 - Welded Steel Wire Fabric for Concrete Reinforcement.
b. A 615 - Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.
c. C 33 - Concrete Aggregates.
d. C 478 - Pre-cast Reinforced Concrete Vault Sections, Specification for.

1.04 SUBMITTALS

As specified in Division 1 and Section 26 05 10.

A. Catalog Data: Provide manufacturer's descriptive literature.

B. Single Submittal: A single complete submittal is required for all products covered by this Section.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. General Requirements

1. Concrete vaults and pull boxes for electrical power, controls and other communication circuits shall consist of pre-cast reinforced concrete boxes, extensions' bases, and covers as specified herein and as indicated on the Drawings. Pre-cast units shall be the product of a manufacturer regularly engaged in the manufacture of pre-cast vaults and pull boxes. Acceptable manufacturers are Christy, Utility Vault, Brooks, Associated Concrete or equal.

B. Construction

1. Pre-cast concrete vaults and pull boxes for electrical power distribution and communication circuits with associated risers and tops shall conform to ASTM C478 and ACI 318. Vaults and

pull boxes shall be the type noted on the Drawings and shall be constructed in accordance with the applicable details as shown. Tops, walls and bottoms shall consist of reinforced concrete. Walls and bottom shall be of monolithic concrete construction. Duct entrances and windows shall be located near the corners of structures to facilitate cable racking. Provide all necessary lugs, rabbets, and brackets. Set pulling-in irons and other built-in items in place prior to pouring concrete. A pulling-in iron shall be installed in the wall opposite each duct entrance. All steel other than "rebar" shall be hot dipped galvanized after fabrication.

C. Cable Racks

1. Vaults shall be provided with galvanized cable racks, including rack arms and insulators, and shall be adequate to accommodate the indicated cables; porcelain insulators shall be provided for electrical vaults only.

D. Covers

1. The word "ELECTRICAL" shall be cast in the top face of all electrical power vault and cable boxes.
2. The words "FIRE ALARM" shall be cast in the top face of all fire alarm vault and cable boxes.
3. The word "SIGNAL" shall be cast in the top face of all telecom, intercom, CATV, data, EMS, security and/or clock vault and cable boxes.

E. Sumps

1. Where indicated on the drawings, drain sumps shall be provided.

F. Concrete

1. Aggregates used in the concrete mix, either coarse or fine, excluding light weight aggregates, shall conform to ASTM C 33. Aggregates shall be properly graded and free of deleterious substances to produce a homogeneous concrete mix when blended with cement.

G. Cement

1. The cement shall be Type II low alkali Portland cement and shall meet the requirement of ASTM C 150.

H. Compressive Strength

1. Sufficient cement content shall be used per batch to produce a minimum compressive strength of 3,000 psi at 28 days.

I. Reinforcing Steel

1. Welded wire mesh for street lighting boxes shall conform to ASTM A 185.
2. Reinforcing bars for primary and secondary electrical vaults and pull boxed, and communication vaults and pull boxes shall be intermediate grade billet steel conforming to ASTM A 615.

J. Ladders

1. Ladders for vaults shall be sized as required, stationary galvanized steel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Pre-cast vaults and pull boxes shall be installed approximately where indicated on the Drawings. The exact location of each vault or pull box shall be determined after careful consideration has been given to the location of other utilities, grading, and paving. All vaults, cable boxes and secondary pull boxes shall be installed with a minimum of 6-inch thick crushed rock or sand bedding.

B. Paved areas

1. Vaults and pull boxes located in areas to be paved shall be installed such that the top of the cover shall be flush with the finished surface of the paving.

C. Unpaved Areas

1. In unpaved areas, the top of vaults and pull box covers shall be approximately 2 inches above finished grade.

D. Joint Seals

1. Section joints of pre-cast vaults and pull boxes shall be sealed with compound as recommended by the manufacturer.

E. Trenching, Backfilling, and Compaction

1. Trenching, backfilling and compaction shall be as specified in Section 02200 - Excavation and Backfill.

F. Grounding

1. Ground rods an associated copper ground loop shall be installed in all vaults. Ground loop shall be properly connected to the cable shielding, at each cable joint or splice by means of a minimum number 4 AWG or equivalent braided tinned copper wire. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of two inches above and six inches below concrete penetrations. Ground wires shall be neatly and firmly attached to vault cable support racks.

END OF SECTION

SECTION 26 05 73.11

SHORT-CIRCUIT/COORDINATION STUDY/ARC FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.01 SCOPE

A. The contractor shall furnish short-circuit and protective device coordination studies which shall be prepared by the equipment manufacturer.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.

C. Related sections

1. Section 16016 – Arc Flash Hazard Analysis Study

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
6. IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations

B. American National Standards Institute (ANSI):

1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories
5. ANSI C37.5 – Methods for Determining the RMS Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents

C. The National Fire Protection Association (NFPA)

1. NFPA 70 - National Electrical Code, latest edition
2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.03 SUBMITTALS FOR REVIEW/APPROVAL

A. The short-circuit and protective device coordination studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

1.04 SUBMITTALS FOR CONSTRUCTION

A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Additional copies, where required, shall be provided on CD in PDF format.

B. The report shall include the following sections:

1. One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations

2. Descriptions, purpose, basis and scope of the study

3. Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings

4. Protective device time versus current coordination curves with associated one-line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings

5. Multi-function relay setting file printouts including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.

6. Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout

7. Incident energy and flash protection boundary calculations

8. Comments and recommendations for system improvements, where needed

9. Executive Summary including source of information and assumptions made

1.05 QUALIFICATIONS

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies. The Registered Professional Electrical Engineer shall be a full-time employee of the Engineering Services Organization.

PART 2 - PRODUCT

2.01 STUDIES

A. Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer. By using the equipment manufacturer the study allows coordination of proper breakers, fuses, and current transformers. The coordination study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and include the largest feeder circuit breaker and motor starter in the 480 Volt motor control centers and power distribution panelboards. The study shall also include variable frequency drives, harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency and standby generators associated paralleling equipment and distribution switchgear.

B. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.

2.02 DATA COLLECTION

A. Contractor shall furnish all field data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source combination may include present and future utility supplies, motors, and generators.

C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner or Contractor.

D. Include fault contribution of existing motors in the study, with motors < 50 hp grouped together. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.03 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standards 141, latest edition.

B. Transformer design impedances and standard X/R ratios shall be used when test values are not available.

C. Provide the following:

1. Calculation methods and assumptions

2. Selected base per unit quantities

3. One-line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted

4. Source impedance data, including electric utility system and motor fault contribution characteristics

5. Typical calculations

6. Tabulations of calculated quantities

7. Results, conclusions, and recommendations

D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:

1. Electric utility's supply termination point
2. Incoming switchgear
3. Unit substation primary and secondary terminals
4. Low voltage switchgear
5. Motor control centers
6. Standby generators and automatic transfer switches
7. Branch circuit panelboards
8. Other significant locations throughout the system

E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

F. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings
2. Adequacy of switchgear, motor control centers, and panelboard bus bracing to withstand short-circuit stresses
3. Adequacy of transformer windings to withstand short-circuit stresses
4. Cable and busway sizes for ability to withstand short-circuit heating
5. Notify Owner in writing, of existing, circuit protective devices improperly rated for the calculated available fault current

2.04 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.

B. Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.

D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the curve sheets, where applicable:

1. Electric utility's protective device
2. Medium voltage equipment relays
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
5. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters

6. Conductor damage curves

7. Ground fault protective devices, as applicable

8. Pertinent motor starting characteristics and motor damage points

9. Pertinent generator short-circuit decrement curve and generator damage point

10. Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Select each primary protective device required for a delta-wye connected transformer so that the characteristics or operating band is within the transformer parameters which includes a parameter equivalent to 58% of the ANSI withstand point to afford protection for secondary line-to-ground faults.

H. Separate low voltage power circuit breakers from each other and the associated primary protective device by a 16% current margin for coordination and protection in the event of secondary line-to-line faults.

I. Engineer shall provide settings file printouts for all multifunction relays supplied under this contract including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.

2.05 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2012, Informative Annex D.

B. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.

C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

D. The Arc-Flash Hazard Analysis shall include all MV, 575v, & 480v locations and significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.

E. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm^2.

F. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

G. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

H. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.

2.06 REPORT SECTIONS

A. Input Data:

1. Utility three-phase and line-to-ground available contribution with associated X/R ratios
2. Short-circuit reactance of rotating machines with associated X/R ratios
3. Cable type, construction, size, # per phase, length, impedance and conduit type
4. Bus duct type, size, length, and impedance
5. Transformer primary & secondary voltages, winding configurations, kVA rating, impedance, and X/R ratio
6. Reactor inductance and continuous ampere rating
7. Aerial line type, construction, conductor spacing, size, # per phase, and length

B. Short-Circuit Data:

1. Source fault impedance and generator contributions
2. X to R ratios
3. Asymmetry factors
4. Motor contributions
5. Short circuit kVA
6. Symmetrical and asymmetrical fault currents

C. Recommended Protective Device Settings:

1. Phase and Ground Relays:
    a. Current transformer ratio.
    b. Current setting.
    c. Time setting.
    d. Instantaneous setting.
    e. Specialty non-overcurrent device settings.
    f. Recommendations on improved relaying systems, if applicable.
2. Circuit Breakers:
    a. Adjustable pickups and time delays (long time, short time, ground).
    b. Adjustable time-current characteristic.
    c. Adjustable instantaneous pickup.
    d. Recommendations on improved trip systems, if applicable.

D. Incident energy and arc flash boundary calculations.

1. Arcing fault magnitude

2. Device clearing time

3. Duration of arc

4. Arc flash boundary

5. Working distance

6. Incident energy

7. Recommendations for arc flash energy reduction

PART 3 - EXECUTION

3.01 FIELD ADJUSTMENT

A. Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. Notify Owner in writing of any required major equipment modifications.

D. Following completion of all studies, acceptance testing and startup by the field engineering service division of the equipment manufacturer, a 2-year warranty shall be provided on all components manufactured by the engineering service parent manufacturing company.

3.02 ARC FLASH WARNING LABELS

A. The vendor shall provide a 4 in. x 4 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The label shall have an orange header with the wording, “WARNING, SHOCK & ARC FLASH HAZARD”, and shall include the following information:

1. Location designation

2. Nominal voltage

3. Arc flash boundary

4. Incident energy

5. Working distance

6. Shock Boundaries

7. Engineering report number, revision number and issue date

C. Labels shall be machine printed, with no field markings

D. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

1. For each 600, 480 and applicable 208 volt panelboards and disconnects, one arc flash label shall be provided

2. For each motor control center, one arc flash label shall be provided

3. For each low voltage switchboard, one arc flash label shall be provided

4. For each switchgear, one flash label shall be provided

5. For medium voltage switches one arc flash label shall be provided

E. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

3.03 ARC FLASH TRAINING

A. The equipment vendor shall train personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard For Electrical Safety Requirements For Employee Workplaces, shall be provided in the equipment manuals. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET).

[END OF SECTION 26 05 73.11]

SECTION 26 22 13

ENERGY EFFICIENT LIGHTING AND DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section consists of providing dry-type energy efficient transformers per NEMA TP1, with primary and secondary voltages of 600V and less and capacity ratings 15kVA through 750kVA as shown on Drawings and as described in this section.

1.02 RELATED WORK

A. See the following specification sections for work related to the work in this section.

1. Section 26 05 19 - Line Voltage Wire and Cable.
2. Section 26 05 26 - Grounding.

1.03 SUBMITTALS: In accordance with Division 1.

A. Shop Drawings: Submit manufacturer's name and nameplate data as follows:

1. KVA rating.
2. Nominal primary voltage.
3. Tap voltages.
4. Nominal secondary voltage.
5. Percent impedance.
6. Weight.
7. Physical dimensions and mounting requirements.

B. Submit manufacturer's guaranteed no-load loss value for transformer.

C. Suppliers asking consideration as an approved equal shall submit complete, warranted performance data and physical dimensions for similar transformers. Data shall be submitted for each size specified, and shall be received by the consultant engineer no less than 10 days prior to the bid due date for consideration.

D. Operation and Maintenance Data: Submit the manufacturer's operation and maintenance data in accordance with Division 1. Copies of the factory and field test reports shall be included in this submittal.

1.04 FACTORY TESTING

A. Tests on transformers shall include the manufacturer's standard tests, including winding resistance, ratio, polarity, phase relation, no-load loss, impedance, full load losses, and dielectric tests. Certified copies shall show compliance with all referenced standards.

PART 2 - PRODUCTS

2.01 ENERGY EFFICIENT DRY TYPE TRANSFORMER

A. All insulating materials are to exceed NEMA ST20 standards and be rated for 220°C UL component recognized insulation system.

B. Transformers 15kVA and larger shall be 150°C temperature rise above 40°C ambient. Transformers 25kVA and larger shall have a minimum of 4 - 2.5% full capacity primary taps. Exact voltages and taps to be as designated on the plans or the transformer schedule.

C. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.

D. Transformers shall be low loss type with minimum efficiences per NEMA TP1 when operated at 35% of full load capacity. Efficiency shall be tested in accord with NEMA TP2.

Single Phase		Three Phase	
kVA	Efficiency	kVA	Efficiency
15	97.7%	15	97.0%
25	98.0%	30	97.5%
37.5	98.2%	45	97.7%
50	98.3%	75	98.0%
75	98.5%	112.5	98.2%
100	98.6%	150	98.3%
167	98.7%	225	98.5%
250	98.8%	300	98.6%
333	98.9%	500	98.7%
		750	98.8%

E. The transformer(s) shall be rated as indicated in the following schedule

Identification Number(s)

kVA Rating

Voltages

Phase

F. Transformer coils shall be of the continuous wound construction and shall be impregnated with nonhygroscopic, thermosetting varnish.

G. All cores to be constructed with low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point to prevent core overheating. Cores for transformers greater than 500kVA shall be clamped utilizing insulated bolts through the core laminations to ensure proper pressure throughout the length of the core. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.

H. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.

I. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degeasing, cleaning and phosphatizing, followed by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

J. Sound levels shall be warranted by the manufacturer not to exceed the following:

15 to 50KVA - 45dB;
51 to 150kVA - 50dB;
151 to 300kVA - 55dB;
301 to 500kVA - 60dB;
501 to 700kVA - 62dB;
701 to 1000kVA - 64dB;
1001 to 1500kVA - 65dB;
1501 to 2000kVA- 66dB

K. Transformers installed outdoors shall be NEMA 3R, unless otherwise noted on the Drawings.

L. Dry-type energy efficient transformer shall be as manufactured by Square D or approved equal.

PART 3 - EXECUTION

3.01 TRANSFORMER INSTALLATION

A. Transformer shall be where indicated on the Drawings. Indoor transformers shall have code and manufacturers recommended clearances from adjacent walls. In no case should this clearance be less than six inches.

B. Transformer shall be connected with flexible liquid tight metallic conduit to prevent the transmission of sound through the conduit system. All transformers shall be installed on resilient vibration-isolating mounting pads.

C. Transformer neutral grounding shall be sized in accordance with requirements for separately derived systems and shall be connected to the nearest cold water pipe with supplementary driven ground. Ground rod and connections shall be as detailed in Section 16060.

3.02 FIELD TESTS

A. Insulation-Resistance Tests: 480 volt windings shall be testing with a 1000 volt megohm meter; 208 or 240 shall be test with a 500 volt megohm meter. All tests shall be applied for not less than 5 minutes and until three consecutive readings, one minute part, are obtain. Readings shall be recorded every 30 seconds for the first two minutes and every minute thereafter.

B. Acceptance: Acceptance with be based on satisfactory completion of the insulation resistance tests.

END OF SECTION

SECTION 26 24 16

PANELBOARDS AND DISTRIBUTION PANELS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this Section consists of providing panelboards and circuit breakers as shown on the Drawings and as described herein.

1.02 RELATED WORK

A. See the following specification sections for work related to the work in this Section.

1. Section 26 05 10 - General Electrical Requirements
2. Section 26 05 26 - Grounding
3. Section 26 05 19 - Line Voltage Wire and Cable
4. Section 26 28 16 - Circuit Breakers

1.03 SUBMITTALS

A. Shop Drawings - As specified in Division 1 and Section 26 05 10. For each panelboard and distribution panels furnished under this Contract, submit manufacturer's name, catalog data, and the following information:

1. Panelboard / distribution panel type.
2. Main bus and terminal connection sizes.
3. Location of line connections.
4. Cabinet dimension.
5. Gutter space.
6. Gauge of boxes and fronts.
7. Finish data.
8. Voltage rating.
9. Breaker manufacturer, types, trip rating, and interrupting ratings.
10. When information is available on the Drawings, show breaker circuit numbers and locations along with trip ratings on a panelboard layout.

B. Single Submittal - A single complete submittal is required for all products covered by this Section.

C. Closeout Submittals: Submit operation and maintenance data for panelboards and circuit breakers including nameplate data, parts lists, factory and field-test reports, recommended maintenance procedures and typewritten as-built panel schedules. Submit in accordance with Division 1.

1.04 WARRANTY

A. Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (1) year from the date of installation or eighteen (18) months from the date of purchase.

PART 2 - PRODUCTS

2.01 PANELBOARDS

A. General: Lighting and Receptacle Panelboards shall be the automatic circuit breaker type. The number and arrangement of circuits, trip ratings, spares and blank spaces for future circuit breakers shall be as shown on the Drawings or, if not shown, 42 circuits. All circuit breakers shall be quick-make, quick-break, thermal-magnetic bolt-on type, with 1, 2 or 3 poles as shown, each with a single operating handle. Tandem or piggyback breakers shall not be used.

B. Nameplates

1. Each panelboard shall have a field mounted identifying, rigid, plastic nameplate giving the panel identification as shown on the Drawings. Nameplates shall be laminated with black characters minimum 3/16" high on a white laminated background. Nameplates shall be attached with screws.

2. Each panelboard shall have a manufacturer's nameplate showing the voltage, bus rating, number of phases, frequency and number of wires.

C. Construction

1. Door and trim shall be finished to match color of surrounding wall. Box shall be hot-dip galvanized, field finished to match the front.

2. Panelboards and enclosures shall conform to requirements of all relevant codes. Panelboards shall be suitable for use as service equipment.

3. Panelboards shall be furnished with door-in-door or hinged trim fronts with key latch, on inner door and a typed directory card and holder. Panelboard circuits shall be arranged with odd numbers on the left and even numbers on the right. Provide weatherproof, NEMA type 3R enclosures for outdoor installation.

D. Busbars: Panelboard busbars shall be phase sequence type suitable for bolt-on circuit breakers. All busbars shall be copper. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

1. Busbars shall be braced for the indicated short circuit level scheduled.

2. Busbars shall be installed completely throughout the panel for installation of both required and future breakers. Schedules indicate spaces for future breakers.

3. Busbars shall be designed so circuit breakers may be changed without machining, drilling or tapping.

4. Separate isolated Neutral and Ground busbars shall be provided. If called for on panel schedules, Neutral busbar may be oversized. Ground busbar shall be identified with green stripe and fully bonded to enclosure.

E. Circuit Breakers: Circuit breakers shall be the molded case type with trip and interrupting ratings as shown on the Drawings.

F. Series ratings shall not be allowed unless specifically noted on drawings.

G. Typed Circuit Directories: All panelboards shall have typed directories identifying all circuits installed behind plastic cover provided by the panelboard manufacturer.

H. Manufacturer

1. Panelboards shall be Square D, Siemens or approved equal.

2.02 DISTRIBUTION PANELS

A. General: Distribution panels shall be the automatic circuit breaker type. The number and arrangement of circuits, trip ratings, spares and blank spaces for future circuit breakers shall be as shown on the Drawings. All circuit breakers shall be quick-make, quick-break, thermal-magnetic

bolt-on type, with 1, 2 or 3 poles a shown, each with a single operating handle. Tandem or piggyback breakers shall not be used.

B. Nameplates

1. Each distribution board shall have a field mounted identifying, rigid, plastic nameplate giving the panel identification as shown on the Drawings. Nameplates shall be laminated with black characters minimum 3/16" high on a white laminated background. Nameplates shall be attached with screws.

2. Each distribution panel shall have a manufacturer's nameplate showing the voltage, bus rating, number of phases, frequency and number of wires.

C. Construction

1. Door and trim shall be finished to match color of surrounding wall. Box shall be hot-dip galvanized, field finished to match the front.

2. Distribution panels and enclosures shall conform to requirements of all relevant codes. Distribution panels shall be suitable for use as service.

3. Distribution panels shall have a front door with key latch and a typed directory card and permanently attached holder. Adhesive backed holders are not acceptable. Distribution panel's circuits shall be arranged with odd numbers on the left and even numbers on the right. Provide weatherproof, NEMA type 3R enclosures for outdoor installation.

D. Busbars: Distribution panel's busbars shall be phase sequence type suitable for bolt-on circuit breakers. All busbars shall be copper. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

1. Busbars shall be braced for the indicated short circuit level scheduled.

2. Busbars shall be installed completely throughout the panel for installation of both required and future breakers. Schedules indicate spaces for future breakers.

3. Busbars shall be designed so circuit breakers may be changed without machining, drilling or tapping.

4. Separate isolated Neutral and Ground busbars shall be provided. If called for on panel schedules, Neutral busbar may be oversized. Ground busbar shall be identified with green stripe and fully bonded to enclosure.

E. Circuit Breakers: Circuit breakers shall be the molded case type with trip and interrupting ratings as shown on the Drawings.

F. Series rating shall not be allowed unless specifically noted on drawings.

G. Manufacturer

1. Distribution panels shall be Square D, Siemens or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION: Panelboards and Distribution Panels shall be installed where indicated on the Drawings, and in accordance with the manufacturer's instructions.

3.02 INSTALLATION

A. Panelboards and Distribution Panels shall be installed with the top of the box 6'-6" above the floor. Panelboards and Distribution Panels shall be plumb within 1/8-inch. The highest breaker-operating handle shall not be higher than 72 inches above the floor.

B. Floor mounted Panelboards and Distribution Panels shall be installed on a concrete house keeping slab. The concrete slab shall be a minimum of 4" above finished floor, with minimum of 6" extension

beyond equipment. The concrete slab shall have a ½" chamfer. See Division 3 for concrete work requirements.

3.03 FIELD TESTS

A. Insulation Resistance Tests: Perform insulation resistance tests on circuits with #2 AWG and larger conductors to be energized with a line-to-neutral voltage of 120 volts or more. Make these tests after all equipment has been connected, except that equipment, which may be damaged by the test voltage, shall not be connected. Test the insulation with a 500Vdc insulation resistance tester with a scale reading 100 megohms. The insulation resistance shall be 2 megohms or more. Submit results for review.

B. Grounding: Grounding shall conform to Section 26 05 26.

C. Continuity: Panelboard and Distribution Panel circuits shall be tested for continuity prior to energizing. Continuity tests shall be conducted using a dc device with a bell or buzzer.

END OF SECTION

SECTION 26 27 26

DEVICES WIRING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this section consists of:

1. Furnishing, installing, and connecting all duplex receptacles complete with wall plates and/or covers, as shown on the Drawings.

2. Furnishing, installing and connecting all single pole and three-way switches complete with wall plates and or handle operators, as shown on the Drawings.

1.02 RELATED WORK

A. See the following specification sections for work related to the work of this section:

1. Section 26 05 33 - Conduits, Raceways and Fittings.

2. Section 26 05 19 - Low Voltage Wire and Cable.

3. Section 26 05 34 - Junction and Pull Boxes.

1.03 SUBMITTALS: As specified in Division 1.

A. Submit manufacturers published descriptive literature properly marked to identify the items to be supplied.

B. A single complete submittal is required for all products covered by this Section.

PART 2 - PRODUCTS

2.01 RECEPTACLES

A. General - Receptacles shall be heavy duty, high abuse, grounding type.

B. Duplex Receptacles

1. Receptacles shall be specification grade, rated 20 ampere, two-pole, 3-wire, 120 volt, NEMA 5-20 configuration, self-grounding with screw terminals. Color shall be ivory or as selected by the Architect.

2. Devices shall have a nylon composition face, back and side wired.

3. Manufacturer: Leviton #5362 Series, Hubbell #5362-I Series.

C. GFCI Receptacles

1. Device shall be Smart Lock with lockout action, rated 20 ampere, 2-pole, 3-wire, 120 volt, conforming to NEMA 5-20 configuration. Face shall be nylon composition. Unit shall have an LED type green indicator light, test and reset push buttons. Color shall be ivory unless otherwise noted.

2. GFCI component shall meet UL 2003 Class A standards with a tripping time of 1/40 second at 5 milliamperes current unbalance. Operating range shall extend from -31°F to 158°F. Unit shall have transient voltage protection and shall have a diagnostic indication for miswiring.

3. Manufacturer: Leviton #8898-I Series.

D. GFCI Blank Face Devices

1. Device shall be Smart Lock with lockout action, rated 20 ampere, 2-pole, 3-wire, 120 volt, blank face, dead front. Face shall be nylon composition. Unit shall have a test and reset push buttons. Color shall be ivory unless otherwise noted.

2. GFCI component shall meet UL 2003 Class A standards with a tripping time of 1/40 second at 5 milliamperes current unbalance. Operating range shall extend from -31°F to 158°F. Unit shall have transient voltage protection and shall have a diagnostic indication for miswiring.

3. Manufacturer: Leviton #8590-I Series.

E. Surge Suppression Receptacles

1. Device shall be rated 20 ampere, 2-pole, 3-wire, 120 volt. Face shall be nylon composition. Unit shall have an LED type "Power-on" indication light and damage-alert audible alarm. Color shall be ivory unless otherwise noted.

2. Surge suppression protection shall be listed to UL standard 1449 and shall instantly absorb a transient surge of 6,000 volts minimum. A minimum of four (4) Metal Oxide Varistors shall be utilized to absorb transients.

3. Manufacturer: Leviton #8380-I Series, Hubbell #HBL8362S Series.

2.02 SWITCHES

A. Switches shall be rated 20 amperes to 120/277 volts ac. Units shall be flush mounted, self-grounding, quiet operating toggle devices. Handle color shall be ivory or as selected by the Architect.

1. Manufacturer: Leviton #1221-2I Series, Hubbell #HBL1221 Series.

B. Timed switches: Shall be as designed by Paragon Electric Company # ET2000f, Watt Stopper TS-100 or Leviton # 6215M rated for the voltage specified on drawings. Time out shall be adjustable from 5 minutes up to 12 hours. Unit shall be provided with warning alarm.

C. Motion Sensor shall be dual technology as designed by Watt Stopper DT series. Use protective wire covers in restrooms, multi-use, cafeteria, etc.

2.03 PLATES

A. General - Plates shall be of the style and color to match the wiring devices, and of the required number of gangs. Plates shall conform to NEMA WD 1, UL 514 and FS W-P-455A. Plates on finished walls shall be non-metallic or stainless steel. Plates on unfinished walls and on fittings shall be of zinc plated steel or case metal and shall have rounded corners and beveled edges.

B. Non-Metallic: Plates shall be plain with beveled edges and shall be nylon or reinforced fiberglass.

C. Stainless Steel: Plates shall be .040 inches thick with beveled edges and shall be manufactured from No. 430 alloy having a brushed or satin finish.

D. Cast Metal: Plates shall be cast or malleable iron covers with gaskets so as to be moisture resistant or weatherproof.

E. Blank Plates: Cover plates for future telephone outlets shall match adjacent device wall plates in appearance and construction.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRING DEVICES

A. Interior Locations: In finished walls, install each device in a flush mounted box with washers as required to bring the device mounting strap level with the surface of the finished wall. On unfinished walls, surface mount boxes level and plumb.

B. Mounting Heights: Measure locations of wall outlets from the finished floor to the center of the outlet box. Adjust boxes so that the front edge of the box shall not be farther back from the finished wall plane than 1/4-inch. Adjust boxes so that they do not project beyond the finished wall. Height above finished floor to center of device unless otherwise noted on Drawings shall be as follows:

1. Receptacles 18 Inches above finished floor
2. Toggle Switches 48 Inches above finished floor

C. Receptacles

1. Ground each receptacle using a grounding conductor, not a yoke or screw contact.
2. Install receptacles with connections spliced to the branch circuit wiring in such a way that removal of the receptacle will not disrupt neutral continuity and branch circuit power will not be lost to other receptacles in the same circuit.

3.02 INSTALLATION OF WALL PLATES

A. General - Plates shall match the style of the device and shall be plumb within 1/16-inch of the vertical or horizontal.

B. Interior Locations, Finished Walls: Install non-metallic plates so that all four edges are in continuous contact with the finished wall surfaces. Plaster filling will not be permitted. Do not use oversized plates or sectional plates.

C. Interior Locations, Unfinished Walls: Install stainless steel or cast metal cover plates.

D. Exterior Locations: Install cast metal plates with gaskets on wiring devices in such a manner as to provide a rain tight weatherproof installation. Cover type shall match box type.

E. Future Locations: Install blanking cover plates on all unused outlets.

F. All receptacles shall be labeled with panel and circuit number. Contractor shall provide 3/8" clear label tape on each wall plate with ¼" black machine lettering.

3.03 TESTS

A. Receptacles

1. After installation of receptacles, energize circuits and test each receptacle to detect lack of ground continuity, reversed polarity, and open neutral condition.

END OF SECTION

SECTION 26 28 16

CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work of this Section consists of providing circuit breakers as shown on the Drawings and as described herein.

1.02 RELATED WORK: See the following Specification Sections for work related to the work in this Section.

A. Section 26 05 10 - General Electrical Requirements

B. Section 26 24 16 - Panelboards and Distribution Panels

1.03 SUBMITTALS

A. Shop Drawings - Submittals shall be in accordance with Division 1. For each circuit breaker furnished under this Contract, submit manufacturer's name, catalog data, and the following information:

1. Terminal connection sizes.

2. Voltage rating.

3. Breaker manufacturer, types, trip ratings and interrupting ratings.

B. Single Submittal - A single complete submittal is required for all products covered by this Section.

C. Closeout Submittals: Submit in accordance with Division 1 and Section 26 05 10 operation and maintenance data for circuit breakers including nameplate data, parts lists, manufacturer's circuit breaker timer, current, coordination curves, factory and field test reports and recommended maintenance procedures.

1.04 WARRANTY

A. Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (1) year from the date of installation of eighteen (18) months from the date of purchase.

PART 2 - PRODUCTS

2.01 CIRCUIT BREAKER: Each circuit breaker shall consist of the following:

A. A molded case breaker with an over center toggle-type mechanism, providing quick-make, quick-break action. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. Circuit breakers shall have variable magnetic trip elements which are set by a single adjustment to assure uniform tripping characteristics in each pole.

B. Breaker shall be calibrated for operation in an ambient temperature of 40°C.

C. Each circuit breaker shall have trip indication by handle position and shall be trip-free.

D. Three pole breakers shall be common trip.

E. The circuit breakers shall be constructed to accommodate the supply connection at either end of the circuit breaker. Circuit breaker shall be suitable for mounting and operation in any position.

F. Breakers shall be rated as shown on Drawings.

G. Series rating of circuit breakers shall not be allowed unless specifically noted on drawings.

H. Breakers shall be UL listed. Circuit breakers shall have removable lugs.

I. Lugs shall be UL listed for copper and aluminum conductors.

J. Breakers shall be UL listed for installation of mechanical screw type lugs.

K. Circuit breakers serving HACR rated loads shall be HACR type. Circuit breakers serving other motor loads shall be motor rated.

L. Breakers indicated as “current limiting “ (CL), shall be of the non-fused type; Square D I-Limiter, Cutler Hammer Limit-R, or ITE Sentron only.

PART 3 - EXECUTION

3.01 MOUNTING

A. The highest breaker operating handle shall not be higher than 72 inches above the floor.

END OF SECTION

SECTION 31 01 90

LANDSCAPE AND SITE MAINTENANCE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Landscape maintenance and related work as shown on the Drawings and specified herein including, but not necessarily limited to, the following:
   1. Tree, shrub, ground cover and turf areas.
   2. Irrigation systems.
   3. General site clean-up.

B. Related Requirements:
   1. Section 32 80 00 - Irrigation
   2. Section 32 90 00 - Planting

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

1.04 ACTION SUBMITTALS

A. Product Data: Manufacturer's product information on pesticides and herbicides to be used for approval prior to use.

1.05 QUALITY ASSURANCE

A. Control of Work: Comply with Section 5 of the Standard Specifications.

B. Control of Materials: Comply with Section 6 of the Standard Specifications.

C. The Maintenance Contractor shall be experienced in horticulture and landscape maintenance, practices, and techniques, and shall provide sufficient number of workers with adequate equipment to perform the work during the Landscape Maintenance Period.

1.06 LANDSCAPE MAINTENANCE PERIOD

A. Landscape Maintenance Period shall be 90 calendar days.

B. Continuously maintain the entire project area during the progress of the work, during the specified Landscape Maintenance Period or until Final Acceptance of the project by the Owner's Representative.

C. Landscape Maintenance Period shall not start until all elements of construction, planting and irrigation for the entire project are completed in accordance with Contract Documents. A prime requirement is that turf and landscape areas shall be planted and that turf areas shall show an even, healthy stand of "sod-like" turf which shall have been mown twice. If such criteria are met to the satisfaction of the Owner's

Representative, a written notification shall be issued to establish the effective beginning date of Landscape Maintenance Period. Additionally, elements included in the Pre-maintenance Punch-list shall have been completed to the satisfaction of the Owner's Representative. The Landscape Maintenance period shall, at the discretion of the Owner's Representative, be allowed to start and finish at different times in different areas as applicable.

D. A day of improper maintenance, as determined by the Owner's Representative, shall not be credited as an acceptable Landscape Maintenance Period day. The Landscape Maintenance Period shall be extended on a day-for-day basis should this occur until proper maintenance, as determined by the Owner's Representative, is being performed.

E. Contractor shall secure the project site against trespass, vandalism, and theft during the Landscape Maintenance Period. Security procedures shall be coordinated with the Owner's Representative.

F. Access to fields by Owner in each project area may be required prior final acceptance of turf. Softball and baseball fields are anticipated to be used by Owner for games or practice. Multi-purpose fields may also be utilized for games and practice. Contractor shall coordinate its mowing schedule and other maintenance schedules with Owner. School use will have priority over maintenance.

1.07 GUARANTEE

A. All work executed under this section shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship, as determined by the Owner's Representative, for the entire Landscape Maintenance Period and for a period of one year after Final Acceptance of project.

B. The Contractor shall install all replacement material in conformance with the Contract Documents.

1.08 FINAL ACCEPTANCE

A. Upon completion of all project work, including Landscape Maintenance Period, the Owner's Representative will, upon written request from the Contractor (2 working day minimum notice), make an observation to determine conformance with the Contract Documents.

B. If, at the final project observation, work is found at variance with the Contract Documents, or is otherwise unacceptable, the Owner's Representative shall issue a punch-list of items requiring attention to the Contractor. The Contractor shall repair, replace, or otherwise correct all non-compliant work, continue Landscape Maintenance Period, and make another written request to the Owner's Representative to verify punch-list completion. If punch-list is found to be incomplete, or if site is still found to be unacceptable, the Contractor shall be back-charged as necessary for this and all additional observations required to issue Final Acceptance. All replacement materials and installations shall be in accordance with the Contract Documents. Remove rejected work and materials immediately from project. Prior to Final Acceptance, Contractor shall provide the Owner's Representative with all Record Drawings and written Guaranty Statements in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials used shall either conform to Specifications in other Sections or shall otherwise be acceptable to the Owner's Representative. The Owner's Representative shall be given a monthly record of all herbicides, insecticides and disease control chemicals used.

B. Maintenance Fertilizer: "Gro-Power High Nitrogen" as available through Gro-Power, Inc., 800-473-1307, or accepted equal, and shall contain the following chemical analysis:

Percent	Chemical
14%	nitrogen
4%	phosphoric acid
9%	potash

C. Humus: Inactive, decomposed organic material approved by Owner's Representative.

PART 3 - EXECUTION

3.01 MAINTENANCE

A. General: Proper maintenance, including watering, weeding, mowing, edging, fertilization, repairing, and protection is required until Final Acceptance of the entire project but not less than the specified Landscape Maintenance Period.

B. Watering: Water appropriately for each plant type to insure vigorous and healthy growth until work is accepted. Water or irrigate in a manner to prevent runoff or erosion. When hand watering, use a "water wand" to break the water force.

C. Weeding: Entire project site shall be kept free of weeds at all times. Control new weed growth with pre-emergent herbicides. If weeds develop, use legally approved herbicides.
   1. No herbicide shall be used without the Owner's Representative prior consent. Use herbicides in accordance with manufacturer's recommendations. If selective herbicides are used, extreme caution shall be observed so as not to damage other plants. Spraying shall only be done under windless conditions.
   2. Disease and Pest Control: Disease and insect damage shall be controlled by the use of fungicides and insecticides, subject to the prior consent of the Owner's Representative. Mole and gopher mitigation shall be accomplished using legal means other than poison baits.

D. Pruning:
   1. Trees: Prune trees to select and develop permanent scaffold branches; to eliminate narrow V-shaped branch forks that lack strength; to reduce potential toppling and wind damage by thinning out crowns; to maintain a natural appearance; and to balance crown with roots. Prune only as directed by the Owner's Representative.
   2. Shrubs: The objectives of shrub pruning are the same as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the design.
   3. All pruning cuts shall be made to lateral branches, buds or near flush with the trunk. "Stubbing" or heading cuts is not permitted.
   4. Only skilled workers shall perform pruning work in accordance with standard horticultural pruning practices. Remove from the project all pruned branches and material. Remove and replace plant material excessively pruned or malformed resulting from improper pruning practices at no additional cost to the Owner.

E. Staking: Stakes shall remain in place through the maintenance and guaranty periods and shall be periodically inspected and adjusted by the Contractor to prevent rubbing that causes bark wounds, loosen for proper growth or other appropriate reasons.

F. Protection: The Contractor shall maintain protection of planting areas until Final Acceptance. Damaged areas shall be repaired or replaced at the Contractor's expense. Install a temporary maintenance fence using 4-foot blaze orange with steel driven stakes, or acceptable equal, around all turf areas for the entire length of Landscape Maintenance Period.

G. Trash: Remove trash in all project areas plus adjacent pedestrian walkways and parking areas for the entire length of Landscape Maintenance Period.

H. Replacement: Refer to the Article "Guarantee" in Part 1.

I. Fertilizing: Turf shall be fertilized on day 45 and 85 after initial seeding or installation with 20 pounds of fertilizer per 1,000 square feet.

3.02 TURF MAINTENANCE

A. Mowing and Edging
   1. Turf shall not be allowed to exceed 3 inches in height and shall not be mown shorter than 1-1/2 inches in height. Turf shall be well established, free of bare spots and weeds, and of a "sod-like" quality to the satisfaction of the Owner's Representative prior to Final Acceptance.
   2. All grass clippings shall be picked up and removed from the site and premises.
   3. Let turf areas dry out enough so that mower wheels do not skid, tear, or mark the surface.
   4. Edges shall be trimmed at least twice monthly or as needed for neat appearance. Clippings shall be completely removed and disposed of off-site.

B. Watering: Turf shall be watered at such frequency as weather conditions require to replenish soil moisture below root zone and to establish healthy turf areas.

C. Disease Control: Control all turf diseases throughout the Landscape Maintenance Period with legally approved fungicides and herbicides.

D. Weed Control: Control broad leaf weeds with selective, legally approved herbicides. No herbicide shall be used without the prior consent of the Owner's Representative.

E. Replacement: At or near the end of specified Landscape Maintenance Period, a final observation of turf areas will be made jointly by the Owner's Representative and Contractor. Remove deceased areas and unhealthy stands of turf from the site; do not bury into the soil. Replant all applicable areas with materials and in a manner acceptable to the Owner's Representative.

3.03 BIORETENTION SOD MAINTENANCE

A. Mowing and Edging
   1. Sod shall be allowed to grow to develop a natural appearance with semi-annual mowing, or as determined by the Owner's Representative. During mowing, sod shall be trimmed gradually so that no more than 1/3 of the leaf blade is removed during a single trimming. Turf shall be well established, free of bare spots and weeds, and of a "sod-like" quality to the satisfaction of the Owner's Representative prior to Final Acceptance.
   2. All grass clippings shall be picked up and removed from the site and premises.
   3. Let sod areas dry out enough so that mower wheels do not skid, tear, or mark the surface.
   4. Edges shall be trimmed during semi-annual mowing, or as needed for neat appearance. Clippings shall be completely removed and disposed of off-site.

B. Watering: Bioretention sod shall be watered at short and frequent intervals during the first 7 to 14 days after installation. Thereafter site shall be watered with such frequency as weather conditions require to replenish soil moisture below root zone and to establish healthy turf areas.

C. Disease Control: Control all turf diseases throughout the Landscape Maintenance Period with legally approved fungicides and herbicides.

D. Weed Control: Control broad leaf weeds with selective, legally approved herbicides. No herbicide shall be used without the prior consent of the Owner's Representative.

E. Replacement: At or near the end of specified Landscape Maintenance Period, a final observation of bioretention sod areas will be made jointly by the Owner's Representative and Contractor. Remove

deceased areas and unhealthy stands of turf from the site; do not bury into the soil. Replant all applicable areas with materials and in a manner acceptable to the Owner's Representative.

3.04 ATHLETIC FIELD TURF MAINTENANCE AND ACCEPTANCE

A. Current cultural management practices may be modified in accordance with tissue test results or environmental conditions. Fertilizer composition, rate, or source may be adjusted based on current soil and tissue test results and existing environmental conditions.

B. The following list represents the minimum required data that must be recorded in a field operations log:
   1. Chemical Application Logs: All labels, application rates, equipment used to apply chemicals shall be kept in the maintenance log. Chemicals shall include all fertilizers, bio-stimulants, growth regulators, fungicides, herbicides, and pesticides.
   2. Cultural maintenance activities such as mowing, sample collection, and seeding shall be recorded.
   3. Irrigation Applications: Use of the irrigation system shall be documented as to zones used, duration of application, and any problems with coverage or system components.
   4. System repair logs for each system shall be maintained. Record replaced or repaired items such as irrigation heads and valves, or any drainage components in the appropriate system repair log.

C. The Contractor shall be responsible for the performance and operation of the playing field irrigation system during the construction, maintenance periods and until final acceptance. The Contractor shall keep a technically qualified supervisor on site and maintain adequate labor, equipment and supplies in reserve to immediately repair the system or components in the event of any deficiency or failure, during the interim maintenance period.

D. Contractor shall provide all operations necessary to maintain the field throughout the Maintenance Period. The following list of items represents the minimum operations necessary to maintain the fields. Maintenance items should, at the minimum, include:
   1. Mowing: Turf shall be cut with a dedicated mower. Cutting height will be determined by environmental conditions, condition of sod, and time of year or activities. Turf height shall be maintained using only sharp, clean equipment capable of cutting heights of 1 to 2-1/4 inches. The initial cutting or subsequent cuttings shall remove not more than 1/3 of the grass leaf. Turf shall be maintained to a neat appearance. Remove cuttings from site. Turf shall not be allowed to exceed 2-1/4 inches in height and shall not be mown shorter than one and one half 1-1/2 inches in height.
   2. Turf shall be established to be turned over with a 1-1/2-inch height for mowing.
   3. Weed and Pest Control: The Contractor shall maintain the turf free from disease and infestation.
      a. Required treatments shall be made according to the needs of the field as determined by the Owner's Representative.
      b. Comply with applicable requirements of Federal, State, and Local laws, regulations and codes having jurisdiction over chemical treatments.
      c. The Contractor shall apply suitable preventative or post infection fungicides to protect the quality of the turf.
      d. Special attention shall be required during the seedling establishment period for damping off diseases.
   4. Turf areas shall be allowed to dry out sufficiently so that mower wheels do not skid, tear, or mark the surface.
   5. Edges shall be trimmed as needed for neat appearance but at least twice monthly. Clippings shall be removed and disposed of off-site.

E. Turf Acceptance: Final acceptance will follow final approval by the Owner's Representative of the punch list and the following criteria:
   1. Turf has rooted into the rootzone mix to a depth of 6 inches and has formed a mature sod mat. This will be determined by random samples being pulled from the rootzone with the Owner's Representatives in attendance. If less than 80 percent of the random tests pass after not less than 15 samples have been pulled from the field areas, then the fields will not be considered acceptable. If any tests are below 5 inches, then the field in question will not be accepted.

2. The playing field surface is in a safe and playable condition.
3. Turf is free of open sod joints, dead or bare spots in excess of 3 square inches.
4. Maintenance log is complete and all equipment manuals and documentation delivered to the Owner.

3.05 IRRIGATION SYSTEM

A. System Observation: The Contractor shall visually check all systems for proper operation on a weekly basis and make necessary repairs. Equipment shall be adjusted as necessary for proper coverage and function.

B. Controllers: Program automatic controllers for appropriate seasonal water requirements. Perform a full instruction session in the presence of the Owner's designated maintenance personnel demonstrating programming, system testing, and trouble shooting. Include instructions on how to turn off system in case of emergency.

C. Repairs: Repairs made to the irrigation system shall be at the Contractor's expense. Repairs, when required, shall be made within 24 hours of discovery by either Owner or Contractor.

3.06 INFIELD MAINTENANCE

A. Infield fines shall be maintained during maintenance period. This includes warning tracks, bullpens, mounds, home plate area, and similar features.

B. Areas shall be kept free of weeds and trash.

C. Pitching mound and home plate areas shall be covered during rains. Cover shall be removed after rains.

D. Mound area and home plate shall be turned over being firm and finished in accordance with the Drawings.

E. Eroded or otherwise lost material shall be replaced.

3.07 FIELD QUALITY CONTROL

A. Final Review:
1. At, or near the end of specified Landscape Maintenance Period, the Contractor shall make a written request for a final review and the work shall be reviewed for conformance with the Construction Documents.
2. If the work is not accepted at time of review, a punch-list of items requiring attention will be prepared by the Owner's Representative and issued to the Contractor for correction.
3. The Landscape Maintenance Period shall be extended at Contractors sole cost, as necessary.
4. Upon completion of the punch-list, the Contractor shall again make written request for review. If, upon re-visiting the site, it is found that the punch-list has not been completed, the review shall end and a subsequent visit shall not be scheduled until the Contractor can assure the Owner the work is complete. The incomplete punch-list review meeting and any further visits and reviews, and re-inspections required due to Contractor not being prepared, or non-conformance with the Construction Documents, shall be back charged to the Contractor.

B. Final Acceptance: When work is found to be in conformance with the Contract Documents, subject to the discretion of the Owner's Representative, a statement of Final Acceptance shall be issued to the Contractor.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Site excavation and backfilling as shown on the Drawings including, but is not necessarily limited to, the following:
   1. Topsoil stripping, stockpiling, and replacement into planting areas.
   2. Rough grading.
   3. Filling and backfilling to attain required grades.
   4. Excavating for paving, footings, and foundations.

B. Related Requirements:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 01 71 23 - Field Engineering
   3. Section 01 78 39 - Project Record Drawings
   4. Section 02 41 13 - Site Clearing and Demolition
   5. Section 31 23 00 - Excavation and Fill
   6. Section 32 01 90 - Existing Tree Protection and Maintenance
   7. Section 32 11 00 - Base Courses
   8. Section 32 90 00 - Planting

1.02 REFERENCES

A. California Building Code (CBC).

B. American Society for Testing and Materials (ASTM):
   1. D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

C. California Occupational Safety and Health Standards (OSHA):
   1. Article 6 - Excavations and Shoring.

D. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

1.04 CLOSEOUT SUBMITTALS

A. Project Record Drawings:
   1. Conform to requirements specified in Section 01 78 39 - Project Record Documents.
   2. Accurately record locations of utilities remaining, re-routed utilities, new utilities, and newly discovered utilities by horizontal dimensions, elevations, inverts, and slope gradients.

1.05 ACTION SUBMITTALS

A. Import Topsoil:

1. It is the Contractor's responsibility to determine if import topsoil is required on the Project.
2. If required, Contractor shall submit four 1/2-pound samples in nominal 1 quart-sized "zip-lock" plastic bags for each proposed import topsoil. Each sample shall include current accompanying fertility and structure analyses prepared by a recognized soil and plant laboratory.

1.06 QUALITY ASSURANCE

A. Adhere to requirements, recommendations, and Best Management Practices (BMPs) for storm water management as may be outlined in the Project Storm Water Pollution Prevention Plan (SWPPP) prepared for this project, or as required by governing agencies.

B. Geotechnical Investigation:
   1. Unless otherwise specified or indicated on the Drawings, it is intended that all work shall be done in accordance with applicable provisions of the Geotechnical Report.

C. The Owner may retain the services of the Geotechnical Engineer to make recommendations based on the soil conditions encountered the results of field and laboratory tests, and observations of the activities performed under this Section.
   1. If, in opinion of the Geotechnical Engineer, work performed does not meet technical or design requirements stipulated, the Contractor shall make necessary readjustments to the approval of the Geotechnical Engineer.
   2. No deviations from the Contract Documents shall be made without specific and written acceptance of the Owner's Representative.
   3. In event of conflict between the Specifications and recommendations contained in Geotechnical Report, the Owner's Representative and Geotechnical Engineer shall be notified.
      a. Contractor shall follow clarification and interpretation issued through the Owner's Representative at no extra cost to the Owner.
      b. If clarification or interpretation should change scope of work, there will be mutually agreed-to adjustment in the Contract price by written Change Order.
   4. The Geotechnical Engineer will not inspect the Contractor's safety measures.

D. Compaction densities specified for structural fills under footings, slabs, or pavements shall be determined in accordance the Geotechnical Engineer's written recommendations.

E. Certification:
   1. The Contractor shall certify source and type of backfill and topsoil proposed to be incorporated into the work, at the request of the Owner's Representative.
   2. The Contractor shall certify elevations of excavations, footings, subgrades, and finish grades with the use of a Licensed Surveyor, at Contractor's expense, at the request of the Owner's Representative.

F. Control of Work: Conform to Section 5 of the Standard Specifications.

G. Control of Materials: Conform to Section 6 of the Standard Specifications.

1.07 PROTECTION

A. Protect all existing structures, fences, roads, sidewalks, paving, curbs, and other items as necessary from earthwork activity.

B. Protect above or below grade utilities which are to remain.

C. Protect trees to remain in accordance with Section 32 01 90 - Existing Tree Protection and Maintenance as applicable.

D. Repair damage to any existing site features which are to remain. Repair and restoration shall be equal to quality and appearance of prior condition and to the satisfaction of the Owner's Representative.

1.08 FIELD CONDITIONS

A. Underground Utilities: Unknown buried utility lines may exist. If encountered, notify Owner's Representative immediately for direction and re-direct work to avoid delay.
   1. Cooperate and coordinate with Owner's Representative and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
   2. Do not interrupt existing utilities serving occupied facilities without proper notification to, and written direction from, Owner's Representative.

B. Wet Conditions: No grading operations shall be conducted when excessively wet conditions exist as determined by the Owner's Representative.

C. Contractor shall provide de-watering equipment as required to continue scheduled operations and provide optimum working conditions at no additional cost to Owner.

D. Dry Conditions: Contractor shall apply sufficient water to materials during construction to properly compact materials and control dust. Contractor shall provide dust control in conformance with Section 10 of Standard Specifications and shall provide water to subgrades as necessary to achieve compaction goals.

1.09 GRADE STAKES AND LINES

A. Grading and subgrading shall be controlled by Contractor-installed intermediate grade stakes and lines necessary to obtain the finished grade elevations shown or implied in the Drawings. Subgrade and finish grade surfaces shall conform to the control planes established by these grade stakes and lines.

B. Protect and maintain all existing benchmarks, monuments, and other reference points. If disturbed or destroyed, they shall be replaced at the Contractor's expense.

C. Contractor shall set temporary benchmarks as necessary to properly complete construction operations.

1.10 SURVEYING

A. Contractor shall be responsible for hiring a licensed professional surveyor to perform all surveying, layout and staking in accordance with requirements specified in Section 01 71 23 - Field Engineering. Contractor shall be responsible for informing Owner's Representative a minimum 2 working days' notice when staking and layout is scheduled so that a review of completed chalk lines and staking can take place.

1.11 TOLERANCES

A. Refer to related specification sections for grading tolerances of specified improvements.

PART 2 - PRODUCTS

2.01 PERFORMANCE CRITERIA

A. Excavations shall not exceed plus or minus 1/10-foot variation from dimensions and elevations shown or noted, unless otherwise accepted by Owner's Representative.

B. Grading Tolerance: Refer to related specification sections for grading tolerances of specified improvements.

2.02 MATERIALS

A. Fill Material: Soil excavated from the site or imported conforming to requirements for fill material contained in applicable portions of Division III Grading, Section 19 - Earthwork of the Standard Specifications, unless modified by recommendations for fill material contained in the Geotechnical Report. Imported fill shall be approved by the Geotechnical Engineer before importation to the site.

B. Topsoil: Excavated material from top 6 inches maximum of existing grade at unpaved areas and/or import material graded free of roots and rocks larger than two inches, subsoil, debris, weeds, large mats of grass, and other deleterious material. Topsoil shall be approved by the Owner's Representative and comply with the additional requirements specified in Section 32 90 00 - Planting.

C. Subsoil: Excavated material below top 6 inches of existing grade, graded free of clay clods larger than 6 inches, rocks larger than 3 inches, and debris.

D. Permeable Fills: As specified in Section 32 11 00 - Base Courses and conforming to recommendations for granular fill in the Geotechnical Report.

E. Water: Clean and free from deleterious amounts of acids, alkalis, salts, and organic matter.

F. Additional Materials: As noted in the Geotechnical Report.

PART 3 - EXECUTION

3.01 PREPARATION

A. Identify all required lines, levels, contours, datum, control points and property lines required to properly establish limits of work.

B. Verify elevations of critical existing grades as noted on Drawings and as directed by Owner's Representative. Notify Owner's Representative of discrepancies prior to start of work and re-direct work to avoid delay.

C. Identify all known below grade utilities. Stake and flag locations.

D. Identify and flag surface grades and utilities.

E. Contact Underground Service Alert (USA), 800-642-2444, and local utility companies to verify locations of existing utilities a minimum of 5 working days prior to excavation.

3.02 PROTECTION

A. Maintain and protect existing utilities remaining which pass through work area.

B. Perform excavation work near utilities by hand. Provide necessary protection as the work progresses.

C. Provide and maintain protection for walks, curbs, drains, trees, corners of structures, and other improvement, as necessary to prevent damage.

D. Barricade and/or cover open excavations occurring as part of this work and post with warning lights to the satisfaction of the Owner's Representative. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

E. Keep adjacent properties, streets and drives clean of any dirt, dust, or stains caused by earthwork operations.

F. Upon discovery of unknown utility or concealed conditions, notify the Owner's Representative immediately and re-direct work to avoid delay.

G. Control dust on and near the work, and on and near off-site borrow areas.
   1. Thoroughly moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of any other activities that may occur on the site.
   2. Non-compliance with proper dust control measures will be cause for issuance of a "stop work" order by the Owner until such time as satisfactory measures can be implemented.

3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from areas scheduled for paving or rough grading and stockpile material in neat wind-row(s) and in location(s) previously established and accepted in coordination with the Owner's Representative and which will cause least interference to construction operations.

B. Do not excavate topsoil that has become wetted to, or beyond, the saturation point that would be required for optimum compaction.

C. Stockpile topsoil in wind-row(s) of a height not to exceed 8 feet, protect from erosion, and cover as necessary to prevent formation of dust.

D. Topsoil staging areas shall be clearly defined and protected from other grading and utility operations.

3.04 ROUGH GRADING

A. Grade site subsoil to establish proper subgrade elevations and site contouring as described or implied in the Drawings:

B. Contouring:
   1. Construct landforms depicted in the Drawings to the satisfaction of the Owner's Representative.
   2. "Round-off" tops of slopes.
   3. "Feather" toes of slopes.

C. Compaction:
   1. Compact subgrade and engineered fill in accordance with the procedures and to relative compaction percent indicated in the Geotechnical Report.
   2. Compact by power tamping, rolling, or combinations thereof as accepted by Geotechnical Engineer.
      a. Where impractical to use rollers in close proximity to adjacent construction, compact by mechanical tamping.
      b. Scarify, moisture condition, and recompact any layer not attaining compaction until required density is obtained.
   3. Repeat compaction procedure until proper grade is attained.
   4. In planting areas, fill in maximum 8-inch loose lifts compacted to between 85 percent and 88 percent relative compaction.

D. Remove all excess subsoil material from site and dispose of in a legal manner. Refer to "Material Storage" below.

E. Entire project or individual field area shall be rough graded at one time. No earthwork operation shall occur for partial field areas without receiving direction from the Owner or prior written approval from the Owner.

3.05 EXCAVATION

A. Remove and dispose of all miscellaneous materials encountered when establishing required grade elevations:
   1. Miscellaneous materials can include but are not limited to: pavements and other obstructions, underground structures, utilities, abandoned irrigation materials, and other materials encountered per the discretion of the Owner's Representative.

B. Stability of Excavations:
   1. Comply with any applicable recommendations contained within the Project Geotechnical Report and requirements of agencies having jurisdiction.
   2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

C. De-watering: Provide and maintain, at all times during construction, ample means and devices with which to promptly remove and properly dispose of water from any source entering structural excavation, pipe trenches, or other excavations. All costs incurred from de-watering activities shall be paid for by the Contractor.

D. Excavation for Structures: Conform to elevations and dimensions shown in the drawings within a tolerance of plus-or-minus 1/10 (0.10) of a foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form-work, installation of services, and quality review.

E. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown in the Drawings.

F. Material Storage:
   1. Stockpile satisfactory excavated materials where appropriate, until required for use.
   2. Stockpile topsoil and subgrade soil in separate piles.
   3. Place, grade, and shape stockpiles for proper drainage.
   4. Locate and retain stockpiles away from edge of excavations.
   5. Dispose of excess soil material in a legal fashion after it has become evident that the material is no longer needed on the project and is of no value to the Owner.

3.06 TOPSOIL PLACEMENT

A. Thoroughly cross-rip all subgrade soil to a depth of 12 inches prior to placing the specified thickness of topsoil back into all applicable planting areas. Secure review and acceptance of ripping depth prior to placement of topsoil. Refer to Section 32 90 00 - Planting for this process.

B. Topsoil placement requirements for planting areas shall be as follows:
   1. Planting Areas: A minimum of 6 inches of clean, acceptable topsoil.
   2. Topsoil shall not be placed until all earthwork and utility operations are complete.
   3. Topsoil shall be installed at one time for entire project or entire field area. No partial placements shall occur.

C. Compact topsoil to 85 percent to 88 percent relative density.

D. Maintain slopes and gradients established during subgrade operations and shape landforms to satisfaction of the Owner's Representative.

E. Refer to Section 32 90 00 - Planting for finish grading information and finish grades at edge of planting areas and hardscape.

3.07 FIELD QUALITY CONTROL

A. Tolerances: Conform to Conform to Section 19 of the Standard Specifications, unless more stringent requirements in these Contract Documents are provided, in which place the more stringent tolerances shall govern. Refer to Section 01 71 23 - Field Engineering for additional project requirements.

B. The Owner Representative shall review and accept work at the following stages:
   1. Topsoil removal and stockpile.
   2. Grading plan for project. Plan shall provide strategy for grading sequence for entire site at one time or by field. Limits and sequence shall be reviewed and coordinated.
   3. Cross ripping of subgrade shall be reviewed and observed.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Trenching, backfilling, and compaction required for, but not necessarily limited to, the following:
   1. Sanitary sewer line installation.
   2. Storm drainage system installation.
   3. Potable water line installation.
   4. Irrigation system installation.
   5. Electrical conduit installation.

B. Related Requirements:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 01 71 23 - Field Engineering
   3. Section 01 78 39 - Project Record Drawings
   4. Section 02 41 13 - Site Clearing and Demolition
   5. Section 31 20 00 - Earth Moving
   6. Section 32 01 90 - Existing Tree Protection and Maintenance
   7. Section 32 11 00 - Base Courses
   8. Section 32 90 00 - Planting
   9. Section 33 11 00 - Domestic Water Utilities
   10. Section 33 40 00 - Storm Drainage Utilities

1.02 REFERENCES

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 SEQUENCING AND SCHEDULING

A. Refer to all other Contract Documents, determine the extent and character of related work, and properly coordinate work specified herein with that described elsewhere to produce a complete, operational installation.

1.04 CLOSEOUT SUBMITTALS

A. Project Record Drawings:
   1. Conform to requirements specified in Section 01 78 39 - Project Record Documents.
   2. Accurately record locations of utilities remaining, re-routed utilities, new utilities, and newly discovered utilities by horizontal dimensions, elevations, inverts and slope gradients as practical.

1.05 QUALITY ASSURANCE

A. Control of Work: Comply with Section 5 of the Standard Specifications.

B. Control of Materials: Comply with Section 6 of the Standard Specifications.

C. Trench Safety: Comply with applicable portions of Sections 5 and 7 of the Standard Specifications and requirements of OSHA and other agencies having jurisdiction).

1.06 FIELD CONDITIONS

A. Wet Conditions: No trenching shall occur when excessively wet conditions exist in the opinion of the Owner's Representative.

B. Dry Conditions: Contractor shall provide dust control in conformance with Section 10 of Standard Specifications and shall provide water to work as necessary to achieve compaction goals.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Materials shall be free of debris, roots, wood, scrap material, vegetative matter, refuse, soft unsound particles, or other deleterious and objectionable materials.

B. Bedding for Utility Piping: Sand conforming to Section 19-3.02F(2) of the Standard Specifications.

C. Native Backfill: Native backfill shall be acceptable soil material excavated from the project site. This material will be considered unclassified and no testing other than for compaction will be required. Additional material required for backfill shall be acceptable to the Owner's Representative.

D. Permeable Material: Permeable material shall be Caltrans Class ll permeable rock material.

E. Slurry Fill: Controlled low-strength fluid material (CLSM) consisting of water, Portland cement, aggregate, and fly ash with slump of 10 inches or more and an unconfined compressive strength of 200 psi or less.

F. Aggregate Base: As specified in Section 32 11 00 - Base Courses.

PART 3 - EXECUTION

3.01 PREPARATION

A. General:
1. Prior to trenching, the Contractor shall pothole existing utilities at locations indicated or implied on the Drawings, where new piping or utilities will cross existing utilities of uncertain depth to determine the elevation of the utility in question and ensure that the new line will clear the potential obstruction.
2. The Contractor shall mark out construction areas in white with non-permanent paint and contact Underground Service Alert (U.S.A.), 800-642-2444, to locate all known utilities a minimum 48 working hours prior to any excavation.
3. Should an existing crossing utility present an obstruction, the proposed line shall be adjusted as acceptable to the Owner's Representative to clear the existing utility.

3.02 TRENCH EXCAVATION

A. General:
1. Excavation shall include removal of water and materials that interfere with construction. Remove water which may be encountered in the trench by pumping or other methods prior to pipe laying, bedding and backfill operations. Trenches shall be sufficiently dry to permit proper jointing and compaction.
2. Contractor is responsible for directing vehicular and pedestrian traffic safely through or around the work area at all times.

3. The Contractor shall relocate, replace, reconstruct or repair, to an "as-was" or better condition, surface or subsurface improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the construction activities. Except as specified in other Sections or shown in the Drawings, this provision applies to all surface improvements of whatever nature such as walls, fences, above-grade utilities, landscaping, paving, structures, or other physical features whether shown in the Drawings or not and to all subsurface improvements such as utilities which may be indicated in the Drawings or marked in the field. The Contractor shall connect modified utilities to existing systems and leave work in an operating condition. The cost of this work shall be considered as included in other items of work and no additional compensation will be allowed.
4. The maximum allowable trench width at the top of pipe shall be 18 inches greater than the pipe diameter.
5. New utility trenches extending deeper than 2 feet below finish grade should be located a minimum of 5 feet away from footings and foundations.

B. Existing Paving Areas:
   1. Existing asphalt paving over new trenches shall be sawcut, removed, and legally disposed. Existing asphalt paving shall be neatly sawcut 1 foot greater on each side than the trench width. If a longitudinal pavement joint or edge of pavement is located within 3 feet of the limit of excavation, intervening pavement shall be removed and replaced after completion of backfilling. If curb, gutter, or similar concrete improvement are to be replaced, the adjacent existing asphalt paving shall be sawcut 2 feet from the edge of concrete.
   2. Existing Portland cement concrete paving over new trenches shall be sawcut to a minimum depth of 1-1/2 inches in straight lines either parallel to the curb or at 90-degree angles to the alignment of the sidewalk prior to being broken out. No section to be replaced shall be smaller than 30 inches in either length or width. If the sawcut would fall within 30 inches of a construction joint, expansion joint, or edge, or within 12 inches of a score mark, the concrete shall be removed to the joint, edge, or mark.

C. Walkway Areas:
   1. Backfill for trenches or other excavations within walkway areas should be compacted in 6-inch maximum layers, unless otherwise noted, with hand-held tampers to assure adequate subgrade support.

D. Compacted Fill Areas:
   1. Where trenches are to be excavated in compacted fill, these trenches shall be backfilled with the fill materials excavated and re-compacted in the layers and to the density specified for the particular area.

E. Open Trench:
   1. No trench shall be left in an open un-protected condition at the end of the day. At the end of the day, open trenches shall be protected in a manner acceptable to the Owner's Representative.
   2. Provisions for trench crossings and access shall be made at all street crossings, driveways, water gate valves, and fire hydrants unless otherwise acceptable to the Owner's Representative.

F. Excavated Material:
   1. Excavated material not required for backfill or of value to the Owner shall be removed and legally disposed of by the Contractor at no additional cost.
   2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
   3. Provisions shall be made whereby all storm and waste water can flow uninterrupted in gutters or drainage channels to drainage structures.
   4. Excavated material shall not be stored on existing landscaping or paving without provisions being made to protect the surface below from being stained or otherwise adversely affected.

G. Shoring

1. Should excavations extend more than 4 feet below existing ground surface, shoring will be required.
2. For trenching greater than 4 feet deep side slopes are not to exceed 1-1/2: 1 with a depth of 20' max.
3. When trenching greater than 4 feet deep, provide a trench box or shield approved by a PE or designed with accompanying tabulated data approved by a PE.
4. Provide shoring, bracing, or underpinning when trenching next to adjoining walls, sidewalks, or pavements. There shall be no trenching below the base or footing of a foundation that can reasonably expected to pose a hazard to workers unless one of the mentioned support systems is used.
5. Follow OSHA standards for maintaining, installing, and removing support systems.
6. Utility trenches shall be excavated according to accepted engineering practices following OSHA.

3.03 PIPE BEDDING

A. Stabilization of Trench Bottom:
   1. When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be de-watered as necessary. The Owner's Representative will determine the suitability of the trench bottom and the amount of sand, gravel, or crushed rock needed to stabilize the soft foundation.

3.04 TRENCH BACKFILL AND COMPACTION

A. General:
   1. Construct backfill in two operations, initial and final.
   2. Do not backfill where the foundation material in trench is already saturated, except as acceptable to the Owner's Representative. Provide a minimum cover as shown or specified.
   3. Where settling greater than the tolerance allowed for grading occurs in trenches and pits due to unstable subgrade material, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
   4. Place final backfill in 6-inch maximum loose lifts for utilities under roads, streets, concrete slabs or other areas to be paved.
   5. Compact backfill surrounding ducts, conduits, pipes and other structures, including the top 12-inches of subgrade to 95 percent maximum density in accordance with ASTM D1557.
   6. Backfill to permit the rolling and compacting of the completed excavation with the adjoining material providing the specified density necessary to enable rock placement of paving of the area immediately after backfilling has been completed.
   7. Where trenching occurs at chemically treated subgrade, backfill using a controlled low-strength material (CLSM) slurry as specified.

B. Initial Backfill:
   1. Prior to trench backfill, the condition of the trench and laying of pipe shall be acceptable to the Owner's Representative.
   2. Select backfill material shall be used as initial backfill for all utilities except irrigation piping, except as otherwise noted and specified.
      a. After the pipe has been properly laid and accepted by the Owner's Representative, selected backfill material shall be placed on both sides of the pipe and compacted to the depth shown in the Drawings.
      b. Compaction: The initial backfill material shall be hand tamped in layers not exceeding 4 inches in uncompacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortional stress. After hand-tamping, the relative compaction of the initial backfill material shall be at least 95 percent relative compaction.
   3. Where trenching occurs at chemically treated subgrade, backfill using specified controlled low-strength material (CLSM) slurry.
      a. The mixture shall be placed using chutes, conveyors, buckets, or pumps depending upon t accessibility.
      b. Placed in lifts to prevent piping from floating.

c. Do not vibrate.

C. Final Backfill:
1. Native backfill material shall be used for final backfill, unless otherwise noted.
2. Compaction: Final backfill compaction shall be by mechanical means with backfill material placed in layers not exceeding 6 inches in loose depth. Each layer shall be thoroughly compacted before succeeding layers are placed. The use of machine tampers, except manually held types, shall not be permitted. Final backfill shall be compacted to a relative compaction of 95 percent for paving areas. In planting areas, provide acceptable topsoil to required depth compacted to 85 percent to 89 percent maximum relative compaction.

D. Jetting: No jetting will be allowed.

3.05 TRENCH SURFACING

A. General:
1. In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench.
2. Backfill shall be flush with adjoining grade in a firm, unyielding position with no visible settling for a period of one year after Final Acceptance.

B. Paved Areas:
1. Temporary surfacing acceptable to the Owner's Representative shall be laid within 1 day after backfilling, except where the Contractor elects to place permanent surfacing within this time period, until permanent paving is installed.

END OF SECTION

SECTION 32 01 90

EXISTING TREE PROTECTION AND MAINTENANCE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Protection of trees and other plants that are scheduled to remain.
   2. Work necessary to ensure that trees, and landscaping in general, designated on the Drawings to remain receive all due protection, care, and maintenance necessary to ensure their survival.
   3. Irrigation as directed or as required to maintain the health of trees and other plants to remain, where existing irrigation of such plants is shut down for the work of this Contract.

B. Work specifically includes the following:
   1. Erection of barriers and other general protective measures.
   2. Placement of wood shavings.
   3. Care of roots during grading.
   4. Inspection and recommendations.
   5. Repair and/or replacement of trees and other plants damaged during the construction operations.
   6. Repair and/or replacement of any irrigation systems damaged or removed during construction operations.

C. Related Requirements:
   1. Section 02 41 13 - Site Clearing and Demolition
   2. Section 31 01 90 - Landscape and Site Maintenance
   3. Section 31 20 00 - Earth Moving
   4. Section 31 23 00 - Excavation and Fill
   5. Section 32 80 00 - Irrigation
   6. Section 32 90 00 - Planting
   7. Section 33 11 00 - Domestic Water Utilities
   8. Section 33 30 00 - Sanitary Sewerage Utilities
   9. Section 33 40 00 - Storm Drainage Utilities

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. American Joint Committee on Horticultural Nomenclature (AJCHN), Standardized Plant Names.

B. American Association of Nurserymen, Inc. (AAN), American Standard for Nursery Stock.

C. Sunset Western Garden Book, Lane Publishing Company.

D. Agricultural Code of California.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Contractor shall avoid injury or damage resulting from the Contractor's operations, including:
   1. Cutting, breaking, or skinning of roots, trunks, or branches.
   2. Smothering or soil compaction by stockpiled materials, excavated materials, foot or vehicular traffic within the dripline.

3. Desiccation due to interruption of existing irrigation schedule.

C. Pre-Construction Meetings:
1. The Tree Work Contractor: Prior to commencing installation of Tree Protection Measures (TPM's), or performing any tree work or tree removal work, arrange and have the tree work contractor attend a pre-construction meeting with the Owners Representative to review tree protection requirements, TPM's, tree work and work procedures prior to commencing such on-site work.
2. Other Contractors: Unless specifically agreed to in advance by the Owners Representative, schedule all other contractors so as to be present on site to attend a single pre-construction meeting with the Owners Representative to review project specific tree protection requirements and review work procedures prior to commencing on-site activities. Schedule meeting after TPM's have been installed and accepted by the Owners Representative.

1.04 ACTION SUBMITTALS

A. Product Data: Manufacturer's descriptive literature or "cut-sheets" for all products proposed for use.

1.05 EXAMINATION

A. At the outset of construction, the Contractor shall have all trees to remain inspected by a qualified and experienced arborist, and the recommendations of the arborist shall be submitted in writing to the Owner's Representative.

B. The Contractor shall be notified by the Architect of any changes or additions to the procedures herein specified.

1.06 GUARANTEE

A. If a tree to remain is destroyed, or damaged so that in the judgment of the Owner's Representative it should be replaced, it shall be removed at Contractor's expense.

B. If a shrub designated to remain is destroyed or damaged so that in the judgment of the District's Representative it should be replaced, it shall be removed at the Contractor's expense

C. If irrigated turf or groundcover to remain is destroyed or damaged so that in the judgment of the District's Representative it should be replaced, it shall be removed at the Contractor's expense

PART 2 - PRODUCTS

2.01 MATERIALS

A. Protective Fencing: 6 foot high, self-supporting, chain link. Materials and installation shall conform to the requirements of the Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual." Driven support posts are not acceptable.

PART 3 - EXECUTION

3.01 GENERAL

A. Protect, prune, irrigate and maintain all existing trees and other vegetation not designated for removal.

B. At a minimum, protect existing trees and other vegetation not designated for removal from the following:
1. Breaking, cutting and skinning of branches, bark and roots.

2. Stockpiling of building materials, soil or trash within dripline.
3. Vehicular traffic and parking.

C. Trees and other vegetation not designated for removal that become damaged during the life of the project shall be repaired or replaced by the contractor at no cost to the Owner subject to the discretion of the Owner's Representative.

3.02 TREE PROTECTION

A. Tree Protection Zones (TPZ): Unless otherwise expressly permitted by the Owners Representative in writing, establish a 20 foot TPZ as measured horizontally and radially from the edge of the root flare at the ground surface at all trees to be preserved.

B. TPZ Access and Uses:
1. TPZ's are intended to control access and limit physical damage to canopy and root system, and to prevent harmful changes to growing conditions such as altered drainage, or soil compaction.
2. No ground disturbing construction such as clearing and grubbing, trenching, grading or excavation, nor other construction activities such as demolition, long or short term debris, spoils, soils and materials stockpiling or storage, washout or dumping of wastes and contaminants, equipment staging, equipment access, or worker access, shall be permitted within TPZ's unless specifically enumerated in the owners Representative accepted tree protection documents, or as may be otherwise specifically established by written agreement between the owners Representative.

C. Ground Disturbance Controls:
1. Relocate from and/or limit ground disturbing activities within TPZ's.
2. Obtain Owners Representative acceptance of all ground disturbing work and contractor means and methods proposed within the TPZ's prior to commencing such work.
3. Perform all such Owners Representative accepted ground disturbing work in a manner that minimizes root disturbance and soil compaction.
4. As may be requested by the Owners Representative, employ alternative means and methods including but not limited to clearing and grubbing by hand tools and/or hand operated equipment, demolition using a "lifting" technique, and excavation and trenching by hand digging, soil vacuuming, air spading or hydraulic jetting, or by boring in lieu of trenching, employing cellular confinement backfilled with class ii permeable material in lieu of subgrade excavation, scarification and/or compaction.
5. Reflect Owners Representative accepted ground disturbance control measures in tree protection documents and/or Construction Plan as appropriate.

D. Equipment Access Controls:
1. Where mechanized equipment access within TPZ's is accepted by the Owners Representative, but prior to accessing equipment, protect tree trunks and limbs to a minimum height of 8 feet above the soil line.
2. Wrap the tree trunk and/or limbs with burlap wrap fiber rolls, place vertical 2 x 4 wood slats set 8 inches on center over the netting and secure with orange safety fencing and nylon or metal banding, or continuously spiral wrap trunk and limbs with burlap covered rice straw wattles.
3. Do not attach fasteners into the tree.
4. Prior to accessing equipment within TPZ's, protect soil from compaction by placing and then maintaining wood chips to a depth of 6 inches in all areas of the TPZ subject to equipment traffic.
5. Based upon equipment to be used and access frequencies planned, provide additional protection measures such as steel plating or cellular confinement filled with class ii permeable material as may be directed by the Owners Representative.
6. Throughout the project duration, the Owners Representative reserves the right to require the Contractor to reposition equipment or utilize alternative construction methods to avoid damage to trees to be preserved.
7. Reflect Owners Representative accepted equipment access control measures in tree protection documents and/or Construction Plan as appropriate.

E. Aerial Equipment Controls:
   1. When Construction Plan utilizes aerial equipment such as cranes or boom trucks, such equipment staging and maneuvering shall be subject to Owners Representative acceptance.
   2. Aerial movements of boom or suspended loads shall avoid passing over or in close proximity to canopies of trees to be preserved.
   3. The Owners Representative reserves the right to require spotters and/or to require the repositioning of equipment or utilization of alternative equipment to avoid movements in close proximity to canopies of trees to be preserved.
   4. Reflect Owners Representative accepted aerial equipment control measures in tree protection documents and/or Construction Plan as appropriate.

F. Tree Protection Fencing (TPF) :
   1. Install a 6 foot tall self-supporting chain link type TPF at perimeter of TPZ of all trees to be preserved.
   2. Where site constraints and safety considerations prevent placement of the TPF at the limits of the TPZ, obtain direction from the owners representative and locate fence as directed.
   3. Caution: Owners Representative accepted adjustments in TPF locations do not alter the extents of the actual TPZ's or the requirements related thereto.
   4. Mount Owner-furnished tree protection signs on TPF in a manner and in locations as may be directed by the Owners Representative.
   5. Where Owners Representative accepted work within TPZ's requires temporary relocation of TPF, obtain Owners Representative acceptance for proposed fence relocation prior to relocation.
   6. Promptly relocate TPF to the original alignment whenever not actively engaged in working within a specific TPZ.

G. Work Monitoring:
   1. When required by the Owners Representative, all work performed within TPZ's shall be continuously monitored by the Owners Representative and/or Project Arborist, if retained.
   2. Coordinate scheduling of work with availability of the designated monito.

H. Tree Roots:
   1. Severing roots greater than 1 inch in diameter within the TPZ requires prior written authorization by the Owners Representative.
   2. Where roots in excess of 1 inch in diameter are encountered within the TPZ, avoid damaging the roots as set forth above in ground disturbance controls.
   3. If damage is unavoidable, suspend work prior to damaging the roots, protect exposed roots, and request a change assessment as set forth above in assessments. Do not resume work or damage roots until Owners Representative has provided written instructions.
   4. Roots damaged during construction shall be exposed to sound tissue and cut cleanly.
      a. Sever roots cleanly by cutting with a sharp hand saw.
      b. Severed roots greater than 1 inch in diameter are subject to field review by the Owners Representative prior to backfilling.

I. Canopy Pruning:
   1. Pruning of tree canopies for clearance during construction shall be allowed only with prior acceptance by the Owners Representative. Notify the Owners Representative of proposed canopy pruning and request a change assessment as set forth above in assessments.
   2. Where practical, the Owners Representative may require that tree limbs be temporarily tied back in lieu of pruning.
   3. When pruning is not permitted, perform work by alternate means that does not require pruning of canopies.
   4. Tying and pruning work shall be performed under the supervision of the Project Arborist.

3.03 PROTECTIVE FENCING

A. Prior to site clearing, demolition or grading, install acceptable protective fencing around all existing trees and other vegetation not designated for removal 1 foot beyond dripline or as directed by Owner's Representative.

B. Locate structural roots by hand probing and set posts with care to preclude root damage.

C. Space protective fencing posts at 6'-0" centers maximum and securely attach fabric.

D. Maintain protection until Final Acceptance of project.

E. Install signage indicating that the protective fencing and area within shall not be disturbed.

F. When work is required within the fenced protection area, submit a written request to the Owner's Representative stating work to be performed and approximate time of completion. No work shall be allowed within the protected fenced area without the prior acceptance by the Owner's Representative. Fencing shall be replaced promptly following completion of work within fenced areas.

3.04 GRADING AND TRENCHING

A. The earth surface within protective fencing shall not be altered except as acceptable to the Owner's Representative. Grading and trenching necessary within the dripline shall be done by hand at the discretion of the Owner's Representative.

3.05 IRRIGATION

A. Provide and maintain irrigation for existing trees and other vegetation not designated for removal as necessary to promote healthy, vigorous growth. Weekly watering shall occur with a 20 minute soak equivalent to 100 gallons per tree.

3.06 ROOT PRUNING

A. Root pruning shall consist of a smooth, final cut and shall be performed wherever a root 2 inches or more in diameter has been broken or severed.

3.07 CANOPY PRUNING

A. Pruning shall be completed by a tree care contractor or under supervision of a licensed arborist.

B. Prune existing trees to remain in accordance with the following guidelines:
   1. Proper removal of dead branches and live "stubs" 3 inches and over in diameter.
   2. Removal of broken or loose branches and other debris lodged in trees and shrubs.
   3. Removal of live branches which interfere with tree structural strength and healthful development. These include:
      a. Limbs which rub and abrade a more "important" or dominant branch, and as directed by the Owner's Representative.
      b. Limbs of weak structure.
      c. Limbs with twigs and foliage obstructing the development of more "important" branches, as directed by the Owner's Representative.
      d. Branches near the end of a limb which may produce more weight than the limb is likely to support.
      e. Branches conflicting with building or vehicular roadways.
   4. Removal of branches located between grade level and 10 feet above grade over pedestrian walkways.

C. Selectively prune branches as deemed necessary by the Owner's Representative.

3.08 PRUNING REPAIRS

A. Prune and treat damaged area as directed by the Owner's Representative.

3.09 CLEAN-UP

A. Branches, trimmings and debris remaining upon completion of each operation shall become property of the Contractor and shall be promptly removed from the site.

END OF SECTION

SECTION 32 11 00

BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Grading and compaction of subgrade soil for areas to receive pavement, structures, and base material.
   2. Furnishing and placing of aggregate base material.

B. Related Requirements:
   1. Section 01 71 23 - Field Engineering
   2. Section 31 20 00 - Earth Moving
   3. Section 32 12 16 - Asphalt Paving
   4. Section 32 13 13 - Concrete Paving

1.02 REFERENCES

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Sequencing and Scheduling
   1. Work of this Section shall not proceed until all underground utilities and irrigation sleeving have been installed and accepted.
   2. Contractor shall schedule work so that installation of paving and surfacing occurs no later than 5 working days after placement and proper compaction of base materials. Base materials left unpaved longer than this time period shall be subject to testing and re-compaction at the contractor's expense.

1.04 ACTION SUBMITTALS

A. Certificates of compliance, including sieve analyses, for products and materials proposed to be used in work covered by this Section.

1.05 QUALITY ASSURANCE

A. Control of Work: Conform to Section 5 of the Standard Specifications.

B. Control of Materials: Conform to Section 6 of the Standard Specifications.

1.06 FIELD CONDITIONS

A. Wet Conditions: Do not prepare subgrade or place base material when excessively wet conditions exist as determined by the Owner's Representative.

B. Dry Conditions: Contractor shall provide dust control in conformance with Section 10 of Standard Specifications and shall provide water to subgrades and base courses as necessary to achieve compaction goals.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be stockpiled on site in locations that, in the opinion of the contractor, cause least interference with construction operations and as acceptable to the Owner's Representative.

B. Materials shall not be stockpiled in proposed planting areas.

C. Protect materials from segregation, contamination and wind and water erosion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate Base: Class 2, 3/4-inch maximum material conforming to Section 26-1.02A of the Standard Specifications. No recycled materials will be accepted for building pad areas. All other paving and surfacing using aggregate base can use recycled materials.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

A. Preparation of subgrade shall conform to Section 6 of the Standard Specifications and as specified in Section 31 20 00 - Earth Moving.

B. Remove unsuitable subgrade material as necessary and replace with suitable material or aggregate base per the discretion of the Owner's Representative.

3.02 BASE MATERIAL PLACEMENT

A. Conform to Section 26 of the Standard Specifications.

B. Obtain acceptance of subgrade preparation work prior to placing base material thereon.

C. Place and compact base material in 6-inch maximum lifts unless otherwise noted. Compaction shall be at least 95 percent relative compaction.

D. Base material shall be moisture conditioned to between optimum and 3 percent above optimum prior to placement and compaction.

3.03 TOLERANCES

A. Conform to Section 26 of the Standard Specifications, unless more stringent requirements in these Contract Documents are provided, in which place the more stringent tolerances shall govern.

3.04 CLEAN-UP OF WORK AREA

A. The Contractor shall remove and legally dispose of excess materials, spoils, and debris from the job site on a daily basis.

3.05 PROTECTION OF FINISHED PRODUCT

A. The Contractor shall provide lighted barricades, signs, and other devices as necessary to prevent damage to finished base courses.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Asphalt paving is shown on the Drawings including, but is not necessarily limited to, the following:
   1. Plant-mixed asphalt and other asphalt items.
   2. Header boards.

B. Related Requirements:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 31 20 00 - Earth Moving
   3. Section 32 11 00 - Base Courses
   4. Section 32 13 13 - Concrete Paving
   5. Section 32 33 00 - Site Furnishings
   6. Section 33 40 00 - Storm Drainage Utilities

1.02 REFERENCES

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Sequencing and Scheduling:
   1. Time delay between placement and compaction of base material and installation of asphaltic shall not be more than 5 calendar days. Base material left unpaved longer than this time period shall be subject to testing and re-compaction at the expense of the contractor.

1.04 ACTION SUBMITTALS

A. Product Data: Descriptive literature for primer and other materials proposed for use if requested by the Owner's Representative.

B. Certificates, signed by asphaltic producer and Contractor, stating that materials comply with specification requirements. Minimum information submitted shall include a manufacturer's certification for asphalt products and an asphalt mix design by an independent, qualified laboratory.

C. The Contractor shall furnish vendor's certified test reports for each carload, or equivalent of bituminous material shipped to the project, signed by asphaltic producer and Contractor stating that materials comply with specification requirements.
   1. Minimum information submitted shall include a manufacturer's certification for asphalt products and an asphalt mix design by an independent, qualified laboratory.
   2. The report shall be submitted and approved before material is used on the Project. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as basis for final acceptance.

3. Test reports shall be subject to verification by testing samples of materials received for use on the project.

1.05 CLOSEOUT SUBMITTALS

A. Warranty as specified.

1.06 QUALITY ASSURANCE

A. Work shall conform to the appropriate portion of the referenced “Standard Specifications” except references to "measurement" and "payment" are not applicable.

B. Control of Work: Conform to Section 5 of Standard Specifications.

C. Control of Materials: Conform to Section 6 of Standard Specifications.

D. Asphalt paving surfaces shall have positive drainage as indicated on the Drawings.

1.07 PROTECTION OF WORK

A. Curbs and other work shall be covered with suitable material and protected from staining or injury by equipment and contact with oil, emulsion, and asphalt.

B. Manholes, catch basins, and other gratings shall be covered with suitable material so that no asphalt or emulsion will come in contact with the inside walls or floors of the structures.

C. Damage to adjacent improvements shall be repaired or replaced at the Contractor's expense and to satisfaction of the Owner’s Representative.

1.08 FIELD CONDITIONS

A. Grade Control:
1. Establish and maintain required lines and grades, including crown and cross slope.
2. The final grades and elevations of the ground paving shall be a consistent depth below adjacent concrete work.

B. Ambient Conditions:
1. Apply bituminous prime and tack coats only when ambient temperature in shade is at least 50 degrees F and when temperature has not been below 35 degrees F for 12 hours immediately prior to application.
2. Do not apply when substrate surface is wet or contains an excess of moisture.
3. Construct asphaltic surface course only when atmospheric temperature is above 40 degrees F and underlying base is thoroughly dry.

1.09 WARRANTY

A. Contractor: Provide an extended 2-year warranty for asphalt paving.
1. Warranty shall be limited to ordinary wear and tear by weather or defects due to faulty materials and workmanship.
2. Make repairs at no expense to Owner.

PART 2 - PRODUCTS

2.01 DESIGN AND PERFORMANCE REQUIREMENTS

A. At no point shall paved surface fail to drain. Provide drainage as indicated on the Drawings.

B. Asphalt paving shall be free from excessive segregation defined as gaps between aggregate visible at 3/16 inch or larger, cracking, potholes, raveling, slippage, depressions, corrugations, or other defects at the date of completion and acceptance of the project.

C. Unless otherwise noted, aggregates in asphalt mix may be a blend of virgin material and reclaimed asphalt paving (RAP), with the RAP constituting no more than 15% of the aggregate blend per Section 39 of the Standard Specifications.

D. Asphalt mix for use beneath track surfacing, tennis court surfacing, or other court system to receive surface coating shall consist of only virgin material; RAP shall not be used.

2.02 ASPHALT PAVING

A. Paving Asphalt Binder: Shall be PG 64-10, conforming to Section 92 of the Standard Specifications.

B. Prime Coat: Liquid asphalt to conform to the requirements for SS-1 liquid asphalt as per Section 94 of the Standard Specifications and approved by the Owner's Representative.

C. Tack Coat: Asphaltic emulsion to be penetration type conforming to the RS-1 requirements of Section 94 of the Standard Specifications.

D. Aggregates:
   1. Traffic Areas (Vehicular Asphalt Paving): 1/2-inch medium in accordance with the gradation requirements of Section 39 of the Standard Specifications, unless otherwise specified or noted. Traffic area aggregate shall be used in parking and street areas.
   2. Pedestrian and Non-Vehicular Areas: 3/8 inch maximum or No. 4 maximum aggregate in accordance with the gradation requirements of Section 39 of the Standard Specifications, unless otherwise specified or noted.

2.03 HEADERS

A. Refer to details on the Drawings.

2.04 AGGREGATE BASE

A. Aggregate base shall conform to Section 32 11 00 - Base Courses.

2.05 EQUIPMENT

A. Spreading and rolling equipment shall be in accordance with Section 39-5 of the Standard Specifications and additional requirements specified.

B. Spreading and compaction shall be in accordance with Section 39-6 of the Standard Specifications and additional requirements specified.

C. Pavers that leave ridges, indentations or other marks in the surface that cannot be eliminated by rolling or prevented by adjustment in operation shall not be used.

PART 3 - EXECUTION

3.01 EDGEBAND INSTALLATION

A. Install to conform to shapes, lines, dimensions, and grades shown on the Drawings.

B. Radii shall be smooth and constant with properly aligned tangent points.

3.02 PAVING INSTALLATION - GENERAL

A. Conform to requirements of Sections 37 and 39 of the Standard Specifications.

B. Place plastic materials under asphaltic paving equipment while not in use, to catch and/or contain drips and leaks.

C. Areas shall be paved in sequence and direction to avoid driving loaded trucks on the new asphalt surface.

3.03 PREPARATION – TACK COAT

A. General: Apply tack coat to contact surfaces of adjacent pavement and concrete curbs.

B. Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or air blast to remove all loose dirt and other objectionable material.
   1. Vegetation shall be removed and an approved herbicide applied to those areas before cleaning.
   2. Emulsified asphalt shall be diluted by the addition of water when directed by the Owner's Representative and shall be applied a sufficient time in advance of the paver to ensure that all water has evaporated before the overlying mixture is placed on the tacked surface.
   3. The bituminous material including vehicle or solvent shall be uniformly applied with a bituminous distributor at the rate of 0.05 to 0.07 gallons per square yard. The type of bituminous material and application rate shall be approved by the Owner's Representative prior to application.

C. Following the application, the surface shall be allowed to cure without being disturbed. The curing period shall be not less than 24 hours, unless otherwise approved by the Owner's Representative, and shall be sufficient to permit drying out and setting of the tack coat.

D. After tack coat has cured, suitable precautions shall be taken by the Contractor to protect the surface against damage prior to placement of next course.

3.04 PLACING ASPHALT PAVEMENT

A. General:
   1. Place asphalt within 48 hours of applying primer or tack coat and after required curing time for emulsions.
   2. Each course of asphalt concrete shall be installed or constructed in accordance with the Standard Specifications Section 39.
   3. All layers, except as otherwise provided in these Specifications, shall be spread with mechanical spreading and finishing equipment as provided for in the Standard Specifications Section 39-5.01.

B. Tack and Levelling Course:
   1. After completion of the base course a tack coat shall be applied and a leveling course of minimum 1-inch thickness shall be placed and compacted over entire area.
   2. After compacting, the surface of the leveling course shall be check for compliance with the specified tolerances.

3. Where required, depressions shall be filled with asphalt concrete fines prior to proceeding with subsequent pavement construction and final court surfacing.

C. Paver Equipment Requirements:
   1. Asphalt pavers shall be self-propelled mechanical spreading and finishing equipment provided with a screed or strike-off assembly capable of distributing the material to not less than the full width of a traffic lane.
      a. Screed action shall include cutting, crowding, and other practical action which is effective on the mixture without tearing, shoving, or gouging, and which produces a surface texture of uniform appearance.
      b. The screed shall be adjustable to the required section and thickness. The paver shall be provided with a full width roller or tamper or other suitable compacting devices.
   2. Asphalt pavers shall be operated to insure continuous and uniform movement of the paver.
   3. The asphalt paver shall operate independently of the vehicle being unloaded or shall be capable of propelling the vehicle being unloaded in a satisfactory manner and, if necessary, the load of the haul vehicle shall be limited to that which will insure satisfactory spreading.
   4. While being unloaded, the haul vehicle shall be in contact with the machine at all times, and the brakes on the haul vehicle shall not be depended upon to maintain contact between the vehicle and the machine.

D. Placing Hot-Mix Asphalt:
   1. The completed mixture shall be deposited at a uniform quantity per linear foot to provide the required compacted thickness without resorting to spotting, picking-up or otherwise shifting the mixture.
      a. Segregation shall be avoided, and the surfacing shall be free from pockets of coarse or fine material.
      b. Asphalt containing hardened lumps shall not be used.
   2. Unless lower temperatures are directed by the Owner's Representative, mixtures shall be spread, and the first coverage of initial or breakdown compaction shall be performed, when the temperature of the mixture is not less than 275 degrees F. Breakdown compaction shall be completed before the temperature of the mixture drops below 250 degrees F.
      a. A layer shall not be placed over another layer that exceeds 2 inches in compacted thickness until the temperature of the layer that exceeds 2 inches in compacted thickness is less than 150 degrees F at mid depth.
      b. Layer thickness shall not be less than 1.25 inches or exceed 2 inches unless approved in advance and in writing by Owner's Representative.

E. Construction Joints: Before placing the top layer adjacent to cold transverse construction joints, the cold transverse construction joints shall be trimmed to a vertical face and to neat line.
   1. Transverse joints shall be tested with a 16-foot straightedge and shall be cut back to conform to meet the specified tolerances.
   2. Connections to existing surfacing shall be feathered to conform to the requirements for smoothness.
   3. Longitudinal joints shall be trimmed to a vertical face and to a neat line if the edges of the previously laid surfacing are, in the opinion of the Owner's Representative, in such condition that the quality of the completed joint will be affected.

F. Rollers and Roller Equipment: The Contractor shall furnish a sufficient number of rollers to achieve the compaction and surface finish required by these Specifications.
   1. Each roller shall have a separate operator.
   2. Rolling equipment shall be self-propelled and reversible.
   3. Rollers shall be equipped with pads and water systems that prevent sticking of asphalt mixtures to the pneumatic- or steel-tired wheels.
   4. A parting agent that will not damage the asphalt mixture, as determined by the Owner's Representative, may be used to aid in preventing the sticking of the mixture to the wheels.

G. Compaction:

1. Compact pavement by rolling to specified relative compaction but not less than 96 percent of bulk unit weight tested in accordance with the nuclear gauge or CTM 308 core method.
   a. Do not displace or extrude pavement from position.
   b. Hand compact in areas inaccessible to rolling equipment.
   c. A "pass" shall be one movement of a roller in either direction.
   d. A "coverage" shall be as many passes as are necessary to cover the entire width being paved.
   e. Overlap between passes during a coverage, made to ensure compaction without displacement of material in accordance with good rolling practice, shall be considered to be part of the coverage being made and not part of a subsequent coverage.
   f. Each coverage shall be completed before subsequent coverages are started.
   g. Rolling shall commence at the lower edge and shall progress toward the highest portion.
   h. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
2. Asphalt concrete shall be compacted to a relative compaction of not less than 96 percent and shall be finished to the lines, grades, and section shown on the Drawings.
   a. In-place density of asphalt concrete will be determined prior to opening the pavement to public use.
   b. Relative compaction will be determined by California Test 375.
   c. Laboratory specimens will be compacted in conformance with California Test 304.

H. The completed surfacing shall be thoroughly compacted, smooth, and free from routes, humps, depressions, or irregularities. Ridges, indentations, or other objectionable marks left in the surface of the asphalt paving by blading or other equipment shall be eliminated by rolling or other means. The use of any equipment that leaves ridges, indentations, or other objectionable marks in the asphalt paving shall be discontinued, and other acceptable equipment shall be furnished by the Contractor.

3.05 TOLERANCES

A. Surface Tolerance:
   1. The Contractor shall have on site a 12-foot straightedge for testing the asphalt paving surface when said straightedge is laid on the finished surface and parallel with the center line, the surface shall not vary more than 0.01-foot from the lower edge of the straightedge.
   2. The transverse slope of the finished surface shall be uniform to a degree that no depressions greater than 0.02-foot are present when tested with a straightedge 12 feet long.
   3. Skin patching will not be allowed to correct depressions.

B. Thickness Tolerance:
   1. The pavement thickness shall be determined by measuring the average thickness of core samples taken from the pavement for density determination.
   2. Thickness will be determined from the cores and shall be based upon the average of the cores.
   3. The asphalt thickness indicated on the cross sections shall be maintained.
   4. Thickness deficiencies in excess of 3/8-inch shall be corrected by removal and replacement of overlay at the discretion of the Owner's Representative.
   5. Skin patches and overlays less than 1-1/2 inches will not be allowed.

C. Adjustments to Contract Sum:
   1. The Contract will be reduced for thickness deficiencies equal to or less than 3/8-inch in proportion to 2 times the percent of thickness deficiencies to the specified pavement thickness (i.e., a 1/4-inch thickness deficiency in a pavement with a 2-inch specified thickness would result in a reduction of the unit price of (2 x 0.25)/2.0 = 25 percent) for the lot containing a thickness deficiency.
   2. No Contract Sum adjustment will be made for thickness in excess of those specified or shown.

3.06 FIELD QUALITY CONTROL

A. Take samples and perform tests in accordance with Caltrans Test Methods.

B. Upon completion of the work, Contractor shall provide a water drainage test for paved areas.
   1. Areas that fail to drain properly, as determined by the Owner's Representative, shall be corrected and repaired at no additional cost.
   2. If repaired, the entire surface shall have a seal coat applied at Contractor's cost.
      a. Type of seal coat will be determined by the Owner's Representative.
      b. Repairs shall be made within 15 calendar days of notification at the expense of the Contractor.

C. Contractor to install asphalt to be flush with top of new fence curb and/or existing tennis court asphalt surface elevation.

3.07 PROTECTION

A. After final rolling, do not permit vehicular traffic on pavement until it has cooled to not less than temperature noted in the "Standard Specifications" and hardened and in no case sooner than 6 hours.

B. Contractor shall be responsible for erecting barricades to protect paving from traffic until mixture has cooled and attained its maximum degree of hardness.

C. Ample time shall be allowed for drying before traffic, vehicular and pedestrian, is allowed on the pavement.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Concrete flatwork as shown on the Drawings including, but is not necessarily limited to, the following
   1. Curbs.
   2. Mowbands and edge bands.
   3. Walkways.
   4. Expansion and control joints.
   5. Reinforcement.
   6. Finishing.

B. Related Requirements:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 01 71 23 - Field Engineering
   3. Section 31 20 00 - Earth Moving
   4. Section 32 11 00 - Base Courses
   5. Section 32 12 16 - Asphalt Paving

1.02 REFERENCES

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Pre-Installation Meeting: Conduct meeting at Project site to review scope of concrete paving work and expectations.
   1. Meeting shall be scheduled after approval of mockups and sufficiently in advance of commencement of concrete paving.
   2. Attendees shall include:
      a. Contractor.
      b. Concrete subcontractor.
      c. Owner’s Representatives.

1.04 ACTION SUBMITTALS

A. Product Data: Manufacturers' current catalog cuts and specifications for the following:
   1. Expansion joint filler materials.
   2. Color admixtures.
   3. Curing compounds.
   4. Other items as requested by Owner’s Representative.

B. Samples:
   1. Concrete materials as required for testing and inspection.

2. Expansion Joint Sealant: Manufacturer's standard bead samples showing full range of colors available.
3. Concrete Panels: Not less than 12 inches by 12 inches for each selected color and finish texture using concrete mix proposed for this Project.
   a. Indicate materials and methods used to produce each color and texture.
   b. Mockup work shall not commence until a concrete sample panels have been approved.

C. Concrete Mix Design: Submit mix designs and certified compressive strength test reports for each concrete strength, type, additives, and maximum aggregate size required, prepared, and certified by the ready-mix concrete supplier.

1.05 INFORMATIONAL SUBMITTALS

A. Statement of installer/finisher qualifications if requested by Owner's Representative.

B. Mill Certificates and Certifications for reinforcing bars, if used.

C. Delivery tickets for each load of concrete delivered to the site.

D. Results of slip-resistance testing.

1.06 QUALITY ASSURANCE

A. Construction of concrete flatwork, including curbs and gutters, shall conform to Section 73 of the Standard Specifications.

B. Codes and Standards: Comply with the applicable provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
1. California Building Code, Title 24, Part 2, Chapter 19A - Concrete
2. ACI 301 Specifications for Structural Concrete for Buildings
3. ACI 318 Building Code Requirements for Reinforced Concrete
4. ACI 614 Recommended Practice for Measuring, Mixing, and Placing Concrete
5. Concrete Reinforcing Steel Institute, Manual of Standard Practice

C. Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete as placed meets minimum requirements.

D. Slip Resistance: Floor tile shall provide a value equal to or greater than 0.42 when tested in accordance under dry conditions with DCOF AcuTest procedure contained in ANSI A137.1:2012, Section 9.6, and under wet conditions with DCOF AcuTest procedure of ANSI B101.3.

E. Concrete Testing:
1. The Owner may retain, at its expense, a testing laboratory to perform material evaluation tests in accordance with Section 01 45 00 - Quality Control.
2. Testing may include slump tests and securing samples of concrete, cement, aggregates, or other materials for testing. Applicable materials shall be provided by the Contractor at no additional cost to the Owner.

F. When review or observation is required of the Owner's Representative of the concrete work, Contractor shall notify the Owner's Representative not less than 2 working days prior to date when the review or observation is required.

G. Pre-Pouring Review:

1. Formwork, joint patterns, base material, reinforcement, "dobies," ties, and other installation accessories shall be reviewed and accepted by the Owner's Representative prior to pouring concrete.
2. Forms, reinforcing, and accessories shall be in place and Contractor shall give a minimum of 5 working day lead-time notice to Owner's Representative when scheduling the review request.
3. Contractor shall allow a minimum of 2 working days after pre-pour review in Construction Schedule for possible modifications to concrete preparation work, at no cost or delay to the project.

H. The Owner's Representative shall have access to any off-site batch plant or quarry supplying materials at all times for subject project and trucks in route to the project site.

I. Mockups:
   1. General:
      a. Mix design shall match that used on accepted sample panels and proposed for use in final construction including cement and color additive.
      b. Prepare at least one month before start of final concrete work to allow concrete to cure before observation.
      c. Concrete color and finish for mockup appearance shall match color and finish of accepted sample.
      d. Build mockups at the location indicated or, if not indicated, as selected by the Owner's Representative
      e. Notify Owner's Representative 5 working days in advance of dates and times when mockups will be constructed and layouts will be ready for review.
      f. Color and texture shall be approved before starting construction.
      g. Perform specified slip-resistance testing on mockups.
      h. Maintain final accepted mockups in an undisturbed condition as a standard for judging the completed Work.
      i. Retain samples of sands, aggregates, and color additive used in the mockups for comparison with materials used in final work.
      j. Demolish and remove mockups when directed if not incorporated into the final work.
   2. Flat Paving Mockups:
      a. 4-feet x 4-feet sample panels of colored concrete flatwork and concrete darkening agent for each required color and texture shall be poured by the Contractor at the site for review and acceptance by the Owner's Representative.
      b. Quantity:
         1) Contractor shall allow for preparation of up to 2 flat paving mockups for evaluation and final approval of each concrete.

      c. Samples shall include each type and profile of joint, surface texture, and tooled conditions for approval. Contractor shall schedule review well in advance of concrete operations to allow for modifications and preparing an additional mockup panel if necessary.

1.07 DELIVERY AND STORAGE

A. Deliver concrete reinforcement to job site properly tagged and ready to set. Store above ground surface on platforms, skids, or other supports. Coordinate delivery and storage of all other materials as appropriate.

B. Coordinate delivery so that mixes may be immediately poured upon arrival at site.

1.08 FIELD CONDITIONS

A. Maintain control of concrete dust and water. Do not permit adjacent areas to be contaminated.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

A. Aggregate: As specified in Section 32 11 00 - Base Courses.

2.02 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
   1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.
   2. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.03 REINFORCING

A. General:
   1. Reinforcing steel shall be cut and bent cold to exact lengths and shapes to comply with Drawings, reviewed shop drawings, and referenced codes and standards.
   2. Comply with the additional requirement shown on the Drawings.

B. Welded Wire Mesh (WWM): 6 x 6 #10, unless noted otherwise in the Drawings, conforming to ASTM A185. Wire mesh shall be "chaired" up with 2-inch x 2-inch x 2-inch concrete blocks to ensure uniform embedment into concrete section to dimension as shown in the Drawings.

C. Reinforcing Steel: Deformed billet steel bars complying with Section 52-1.02B of Standard Specifications, Section 1907 of CBC and ASTM A615.
   1. Provide Grade 60 for No. 4 and larger, Grade 40 for No. 3 and smaller.
   2. Bars shall be in a new, “first-class” condition.

D. Smooth Dowel Steel Bars for Expansion Joints: ASTM A29, Grade 40, No. 3 smooth.
   1. Dowels shall be shop painted with iron-oxide zinc-chromate primer.
   2. Where shown, provide metal dowel sleeve or other approved break-bond method at one end of dowel to permit lateral movement at dowel within concrete section.
   3. Provide for movement which equals joint width plus 1/2 inch.
   4. Bars shall be in a new, “first-class” condition.

E. Tie Wire: ASTM A82, black annealed, minimum 16 gage.

F. Supports for Reinforcement: Provide bolsters, chairs, spacers, and other devices for spacing, support and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable.

2.04 CONCRETE MATERIALS

A. Cement: ASTM C150, Type II, and shall be provided by one manufacturer.

B. Pozzolan: Class F Fly Ash per ASTM C618 comprising 15-20% of total cementitious materials. Fly Ash may be added to a maximum ratio of 35% of total cementitious materials where testing reports are provided for the mix design review.

C. Coarse Aggregates: Coarse aggregates shall conform to ASTM C33, sizes 57, 67 or 7. Pea gravel aggregate shall not be used.

D. Fine aggregates: Fine Aggregates shall conform to ASTM C33.

E. Water: Clean and not detrimental to concrete.

2.05 CONCRETE ADDITIVES

A. Pigment for Concrete: Synthetic mineral-oxide pigments or colored water-reducing admixtures, color stable, nonfading, and resistant to lime and other alkalis, and complying with ASTM C979; Davis Colors Inc., 800-800-6856, as specified and noted on the Drawings, or equal.
   1. If added to mix at Project site, additive shall be furnished in manufacturer's "Mix-Ready" disintegrating bags.
   2. Dosage Rate: As required to achieve color of approved sample but not exceeding 10 percent of weight of cementitious materials in mix.
   3. Colors:
      a. Darkening Agent: Davis Colors Inc. colorant #8084 Black, or acceptable equal.
         1) Dosage: 1/4-pound per sack of concrete.
      b. Other Colors: As noted on the Drawings.

B. No admixtures shall be allowed without written acceptance by the Engineer of Record. Admixtures that have a negative impact on concrete finish shall not be used. When more than one admixture is used, admixtures shall be compatible.

2.06 ACCESSORIES

A. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days. SIKAGrout 212 or equal.

B. Curing Materials:
   1. Liquid Curing Compounds: ASTM C309, Type 1.
   2. Sheet Material: Waterproofed Kraft paper, ASTM C17, regular type.

C. Joint primer: One component, solvent based; Sonneborn horizontal paving joint primer No. 733, or No. 766, or equal.

D. Fiber Expansion Joint Material: Preformed cellular fiber complying with ASTM D1751; 1/2 inch thick unless otherwise indicated.
   1. Expansion joint material shall be variety with "zip-strip" H-channel joint sealant receptacles. If proposed joint material is not installed with sealant receptacles then, the expansion joint material shall be completely covered with a Sonneborn "Sonofoam" closed cell backer rod or acceptable equal prior to application of joint sealant.
   2. Provide 3/8-inch tooled edges each side of joint material. Refer to Drawings for additional information.

E. Paving Expansion Joint Sealant: One-part, self-leveling polyurethane conforming to ASTM C920, Class 25, Type S, Grade P; Sonneborn "Sonolastic SL 2," or equal.
   1. Color: As selected by Owner's Representative.

2.07 CONCRETE MIXING

A. General:
   1. Mix and deliver concrete in accordance with ASTM C94.
   2. Addition of water to the mix after leaving the plant is not permitted.
   3. No admixtures will be allowed without prior acceptance by the Owner's Representative. If accepted, use admixtures according to manufacturer's written instructions.

4. Ensure equipment and plant will afford accurate weighing, minimize segregation, and will efficiently handle materials.
5. Deposit concrete into final position within 90 minutes of introduction of cement.

B. Pigments:
1. Darkening Agent: Add 1/4 pound of specified black colorant per 94 lb. sack of cement to all concrete which will be exposed to view when cured except for drain rims and concrete receiving other colorants.
2. Other Colors: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

C. Minimum ultimate compression strength of concrete at 28 days is as follows:

Item	Strength	Maximum slump	Size of aggregate	Cement (# of 94 lb. sacks per yard)	W/C Ratio
Slab-On-Grade	3,000	4"	3/4"-1"	5	0.50
Curbs / Edgebands	3,000	4“	3/4"-1"	5	0.60

D. Drying Shrinkage Limit at 21 Days: 0.40 percent.

E. Adjustment to Concrete Mixes:
1. Mix design adjustments may be requested by Contractor when job conditions, weather, test results warrant, or to meet appearance of accepted samples or mockup.
2. Test data for revised mix design shall be submitted to and accepted by Owner’s Representative before using in work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.02 PREPARATION

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

B. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

3.03 EXCAVATION

A. In addition to the general grading excavation required, the Contractor shall excavate to the required depths in the locations shown for flatwork and curbs. Excess excavation shall be replaced with concrete poured monolithically with the wall or pavement, at no additional cost to the Owner.

3.04 INSTALLATION OF FORMWORK

A. Formwork shall conform to Section 51 of the Standard Specifications and as follows:
   1. The Contractor shall build forms with a high degree of care and shall select from materials of adequate strength and smoothness to produce smooth, even surfaces of uniform texture and appearance, free of bulges, depressions, or other imperfections per the discretion of the Owner's Representative. Remove any residue remaining on concrete after forms are removed.
   2. Transition of curves to straight lines and of curves to curves shall be formed as smooth, continuous, and uninterrupted with typical 90-degree radius alignment at the points of tangency.

3.05 PLACING REINFORCEMENT

A. General:
   1. When there has been a delay in placing concrete, reinforcement shall be inspected and, if necessary, cleaned, relocated, and tied at no additional cost to Owner.
   2. Wherever conduits, piping, inserts, sleeves, and similar item interfere with placing of reinforcing steel, obtain approval of Owner's Representative of method of procedure before concrete is placed.

B. Reinforcement installation shall conform to the provisions of the Standard Specifications as follows:
   1. Cleaning Section 52-1.03B
   2. Bending Section 52-1.03C
   3. Placing Section 52-1.03D
   4. Splicing Section 52-6
   5. Lapped Splices Section 52-6.03B

3.06 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify Engineer of Record and Special Inspector minimum 48 hours prior to commencement of operations. Do not place concrete until forms and reinforcements, as well as other required inspections, have occurred and the Special Inspector is present to perform observations and testing during placement.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Separate slabs on grade from vertical surfaces with 1/2-inch-thick joint filler. Place joint filler to required elevations. Secure to resist movement by wet concrete.

E. Extend joint filler from bottom of slab to within 1/8 inch of finished slab surface.

F. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

G. Place concrete continuously between predetermined contraction joints.

H. Do not interrupt successive placement; do not permit cold joints to occur.

I. Screed slabs on grades shown, maintaining surface to tolerance of 1/4 inch maximum in 10 feet.

3.07 CONCRETE JOINTS

A. General:
   1. Joints shall be constructed as detailed in the Drawings.

2. Refer to layouts on the Drawings for location of each joint type.

B. Expansion Joints: Install to full depth of slab.
   1. Fiber Expansion Joints: After allowing concrete to fully cure, remove zip strips and install expansion joint sealant as shown and in accordance with manufacturer's instructions.
   2. Install specified dowel sleeves in accordance with manufacturer's instructions and as shown.

C. Score Joints: Tool to a 3/8-inch radius and to a 1-inch depth.

D. Form contraction joints as detailed on plans. Joints shall be formed immediately after final finishing with an approved concrete-sawing machine; "SOFF-Cut" as manufactured by SOFF-Cut International: Corona, California (909) 272-2330, or equal.
   1. Avoid dislodging aggregates.
   2. Unless otherwise indicated or directed, the joints shall be 1/8-inch-wide and 1-inch deep. Do not use zip-strips.
   3. Saw contraction joints to true alignment with "SOFF-Cut" concrete-sawing machines adequate in number and power and with sufficient replacement blades to complete the sawing at the required rate.
   4. Joints shall be cut as the concrete has hardened sufficiently to permit walking on the slab, and as recommended by the saw manufacturer.
   5. Unless otherwise approved, saw joints in the sequence of concrete placement. Remove cutting debris.
   6. Saw cuts shall be made in accordance with manufacturer's instructions.

E. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
   1. Cut depth shall be 25 percent of slab depth unless otherwise shown or required to comply with accepted mockup.
   2. Layout: As shown on the Drawings.

F. Curb and Edge Band Joint: Locate as follows, unless otherwise noted on the Drawings.
   1. Every 5 feet for score joints.
   2. Install fiber expansion joints maximum 15 feet on center.
   3. Install fiber expansion joints at corners, and beginnings and endings of radii.
   4. Align score and fiber expansion joints with proposed fence posts.

3.08 EDGING

A. Edges of slabs, curbs, and other paving shall be tooled with a 1/2-inch radius edging tool, unless otherwise indicated or specified in the Drawings.

B. Trowel marks resulting from tooling of edges shall be carefully troweled out.

3.09 PLACING OF CONCRETE

A. Notify Owner's Representative minimum 5 working days prior to pour.

B. Preparation:
   1. Protect finished surfaces adjacent to areas to receive concrete.
   2. Valve boxes, electric boxes, drainage inlet structures, manholes, lids, and other similar items shall be covered and protected prior to and during concrete pour. Concrete staining to these items will not be accepted.
   3. Verify that the Owner's Representative, if required, has inspected reinforcement.
   4. Notify the Owner's testing laboratory at least 2 working days before placing concrete.

C. Placing:
   1. Concrete placement shall conform to Section 40-103H of the Standard Specifications.
   2. Moisten earth, and spray forms and reinforcement with water before placing concrete.
   3. Place concrete in continuous operation to permit proper and thorough integration and to complete scheduled placement.

D. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other acceptable means shall be used to prevent segregation.

3.10 CONCRETE FINISHING - GENERAL

A. Provide formed concrete surfaces to be left exposed with a medium sand-blast finish. Coordinate with Landscape Architect prior to placing concrete.

B. Finish concrete floor surfaces in accordance with ACI 301. Provide non-slip surface where concrete floor surfaces are left exposed, unless noted otherwise.

C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.11 FLATWORK FINISHING

A. General:
   1. Provide each concrete finish where shown in the Drawings.
   2. Provide samples and mockups as specified of all concrete finishes for review and acceptance prior to pouring concrete.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.

D. Broom Finish:
   1. Broom with medium bristled broom to a uniformly roughened surface. Finished surface shall be clean with uniform and straight lines.
   2. Paving with a slope greater than 6 percent shall be heavy broom finish and paving less than 6 percent shall be a medium broom finish.

E. Areas to Receive Surface Retarder:
   1. Apply specified surface retarder uniformly to wet concrete after the initial bleed water rises to the surface using low pressure spray equipment in accordance with manufacturer's recommendations.
   2. Remove retarded cement matrix with water.
   3. Exercise care, and install protective procedures, to prevent rinse water from damaging adjacent materials or entering adjacent soil and planting areas. Should rinse water contaminate soil of planting areas, affected soil shall be removed and replaced with new soil complying with Section 32 90 00 - Planting at no additional cost to Owner.

3.12 FIELD QUALITY CONTROL

A. Provide free access to Work and cooperate with Owner's Representatives.

B. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

C. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

D. At a minimum one slump test will be taken for each set of test cylinders taken.

E. Tolerances:
   1. Vertical deviation from specified grades shall not exceed 0.04 foot.
   2. Surface smoothness deviations shall not exceed 1/8 inch in 8 feet, in any direction.
   3. Thickness shall not be more than 0.01 foot less than planned thickness at any point.

3.13 CURING AND PROTECTION

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

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure floor surfaces in accordance with ACI 308.

D. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

E. Provide necessary security to protect the concrete from vandalism. Concrete which is defaced or damaged during the course of this Contract shall be replaced by the Contractor at no additional cost to the Owner.

3.14 PATCHING

A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

C. Patch imperfections in accordance with ACI 301.

3.15 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements; concrete with excessive honeycombs or other surface or finish defects.

B. Repair or replacement of defective concrete will be determined by the Engineer of Record.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

D. No additional compensation will be allowed for repair of defective concrete.

3.16 CLEANING

A. Remove excess base material, concrete spills, cement stains and all other excess materials from all project areas prior to Final Acceptance.

END OF SECTION

SECTION 32 18 00

MISCELLANEOUS PAVING AND SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Miscellaneous paving surfacing as shown on the Drawings including, but is not limited to, the following:
   1. Infield fines mix with sports field conditioner.
   2. Infield fines mix.
   3. Infield clay mix; bag and brick material.

B. Related Requirements:
   1. Section 32 33 00 - Site Furnishings
   2. Section 31 20 00 - Earth Moving
   3. Section 32 11 00 - Base Courses

1.02 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Sequencing and Scheduling:
   1. Coordinate applicable subgrade preparations, installations of base course materials, and all other work with work of this Section to insure a proper, timely installation.

1.03 ACTION SUBMITTALS

A. Samples:
   1. Unless otherwise specified, submit 1-quart size samples of the following:
      a. Infield fines mixture.
      b. Infield clay mixture.

1.04 QUALITY ASSURANCE

A. Materials Source: Sources of materials specified herein shall not be changed during course of work without review and written acceptance by the Owner's Representative.

1.05 WARRANTY

A. Manufacturers: Provide Owner with the following manufacturers extended warranties.
   1. Poured in Place Rubber Resilient Surfacing: 10 years.
   2. Wood Chip Loose Fill Resilient Surface: 25 years.

PART 2 - PRODUCTS

2.01 SAND AND CLAY MATERIALS

A. Supplier: TMT Enterprises, Inc., San Jose, CA, 408-432-9040 as specified and the basis of design unless otherwise noted, or equal. Contact: Matt Moore.

B. Infield Fines and Clay Mix for Warning Track: "Pac -Bell 2.0 Infield Fines."
   1. Mix shall be free of rocks, debris, vegetation, clay balls, foreign materials, etc. Infield mixes shall be sterilized to eliminate the possibility of any growth of vegetation.
   2. The composition of the mix shall be achieved using mechanical blending equipment prior to delivery to the site and shall be as follows:

Sieve Size	Percent Retained by Weight
4 mm	0
2 mm	3.4
1 mm	14.4
0.5 mm	22.5
0.25 mm	11.3
0.1 mm	11.1
0.05 mm	5.6
Total Sand	64.6
Silt/Clay Ratio	0.89

   3. Pitchers' Mound Mix: 100 percent, high-density pure virgin clay; "Turface Professional Mound Clay" by PROFILE Products LLC, or equal.
      a. Color: As noted on the Drawings or, if not indicated, as selected by Owner's Representative.
      b. Size: 50-pound bags.
   4. Home Plate and Bases Clay: 100 percent pure virgin clay blocks; "Turface MoundMaster" by PROFILE Products LLC, or equal.
      a. Color: As noted on the Drawings or, if not indicated, as selected by Owner's Representative.
   5. Bases Clay: "TMT Pro-Grade Screened Clay."

C. Sports Field Conditioner: "Turface MVP" by PROFILE Products LLC, or equal.

2.02 ADDITIONAL MATERIALS

A. Aggregate Base: As specified in Section 32 11 00 - Base Courses.

B. Brick and Bag Clay: "Pro-Mound" by Pros Choice, 800-648-1166, or equal.

C. Coarse Infield Cinders: 5/16" clean red lava rock.

PART 3 - EXECUTION

3.01 INFIELD CLAY MIX AT HOME PLATE AND BASES

A. Home Plate: Excavate evenly designated infield areas and lay a 1/2-inch course of loose clay and compact. Lay clay bricks across entire area and alternate brick joints in courses. Bricks to be worked together to bond and hand tamp. Apply 1/2-inch layer of loose clay to cover and finish with fines layer.

B. Bases: Excavate evenly designated infield areas and lay loose clay in 2-inch lifts and compact. Lay additional clay lifts to achieve 4 inches of clay and compact.

C. Water lightly and compact with 1,000 to 3,000-pound roller.

D. Spread additional material, roll and compact to establish even finished grade at specified elevation.

3.02 INFIELD FINES AND WARNING TRACK MIX

A. Spread infield fines mix evenly where shown in drawings and screed in 2-inch lifts. Thoroughly water each lift until the entire depth is moist.

B. Roto-till specified sports field conditioner into the top 4 inches of fines at a rate of 1.0 ton per 1000 square feet.

C. Compact with a 1,000 to 3,000-pound roller after grading and wetting final lift.

D. Allow material to dry, then spike and mat drag to establish finish grade at specified elevations.

E. Water to settle.

F. Finish grade of infield and warning track fines shall be flush with concrete edgebands. If edge condition is a tall curb set finish grade to finish grade established on the grading Drawings.

3.03 SPORTS FIELD CONDITIONER

A. As specified for infield fines mix.

3.04 AGGREGATE BASE

A. Install as shown on the Drawings and in accordance with Section 32 11 00 – Base Courses.

3.05 PITCHER'S MOUND MIX

A. Apply the pitchers' mound clay mix at 2-inch lifts, tamp, compact, and repeat.

B. Compact with a 1,000 to 3,000-pound roller after grading and wetting final lift.

C. Fill in back and sides of sloping to the edge of the circle.

3.06 COARSE INFIELD CINDARS

A. Install as shown on drawings.

3.07 TOLERANCES

A. Vertical deviation from specified lines, grades, and detail cross sections shall not exceed 0.04 foot for all surfacing specified in this Section.

END OF SECTION

SECTION 32 18 23

TENNIS COURT SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Installation of acrylic surfacing for asphalt tennis courts required for proper completion of the work including, but not necessarily limited to, the following:
   1. Patching and filling cracks.
   2. Tennis court surfacing installation.
   3. Other applicable Project components.

1.02 RELATED SECTIONS

A. Related Requirements:
   1. Section 32 12 16 - Asphalt Paving
   2. Section 32 33 00 – Site Furnishings

B. References
   1. National Asphalt Paving Association (NAPA)
   2. United States Tennis Association (USTA)
   3. International Tennis Federation (ITF)
   4. American Sport Builders Association (ASBA)

1.03 QUALITY ASSURANCE

A. Surfacing shall conform to the guidelines of the ASBA for planarity.

B. All surface coatings products shall be supplied by a single manufacturer.

C. The contractor shall record the batch number of each product used on the site and maintain it through the warranty period.

D. The contractor shall provide the inspector, upon request, an estimate of the volume of each product to be used on the site.

E. The installer shall be an authorized applicator of the specified system.

F. The manufacturer's representative shall be available to help resolve material questions.

1.04 SUBMITTALS

A. Manufacturer specifications for components, color chart and installation instructions.

B. Authorized Applicator certificate from the surface system manufacturer.

C. ITF classification certificate for the system to be installed.

D. Reference list from the installer of at least 5 projects of similar scope done in each of the past 3 years.

E. Current Material Safety Data Sheets (MSDS).

F. Product substitution: If other than the product specified, the contractor shall submit at least 7 days prior to the bid date a complete type written list of proposed substitutions with sufficient data, drawings, samples and literature to demonstrate to the owners satisfaction that the proposed substitution is of equal quality and utility to that originally specified. Information must include a QUV test of at least 1000 hours illustrating the UV stability of the system. The color system shall have an ITF pace rating in Category 2. Under no circumstances will systems from multiple manufacturers be considered.

1.05 MATERIAL HANDLING AND STORAGE

A. Store materials in accordance with manufacturer specifications and MSDS.

B. Deliver product to the site in original unopened containers with proper labels attached.

C. All surfacing materials shall be non-flammable.

1.06 GUARANTEE

A. Provide a guarantee against defects in the materials and workmanship for a period of one year from the date of substantial completion.

1.07 INSTALLER QUALIFICATIONS

A. Installer shall be regularly engaged in construction and surfacing of cushioned acrylic tennis courts, play courts or similar surfaces.

B. Installer shall be an Authorized Applicator of the specified surface system.

C. Installer shall be a builder member of the ASBA.

1.08 MANUFACTURER QUALIFICATIONS

A. System manufacturer shall provide documentation that the surface to be installed has been classified by the ITF as a medium pace surface.

B. System manufacturer shall be a US owned company.

C. System manufacturer shall be a member of the ASBA.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. California Products Corp., Andover, MA. 01810 / Plexi Premier Court System www.plexipave.com
   1. Or www.californiasportssurfaces.com
   2. Representative Dan Brown 602-639-3900 dbrown@icpgroup.com

B. Substitutions: Submit requests at least 7 days prior to the bid date with a complete type written list of proposed substitutions with sufficient data, drawings, samples and literature to demonstrate to the owners satisfaction that the proposed substitution is of equal quality and utility to the specified product. Information must include a QUV test of at least 1000 hours illustrating the UV stability of the system. The

system shall have an ITF pace rating in Category 2. Under no circumstance may the final color surface contain silica sand added at the job site.

2.02 MATERIALS

A. Patching Mix (California Court Patch Binder) - for use in patching cracks, holes, depressions, and other surface imperfections.

B. Crack Filler (Plexipave Crack Filler) - for use in filling fine cracks.

C. Acrylic Filler Course (California Acrylic Resurfacer) – for use as a filler for new or existing asphalt surfaces. The 100% acrylic filler shall be blended with approved silica sand at the jobsite.

D. Plexipave Grand Prix – 100% flexible acrylic coating filled with select silica.

E. Acrylic Color Playing Surface (Plexichrome/Plexipave Color Base) – for use as the finish color and texture. Plexichrome and Plexipave Color Base are blended at the job site to achieve the correct surface texture. *Factory Fortified Plexipave may be used as an alternative material.

F. Line Paint (California Line Paint) – for use as the line marking on the court/play surface.

G. Water – for use in dilution/mixing shall be clean and potable.

2.03 MATERIAL SPECIFICATIONS

A. Court Patch Binder – 100% acrylic resin blended with Portland Cement and silica sand.

1. Percent solids by weight (minimum) 46%
2. Weight 8.7-8.9 lbs./gallon

B. Plexipave Crack Filler – 100% acrylic resin heavily filled with sand.

1. Percent solids by weight (minimum) 85%
2. Percent solids by weight (minimum) 15 lbs./gallon

C. California Acrylic Resurfacer – 100% acrylic resin (no vinyl copolymerization constituent). The product shall contain not less than 3.5% attapulgite.

1. Percent solids by weight (minimum) 26.7%
2. Weight 8.7-8.9 lbs./gallon

D. Plexipave Grand Prix

E. Plexichrome – 100% acrylic resin (no vinyl copolymerization constituent) with selected light fast pigments. Green shall contain not less than 8% chrome oxide.

1. Percent solids by weight (minimum) 36.5%
2. Weight 10.0-10.2 lbs./gallon

F. Plexipave Color Base – 100% acrylic resin containing no vinyl copolymerization constituent. Contains not more than 63% rounded silica sand.

1. Percent solids by weight (minimum) 74%

2. Weight 13.1-14.1 lbs./gallon

G. California Line Paint – 100% acrylic resin containing no alkyds or vinyl constituents. Texturing shall be rounded silica sand.

1. Percent solids by weight (minimum) 60.5%
2. Weight 12-12.3 lbs./gallon

H. All surfacing materials shall be non-flammable and have a VOC content of not less than 100g./ltr. Measured by EPA method 24.

I. Local sands are not acceptable in the color playing surface. Sands must be incorporated at the manufacturing location to ensure quality and stability.

PART 3 - EXECUTION

3.01 WEATHER LIMITATIONS

A. Do not install when rainfall in imminent or extremely high humidity prevents drying.

B. Do not apply unless surface and air temperature are 50°F and rising.

C. Do not apply if surface temperature is in excess of 140°F.

3.02 PREPARATION FOR CUSHIONED UNDERLAYMENT

A. Clean surfaces of loose dirt, oil, grease, leaves, and other debris in strict accordance with manufacturer's directions. Pressure washing will be necessary to adequately clean areas to be coated. Any areas previously showing algae growth shall be treated with bleach or approved product to kill the organisms and then be properly rinsed.

B. Holes and cracks: Cracks and holes shall be cleaned and a suitable soil sterilant, as approved by the owner, shall be applied to kill all vegetation 14 days prior to use of **Court Patch Binder** according to manufacturer's specifications.

C. Depression: Depressions holding enough water to cover a five-cent piece shall be filled with Court Patch Binder Patching Mix. 3 gallons of Court Patch Binder, 100 lbs. 60-80 silica sand, 1-gallon Dry Portland Cement (Type I). **This step shall be accomplished prior to the squeegee application of Acrylic Resurfacer.** The contractor shall flood all the courts and then allow draining. Define and mark all areas holding enough water to cover a nickel. After defined areas are dry, prime with tack coat mixture of 2 parts water/1 part Court Patch Binder. Allow tack coat to dry completely. Spread Court Patch Binder mix true to grade using a straight edge (never a squeegee) for strike off. Steel trowel or wood float the patch so that the texture matches the surrounding area. Never add water to mix. Light misting on surface and edges to feather in is allowed as needed to maintain work ability. Allow to dry thoroughly and cure.

NO WORK FROM THIS STAGE ON SHALL COMMENCE UNTIL AN INSPECTOR HAS ACCEPTED THE SURFACE.

D. Filler Course. (Acrylic Resurfacer): Filler course shall be applied to the clean underlying surface in one application to obtain a total quantity of not less than .06 gallon per square yard based on the material prior to any dilution. Acrylic Resurfacer may be used to pre-coat depression and crack/hole repairs to achieve better planarity prior to filler course application.

1. Over a properly repaired surface of asphalt on existing courts, apply one coat of Acrylic Resurfacer according to the following mix:
   a. Acrylic Resurfacer 55 gallons
   b. Water 20 - 40 gallons
   c. Sand 600-800 pounds / 60-80 mesh
   d. Liquid Yield 112-138 gallons

2. On new asphalt, two coats of Acrylic Resurfacer shall be used to properly fill all voids in the asphalt surface. Use clean, dry 50-60 mesh sand and clean, potable water to make mixes. The quantity of sand and water in the above mix may be adjusted within above limits to complement the roughness and temperature of the surface.

3. Mix the ingredients thoroughly using accepted mixing devices and use a 70 Durometer rubber bladed squeegee to apply each coat of Acrylic Resurfacer as required.

4. Allow the application of Acrylic Resurfacer to dry thoroughly. Scrape off all ridges and rough spots prior to any subsequent application of Acrylic Resurfacer or subsequent cushion surface system.

3.03 APPLICATION OF ACRYLIC COLOR PLAYING SURFACE

A. All areas to be color coated shall be clean, free from sand, clay, grease, dust, salt, or other foreign matters. The Contractor shall obtain the Engineer's approval, prior to applying any surface treatment.

B. Blend color base and Plexichrome with a mechanical mixer to achieve a uniform Fortified Plexipave mixture. The mix shall be:

   1. Color Base 30 gallons
   2. Plexichrome 20 gallons
   3. Water 20 gallons

C. Application shall be made by 50 durometer rubber faced squeegees. The Fortified Plexipave mixture should be poured on to the court surface and spread to a uniform thickness in a regular pattern.

D. A total of 3 applications of Fortified Plexipave shall be made to achieve a total application rate of not less than .15 gal./sy. No application should be made until the previous application is thoroughly dry.

E. If a more flexible surface is desired, Plexipave Gran Prix coating may be used. It is applied at a total application rate of .18 gal./sy.

3.04 LINE PAINTING

A. Line shall be 2" wide unless otherwise noted on the drawings. Lines shall be carefully laid out in accordance with ASBA and USTA guidelines. The area to be marked shall be taped to insure a crisp line. The California Line Paint shall have a texture similar to the surrounding play surface. Application shall be made by brush or roller at the rate of 150-200 sg. /gal. (3/4 gal. per tennis court).

3.05 PROTECTION

A. Erect temporary barriers to protect coatings during drying and curing.

B. Lock gates to prevent use until acceptance by the owner's representative.

3.06 CLEAN UP

A. Remove all containers, surplus materials, and debris. Dispose of materials in accordance with local, state, and Federal regulations.

B. Leave site in a clean and orderly condition.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: chain link fencing improvements as shown on the Drawings including, but not necessarily limited to, the following:
   1. Galvanized chain link fabric, posts, gates, and hardware.
   2. Dugouts with metal roofs
   3. Chain link fence with integrally woven privacy plastic slats.
   4. Baseball / Softball backstop(s) with baseboards.
   5. Batting cage(s) with metal roof and interior netting.
   6. Concrete footings and mow bands.

B. Related Requirements:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 09 91 15 - Exterior Site Painting
   3. Section 32 33 00 - Site Furnishings
   4. Section 32 32 15 - Landscape Concrete
   5. Section 32 90 00 - Planting
   6. Structural Drawings

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
   4. F567 - Standard Practice for Installation of Chain-Link Fence."
   5. F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.
   6. F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

B. American Welding Society (AWS):
   1. A2.4: "Symbols for Welding, Brazing and Nondestructive Examination."

C. Chain Link Fence Manufacturers Institute (CLFMI): Product Manual CLF-PM0610.

D. Industrial Steel Guide for Fence, Rails, Posts, Gates and Accessories.

E. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Sequence and Scheduling: Contractor shall coordinate construction timing of chain link fencing and related work with installation of concrete work specified in Section 32 32 15 – Landscape Concrete and all other work.

1.04 ACTION SUBMITTALS

A. Shop Drawings: To scale drawings showing all different types and sizes of backstop units, gates, and fencing systems.
   1. Shop Drawings shall include, but may not be limited to:
      a. All information regarding clearances, connections, components and any miscellaneous related appurtenances (such as wood baseboards at backstops, locking mechanisms etc.).
      b. Concrete footing and reinforcement information.
   2. Indicate materials, dimensions, sizes, weights and finishes of components. Include plans, elevations, sections and other required installation and operational clearances, connections, components and miscellaneous related appurtenances such as wood baseboards at backstops and locking.
   3. Show required field measurements and interface with work of other Sections. Provide details showing interface and anchorage of fencing and gates with adjacent construction, both new and existing.
   4. Details showing post anchorage, attachment and bracing. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices.
   5. Details of gates and hardware.
   6. Welds, both shop and field, shall be indicated by AWS "Symbols for Welding, Brazing and Nondestructive Examination," A2.4.

B. Product Data: Manufacturer's descriptive literature for materials and components of the chain link fencing system including coatings, fittings, and hardware.
   1. Include the manufacturer's name and catalog number for each item where applicable.
   2. Clearly identify which portions of the information on the printed literature are applicable if more than one product is shown.

C. Samples:
   1. Chain-link fabric, approximately 12 inches square, if requested by Owner's Representative.
   2. Hardware and fittings Owner's Representative.
   3. Sample of privacy slat system.

1.05 INFORMATIONAL SUBMITTALS

A. Installation Instructions and/or Drawings: Submit as applicable.

1.06 QUALITY ASSURANCE

A. Welding:
   1. Qualifications: Certified and qualified in accordance with AWS D1.1.
   2. Procedures and operations shall comply with AWS "Standard for Welding Procedure and Performance Qualifications," B2.1.
   3. Comply with AWS publication "Welding Zinc Coated Steel" for galvanized products.
   4. Welding inspector's qualifications shall be in accordance with AWS D1.1.

PART 2 - PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Except as otherwise specified, comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual.

B. Industry Standards: Materials and installation shall conform to the requirements of the Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual."

C. Regulatory Requirements: Pedestrian gates and related hardware shall comply with applicable codes, including provisions for accessibility required by CBC Chapters 10 and 11B, Part 2; and the Americans with Disabilities Act (ADA) Standards for Accessible Design.

D. Bottom 10 inches of pedestrian gates shall have a smooth uninterrupted surface.

2.02 MATERIALS

A. Fabric: Galvanized steel wire complying with ASTM A392, Class 1, with not less than 1.2 ounce zinc coating per square foot.
   1. Selvage: Knuckled finish top and bottom.
   2. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 16 feet high. Wire sizes includes zinc coating.
   3. Mesh Opening: 2 inches.
   4. Wire Diameter: 9-gauge (0.148-inch diameter), unless noted otherwise.

B. Framework: Posts and rails shall be Schedule 40 pipe complying with conforming to ASTM F1083, Regular Grade, 30,000 psi Yield Strength, or ASTM F1043, Group 1-C, High Strength Grade 50,000 psi Yield Strength, galvanized with no less than 1.8 ounces of zinc coating per square foot of surface area complying with ASTM A123.
   1. Strength requirements for posts and rails shall conform to ASTM F1043 or F1083 as noted below.
   2. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in inches	Outside Diameter (OD) in inches	Type 1 Steel ASTM F1083 (30 KSI)	Type II Steel ASTM F1043 (50 KSI)
1	1.315	1.68	1.35
1.25	1.660	2.27	1.84
1.5	1.900	2.72	2.28
2	2.375	3.65	3.12
2.5	2.875	5.79	4.64
3	3.500	7.58	5.71
3.5	4.000	9.11	6.56
4	4.500	10.79	---
6	6.625	18.97	---
8	8.625	28.55	---

C. Fittings and Accessories:
   1. Unless specified otherwise, steel fence fittings and accessories shall comply with ASTM F626 and be galvanized in accordance with ASTM A53, with zinc weights per Table 1 of ASTM A153.
   2. Tension Wire: 7-gauge (0.177 inch diameter) coil spring steel with finish to match fabric.
   3. Tie Wires: 9 gauge (0.148 inch diameter) steel with finish to match fabric.
   4. Caps: Provide weather tight closure cap for each post and exposed ends of framing. Provide line post caps with loop to receive wire or top rail with finish to match fabric.

5. Tension Bars: Hot-dip galvanized steel with minimum length 2 inches less than full height of fabric, minimum cross-section of 3/16 inch by 3/4 inch and minimum of 1.2 ounce zinc coating per sq. ft. of surface area.
6. Tension Clips: Minimum 3/4 inch wide 12-gauge (.105 inch) thick with finish to match fabric.
7. Truss Rods: Hot dipped galvanized steel rods with a minimum diameter of 5/16 inch (7.9 mm).

D. Hardware for Swinging Gates:
   1. General:
      a. Hardware shall be of adequate size and strength to provide proper operation of gates.
      b. Provide hinges, latching and locking devices, and other hardware as shown on the Drawings or required for a complete operable installation.
   2. Hinges: Master Halco heavy duty, or acceptable equal.
   3. Self-closing Hinges:
      a. For gates up to 330 lbs and 5-feet wide: Heavy-duty self-closing hinge with hydraulic damping, ADA compliant (requiring maximum 5 lbs of operating force per CBC 11B-309.4); Locinox Mammoth Heavy Duty "Mammoth180" or accepted equal.
      b. For gates up to 440 lbs and 6 and ½ -feet wide: Heavy-duty self-closing hinge with hydraulic damping, ADA compliant (requiring maximum 5 lbs of operating force per CBC 11B-309.4); Locinox Mammoth Ultra Heavy Duty "Mammoth-HD" or accepted equal.
   4. Panic Hardware:
      a. Panic bar requiring maximum 5 lbs of operating force per CBC 11B-309.4; "Von Duprin 98/99 – AX series" push pads, strike plates, and receiver brackets" or accepted equal.
      b. Pull Handle, Strike Plate, Guard Plate, and Mounting Plate shall be compatible with panic bar system, and be provided by Von Duprin, or accepted equal.
   5. Accessible Pull Handle:
      a. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist, requiring maximum 5 lbs of operating force per CBC 11B-309.4.
      b. One of the following to be selected by District Representative:
         1) Standard Operation: Von Duprin 996L
   6. Gate Latch Hardware:
      a. Gate latch hardware shall be sized to match receiving fence/gate post size.
      b. Provide and attach welded accessible pull handle where specified.
      c. Fulcrum gate latch, Model "#STRONG-ARM-SNG" by DAC Industries, available from Hoover Fence Co., (800) 355-2335.

E. Batting Cage Netting and Accessories: SportsField Specialties custom netting BSSN60; or equal.
   1. Refer to Section 32 33 00 – Site Furnishings for netting information.
   2. #60 knotted nylon net, 1-7/8" square mesh.
   3. Netting shall be affixed to eyebolts with 1/4 inch minimum vinyl-coated stainless steel aircraft cable.
   4. Galvanized Thimbles, wire rope clamps, carabineer clips, hog rings and jaw and jaw turnbuckles.
   5. Fencing shall be provided with concrete edgebands unless otherwise noted.
      a. Edgebands shall be installed as detailed on plans.
      b. Gates shall have the same edgeband width as adjacent fencing.

2.03 ADDITIONAL MATERIALS AND COMPONENTS

A. Concrete: Minimum Class B, 28-day compressive strength of 2,500 psi as specified in Section 32 32 15 - Landscape Concrete.

B. Privacy Slats: Tubular PVC, UV-light stabilized, flame resistant, self-locking, sized to fit specified mesh opening, and providing full privacy; "Fin/Slat 1000" by Master Halco, or equal.
   1. Color: Forest Green, or as selected by Owner's Representative from reviewed submittals.

C. Backstop Baseboards: Surfaced Kiln Dried Douglas Fir painted with a primer coat and two coats of durable exterior enamel paint.
   1. Color: Forest Green
   2. Install as shown on the Drawings.
   3. Galvanized or Stainless Steel Bolts and nuts shall be painted the same color as the boards after installation.
   4. Top board to have ½" radius on the field side and all outside edges at end of the boards to avoid splintering.

D. Galvanizing-Repair Paint: Minimum 82 percent zinc-dust-content paint for regalvanizing welds in galvanized steel, complying with FS DOD-P-21035a; "Z.R.C. Cold Galvanizing Compound" by ZRC Worldwide, "Cold Galv Primer" by Valspar, or equal.

E. Distance Banners, Signage and all other Applicable Attachments:
   1. Refer to Section 32 33 00, "Site Furnishings" for product information. Products shall be attached at each grommet location and per manufacturers recommendations. Grommets shall be located in thicker seamed areas. No attachment grommets in a single layer of fabric will be allowed.

F. Top of Fence Protective Cap: Attach with heavy duty zip ties spaced every 2'-0" minimum, color matched.

2.04 FABRICATION

A. Welding: Welds shall be shop fabricated prior to galvanizing unless otherwise acceptable to Owner's Representative and were field welding is unavoidable.

B. Repair zinc coating damaged after fabrication with specified repair paint in accordance with ASTM A780, AHDGA publication, "Recommended Practice for Touch-up of Damaged Galvanized Coatings," and manufacturer's recommendations for application of repair paint.

C. Steel Framework: System shall comply with the following minimum requirements.
   1. Posts, Rails, Braces, and Gate Frames: Type I galvanized steel pipe as specified.
   2. End, Corner, and Pull Posts for the Following Fabric Heights: As noted on the Drawings.
   3. Line or Intermediate Posts for the Following Fabric Heights: As noted on the Drawings.
      a. 8 Feet to 15 Feet: 2.875 inch outside diameter (2-7/8 inch outside diameter).
   4. Top, Bottom and Horizontal Intermediate Rails: 1.66 inch outside diameter (1-5/8 inch outside diameter).
   5. Gate Posts: Single gate leaf, and one leaf of a double gate installation, for nominal gate widths as follows: As noted on the Drawings.
   6. Gate Frames: Single or double gate for nominal gate widths as follows:
      a. 6 Feet to 10 Feet: 1.90 inch outside diameter (1-7/8 inch outside diameter).
      b. Under 6 Feet: 1.66 inch outside diameter (1-5/8 inch outside diameter).
   7. Batting Cage Roof: As noted on the Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to excavation, layout all fencing locations for review and acceptance by Owner's Representative.

B. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

3.02 ERECTION

A. General: Erect chain link fence and related items in accordance with ASTM F567, in strict conformance with reviewed and accepted shop drawings, and manufacturer's recommendations.

B. Set all posts straight, plumb, and true to line.
   1. Set line posts at equal spacing not to exceed 10 feet on centers, in concrete footings not less than 10 inches around and 36 inches deep.
   2. Set terminal posts at corners, ends, and gates, in concrete footings not less than 12 inches around and 36 inches deep.
   3. Slope tops of concrete footings so as to provide drainage away from posts.

C. Excavation: Drill or hand-excavate holes for posts to diameter and spacing indicated in firm, undisturbed or compacted soil.
   1. Unless noted otherwise, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross section of post.
   2. Unless noted otherwise, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

D. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space chain link posts maximum 8 feet on center unless noted otherwise. Surface mount posts with mounting plates where indicated. Fasten with lag bolts and shields.

E. Top Rails: Run rail continuously through line posts caps, bending to radius for curved runs and at other posts termination into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

F. Bottom Rails: Install bottom rails between posts with fittings and accessories as shown in Drawings, as applicable.

G. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

H. Tension Wire: As applicable, install at bottom of fabric (and at top if top rail is not specified) as shown in Drawings. Install tension wire before stretching fabric and attach to each post with ties. Secure wire to fabric with 12.5 gauge hog rings at 24 inches on center maximum.

I. Fabric: Leave approximately 2 inches between finish grade and bottom selvages (1 inch at backstops) unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on infield or primary use side of fence, unless noted otherwise, and anchor to framework so that fabric remains in tension after pulling force is released.

J. Tension Bars: Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric integrally woven into post. Thread through fabric, and secure to end, corner, pull, and gate posts with tension clips spaced not over 15 inches on center.

K. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing. Tie fabric to line posts 12 inches maximum on center and to rails and braces 24 inches maximum on center.

L. Fasteners: Install nuts for tension clips and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts. Cut all bolts within three threads of nut or less.

M. Field Welding:
   1. Field welds shall be completed by a Certified Structural Welder.

2. Comply with applicable AWS specification for procedures of manual shielded metal arc welding, for appearance and quality of welds, and for methods used in correcting welding work.
3. Repair zinc coating damaged by field welding as specified for shop welding.

N. Bolts shall be cut back to within three threads of the nut.

3.03 GATE INSTALLATION

A. Install gates as shown on the Drawings in accordance with reviewed submittals.

B. Cut, drill, and fit as required for installation.

C. Set work accurately in location, alignment, and elevation; plumb, level, and true; and free of rack; measured from established lines and levels.

D. Adjust items prior to securing in place so as to ensure proper matching of components and correct alignment.

E. Field weld all gate hinges in place once gates are aligned and approved by owners representative.

3.04 ADJUSTMENT AND TOUCH-UP

A. Inspect installed work. Verify that gates, controls, and hardware operate properly. Correct deficiencies.

B. Restore products and finishes damaged during installation and construction period so that no evidence of correction work remains.

END OF SECTION

SECTION 32 32 00

LANDSCAPE CONCRETE MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Concrete unit masonry at home dugout walls.
   2. Mortar and grout.
   3. Reinforcement for masonry.

B. Related Requirements:
   1. Landscape Concrete: Section 32 32 15; concrete footings.
   2. Exterior Site Painting: Section 09 91 15; painting of masonry.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Coordinate with other Sections for work to be installed in conjunction with concrete unit masonry.

1.03 ACTION SUBMITTALS

A. Shop Drawings: To-scale drawings to illustrate detailing, fabrication, bending and placement of unit masonry reinforcing bars.
   1. Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars and arrangements of masonry reinforcement.
   2. Indicate location of conduit, plumbing and other items embedded in unit masonry walls in coordination with placement of reinforcement.

B. Samples for Verification:
   1. Full-size units for each exposed decorative CMU unit other than gray, smooth-faced, units.

C. Mix Designs:
   1. Verification of mortar strength and governmental approval if other than proportion specifications included in CBC Table 21-A are to be used.
   2. Verification of grout strength if other than proportion specifications included in CBC Table 21-B are to be used.

1.04 INFORMATIONAL SUBMITTALS

A. Mill test reports for all reinforcing steel.

B. Certificates:
   1. Material certificates for the following signed by the manufacturer and the Contractor certifying that each material complies with requirements and standards specified.
      a. Each material and grade of reinforcing bars.
      b. Each type and size of anchors, inserts, ties, and accessories.
   2. Plant certificates for concrete masonry units to the District's Testing Agency and Architect stating that all units have been properly cured before shipment and that they conform to requirements of these Specifications, including but not limited to, requirements for moisture content per ASTM C90.

C. Extreme Weather Procedures: Cold and hot-weather construction procedures evidencing compliance with requirements specified in ACI 530.1 and these Specifications.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable requirements of CBC Chapter 24 - Masonry.

B. Industry Standards: Comply with applicable requirements of:
   1. American Concrete Institute (ACI):
      a. ACI 315 - Details and Detailing of Concrete Reinforcement.
      b. ACI 530.1 – Specifications for Masonry Structures
   2. Concrete Masonry Association of California and Nevada (CMACN) - Typical Details for Concrete Masonry.

C. Mockup: First installed area of exterior exposed CMU, at least 20 square feet, shall serve as a mock-up for review and approval by District's Representative of workmanship, visual effect, and interface with adjacent construction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. At the time of delivery to the site, masonry units shall conform to moisture requirements of ASTM C90 Type I, Table 1. In addition, masonry units shall meet moisture requirements during laying of units and grouting until work is complete.

B. Store masonry units above ground on level platforms which allow air circulation under stacked units.

C. Cover materials as necessary to protect against wetting prior to use.

1.07 FIELD CONDITIONS

A. Environmental:
   1. Hot Weather Conditions: Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 90 degrees F or greater in the shade and when relative humidity is less than 50 percent.
   2. Cold Weather Conditions: Do not place unit masonry when temperature is below 40 degrees F, unless District's Representative approves, and precautions are taken for preventing damage from freezing before and after placement.
      a. Maintain minimum 40 degrees temperature for at least 96 hours after mortar and grout are placed.
      b. Prevent masonry from freezing for at least 7 days after placement and grouting.
      c. Materials used shall be free from frost.
      d. Masonry shall not be placed on frozen substrate.

B. Protection:
   1. Protect surrounding work as required against damage from masonry work.
   2. Protect masonry units from moisture absorption until masonry wall is completed and facing materials or coatings are installed.

PART 2 - PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Source Limitations:
   1. Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
   2. Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

2.02 CONCRETE MASONRY UNITS

A. Regular (Precision) Hollow Concrete Masonry Units: ASTM C90, medium weight smooth face, uniform gray color.
   1. Masonry units shall have minimum compressive strength of 2,800 psi, for minimum design f'm of 2,000 psi.
   2. Provide open end units or "H" block units, for stacked bond pattern.
   3. Provide bond beam units at horizontal reinforcing.
   4. Provide open end units at vertical reinforcing.

2.03 REINFORCEMENT AND ANCHORAGES

A. Refer to CONCRETE MASONRY NOTES, Sheet S1.1 for additional requirements

B. Horizontal Reinforcement: Hot-dip galvanized, ladder-type, single-wythe, 9-gage wire reinforcing; Hohmann and Barnard, Dur-O-Wall, Heckmann, Wire-Bond, or equal.

C. Reinforcing Bars:
   1. Bars: New billet steel, ASTM A615, Grade 60.
   2. Tie Wires: ASTM A82.

D. Reinforcing Bar Positioners: Dur-O-Wall "D/A 811" and "D/A 816," Heckman Building Products, Inc. No. 376, Hohmann & Barnard, Inc. "#RB Rebar Positioner," or equal.

2.04 MORTAR AND GROUT MATERIALS

A. Cement for Mortar and Grout: Type I or Type II Portland Cement conforming to ASTM C150.
   1. Type II Portland Cement may be used only if it equals strength of Type I.
   2. All cement used (mortar and grout) shall be low alkali type (0.6 percent maximum).

B. Aggregate:
   1. Mortar: Sand shall conform to ASTM C144 for standard CMU except that not less than 3 percent of sand shall pass #100 sieves.
   2. Grout: Grout shall have minimum compressive strength of 3,000 psi, per ASTM C476.
      a. Course: Maximum 3/8-inch size; 200 percent by volume.
      b. Fine: Washed river sand; 225 percent by volume.

C. Lime Putty: Made from hydrated lime conforming to ASTM C207.

D. Grout Admixture: Sika Chemical Corporation "Sika Grout Aid Type II."

E. Water: Clean and potable.

2.05 MORTAR AND GROUT MIXES

A. General:
1. Accurately measure materials for mortar and grout in suitably calibrated devices. Measurements based on dry loose volume. Shovel measurements or fractional sack batches not acceptable.
2. Place sand, cement, and water, in that order, in mixer and mix for at least two minutes.
3. For mortar, add lime and continue mixing for at least 10 more minutes or as much longer as required to secure a uniform mass.
4. Retemper mortar only by adding water into a basin made with mortar. Work mortar carefully in.
5. Remove from work any mortar or grout which is unused within one hour after initial mixing.
6. Proportion grout by volume with sufficient water added to produce consistency for pouring without segregation.
7. Do not use calcium chloride in mortar or grout.
8. Admixtures: Add in accordance with admixture manufacturer's instructions and if included in the approved mix design.

B. Mortar Mix: In compliance with CBC requirements and ASTM A270, Type S for regular grade block.

C. Grout Mix: In compliance with CBC requirements and ASTM C476.

D. Design Strengths:
1. Mortar: Not less than 1,800 psi at 28 days.
2. Grout: Not less than 3,000 psi at 28 days.

PART 3 - EXECUTION

3.01 REINFORCING STEEL

A. Place reinforcement in accordance with ACI 531, supported and secured against displacement, with 1/2-inch minimum clearance from the interior face of the masonry unit.

B. Maintain position within 1/2-inch of true dimension.

C. Verify reinforcement is clean, free of scale, dirt, or other foreign coatings which would reduce bond to grout.

3.02 MORTAR BEDS

A. Hollow Units: Provide full mortar coverage on horizontal and vertical face shells and webs in all courses.

3.03 PLACING AND BONDING

A. Placing and Bonding: Lay masonry to lines and levels indicated, plumb and true, using only dry masonry units.

B. Cutting: Make jobsite cuts with proper tools to provide straight unchipped edges and to fit masonry construction to final form. Take care to prevent breaking masonry unit corners or edges.

C. Laying: Lay masonry in full bed and head joint of mortar, properly jointed with other Work.
1. Buttering corners of joints, or excessive furrowing of mortar joints will not be accepted.
2. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment is necessary, remove mortar and replace.

D. Pattern: Lay masonry in running bond, with vertical joints located at center of masonry units above and below. Align vertical cells for continuity of reinforcement and grout. Course one block unit and one mortar joint to equal 8-inches. Make vertical and horizontal joints equal and of uniform thickness.

E. Horizontal and Vertical Face Joints:
1. Nominal thickness: 3/8-inch, uniform.
2. Tooling: Tool joints when thumbprint hard with joint tools to compress mortar to ensure full contact with block surfaces.
3. Concealed joints: Flush.
4. Exposed joints: Flush.
5. Internal cleaning: Remove mortar protruding into cells of cavities to be reinforced or filled.

F. Intersections and Corners: Fully bond intersections, external and internal corners.

G. Joining Masonry Work: Provide expansion joints in accordance with reference standards. When joining fresh masonry to set or partially set masonry construction, clean exposed surface of set masonry and remove loose mortar prior to laying fresh masonry.

H. Cold Joints: If necessary, to stop off a horizontal run of masonry, rack back one-half block length in each course. Do not use toothing to join new masonry to set or partially set masonry when continuing a horizontal run.

I. Cleaning: Remove excess mortar before mortar sets. Clean surfaces at exposed masonry to present even surface texture and color.

3.04 BUILT-IN WORK

A. Avoid cutting and patching. Coordinate placement of built-in products specified in other Sections so built-in products are place as masonry is laid.

B. Install bolts, anchors, nailing blocks, sleeves, inserts, frames, flashings, conduit, and other built-in products as masonry progresses. Install bolts in templates to assure proper alignment and location.

C. Solidly grout spaces around built-in products.

3.05 GROUTING

A. Grout all cells of masonry units which contain rebar, bolts, etc., all cells below grade, and as specified on the Drawings. Work grout into cores and cavities to eliminate voids. Do not displace reinforcing steel when placing grout.

B. Inspection Holes: Provide inspection and cleanout holes at base of vertical cell grout lifts in excess of 5 feet. Clean concrete grout spaces of excess mortar and debris before grouting.

C. Construction Joints: When grouting is halted for one hour or longer, form horizontal construction joints by stopping the pour of the grout 1-1/2 inches below top of uppermost unit.

D. After inspection of concrete grout spaces, plug cleanout holes with masonry units. Brace against wet grout pressure.

3.06 PROTECTION OF WORK

A. Protect sills, ledges and off-sets from mortar drippings or other damage during construction. Remove misplaced mortar or grout immediately.

B. Cover top of walls with non-staining waterproof coverings when Work is not in progress.

3.07 CURING

A. In hot, dry conditions, CMU shall be fogged during a 3-day curing period at least twice a day.

3.08 POINTING AND CLEANING

A. At final completion of unit masonry work, fill holes in joints and tool.

B. Cut out and re-point defective joints.

C. Dry brush masonry surface after mortar has set, at end of each day and after final pointing.

D. Leave masonry and surrounding surfaces clean and free of mortar spots and droppings.

END OF SECTION

SECTION 32 32 15

LANDSCAPE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Architecturally exposed formed concrete.
   2. Natural site concrete at utility pads.
   3. Subgrade, natural, as-cast concrete for foundations, landscape fencing, furnishings and other site improvements.

B. Related Requirements:
   1. Section 31 20 00 - Earth Moving
   2. Section 32 13 13 - Concrete Paving
   3. Section 32 33 00 - Site Furnishings

1.02 REFERENCES

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Pre-Installation Meeting: Conduct meeting at Project with Owner's Representative and concrete installer at site to review scope of landscape concrete work and expectations.
   1. Meeting shall be scheduled after approval of mockups and sufficiently in advance of commencement of architecturally exposed concrete for the site improvements.
   2. Record discussions of conference and any conflict, incompatibility, or inadequacy. Furnish a copy of record to each participant.

C. Coordination:
   1. Coordinate delivery so that mixes may be immediately poured upon arrival at site.
   2. Coordinate proper installation of accessories and anchorage embedded in concrete and for the provision of holes, openings, and other penetrations necessary to the execution of the work of other trades.
   3. Coordinate mix design and finishing of colored concrete work to assure appearance match with cast-in-place concrete included on the Structural Drawings.

1.04 ACTION SUBMITTALS

A. Product Data: Manufacturers' current catalog cuts and specifications for the following:
   1. Formwork panels and board form liners, if used.
   2. Expansion joint filler materials.
   3. Color admixtures.
   4. Curing compounds.
   5. Other items as requested by Owner's Representative.

B. Samples:

1. Concrete materials as required for testing and inspection.
2. Expansion Joint Sealant: Manufacturer's standard bead samples showing full range of colors available.

C. Concrete Mix: Mix design and certified compressive strength test report for each concrete strength and type indicating additives and maximum aggregate size required. Report shall be prepared and certified by the ready-mix concrete supplier.

1.05 INFORMATIONAL SUBMITTALS

A. Statement of installer/finisher qualifications if requested by Owner's Representative.

B. Mill Certificates and Certifications for reinforcing.

C. Delivery tickets for each load of concrete delivered to the site.

D. NRMCA Certificate of Conformance: Submit a copy of the NRMCA Certificate of Conformance to the Owner's Testing Agency for the ready-mix plant, equipment, and mix trucks that will supply the concrete for the project.

E. Record of pre-installation meeting.

1.06 QUALITY ASSURANCE

A. Codes and Standards: Comply with the applicable provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified:
   1. California Building Code, Title 24, Part 2, Chapter 19A – Concrete.
   2. American Concrete Institute (ACI):
      a. ACI 301: Specifications for Structural Concrete for Buildings
      b. ACI 303.1: Standard Specification for Cast-In-Place Architectural Concrete.
      c. ACI 303R: Guide to Cast-In-Place Architectural Concrete.
      d. ACI 318: Building Code Requirements for Reinforced Concrete.
      e. ACI 614: Recommended Practice for Measuring, Mixing, and Placing Concrete.
   3. Concrete Reinforcing Steel Institute, Manual of Standard Practice.
   4. NRMCA - National Ready-Mix Concrete Association, Quality Control Manual – Section 3: Certification of Ready Mixed Concrete Production Facilities.

B. Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete as placed meets minimum requirements.

C. Qualifications:
   1. Contractors Design Laboratory: When mixes are proportioned by trial batch method, engage a laboratory conforming to ASTM E329 and under direction of a civil engineer licensed in the State of California.
   2. Installer for Formed Surfaces: An experienced concrete contractor who has specialized experience installing cast-in-place architectural concrete similar in quality level, material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance. Installer shall retain a quality-control inspector, experienced in inspecting cast-in-place architectural concrete, and who is an ACI-certified Concrete Construction Inspector or is certified by ICC, as a Reinforced Concrete Special Inspector.
   3. Contractor's Testing Agency: An independent testing agency meeting "Recommended Requirements for Independent Laboratory Qualification," published by American Council of Independent Laboratories and basic requirements of ASTM E329, "Use in the Evaluation of Testing and Inspection Agencies as Used in Construction."

D. Concrete Testing:

1. The Owner may retain, at its expense, a testing laboratory to perform material evaluation tests in accordance with Section 01 45 00 - Quality Control.
2. Testing may include slump tests and securing samples of concrete, cement, aggregates or other materials for testing. Applicable materials shall be provided by the Contractor at no additional cost to the Owner.

E. Mockups:
   1. General:
      a. Mix design shall match that used on accepted sample panels and proposed for use in final construction including cement and color additive.
      b. Prepare at least one month before start of final concrete work to allow concrete to cure before observation.
      c. Concrete color and finish for mockup appearance shall match color and finish of accepted sample.
      d. Build mockups at the location indicated or, if not indicated, as selected by the Owner's Representative.
      e. Notify Owner's Representative 5 working days in advance of dates and times when mock-ups will be constructed and layouts will be ready for review.
      f. Contractor shall allow for preparation of 1 comprehensive mockup and up to 2 flat paving mockups for evaluation and final approval of each concrete.
      g. Color and texture shall be approved before starting construction.
      h. Perform specified slip-resistance testing on paving mockups.
      i. Maintain final accepted mockups in an undisturbed condition as a standard for judging the completed Work.
      j. Retain samples of sands, aggregates, and color additive used in the mockups for comparison with materials used in final work.
      k. Demolish and remove mockups when directed if not incorporated into the final work.
   2. Walls and Steps:
      a. Wall Size: Minimum 4 feet long by maximum height and include 2 tie holes, horizontal and vertical corner treatment, and specified texture finishes.
      b. Stair Size: Minimum 2 treads and 2 risers by 4 feet long and including safety scoring at nosing.
   3. Board Formed Concrete: An on-site mockup is required for the board-formed architectural cast-in-place concrete for verification of concrete appearance using the proposed mix design. Mockup will also be used for final evaluation and approval of appearance, formwork layout, and workmanship
      a. Size: Not less than 4 foot x 4 foot and to include a typical outside corner.
      b. Form release agent, if required in final construction, shall also be used on mock-up.
      c. Prepare promptly to allow concrete to cure sufficiently before observation by Owner's Representative.
      d. Mockup will be evaluated for visual appearance of concrete with and without water repellent and patching methods.
      e. Repairs: Representative areas of concrete shall be intentionally damaged, in the presence of the Owner's Representative, to mimic honeycombing, spalling, and other defects as may be experienced upon stripping of formwork.
      f. Repair it to demonstrate materials and methods proposed for repair of surface blemishes.
      g. Specific procedures and materials used for patched area shall be thoroughly documented.

F. Lines and levels shall be established by a licensed surveyor or registered civil engineer.

G. Owner's Representative will review all forms and joint layout prior to casting concrete.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery so that mixes may be immediately poured upon arrival at site.

1.08 FIELD CONDITIONS

A. Maintain control of concrete dust and water. Do not permit adjacent areas to be contaminated.

B. For protection of existing trees to remain, see Arborist Report on the Drawings and Section 32 01 90 – Existing Tree Protection and Maintenance.

C. Maintain control of concrete dust and water. Do not permit adjacent areas to be contaminated.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

A. Aggregate: Class 2, 3/4-inch maximum aggregate base, conforming to Section 26 of California Department of Transportation (CDT) "Standard Specifications."

2.02 FORMWORK

A. General:
1. Comply with ACI 347, "Recommended Practice for Concrete Formwork," for formwork and other form-facing material requirements.
2. Furnish in largest practicable sizes to minimize number of joints unless otherwise shown on the Drawings.
3. Seal joints to prevent leakage of paste using demonstrated effective method that will not affect appearance of finished surface.
4. Forms may be reused at concealed surfaces. Forms shall not be reused for exposed concrete surfaces if there is any evidence of surface wear or defect that would impair the quality of the surface or if their reuse will evident and produce a noticeable variation in the appearance in the completed work.
5. Formwork Surface Class at Exposed Concrete: Class A. In addition to ACI 303.1 limits on form-facing panel deflection, limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, to 1/8 inch.

B. Forming Materials:
1. Panels at Smooth Concrete: New, manufactured without addition of urea-formaldehyde, minimum 3/4-inch thick, MDO plywood made specifically for forming of Architectural Concrete to achieve joint pattern shown on Drawings or accepted shop drawings; "PureKor MDO Concrete Formply" by Panel Source International, Inc., or equal.
2. Unexposed Surfaces of Concrete: Plywood, lumber, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
3. Framing: Contractor option, subject to meeting necessary strengths and surface tolerances.

C. Form Hardware:
1. Ties:
   a. Typical: Metal, spreader type, removable to 1-inch from concrete face.
   b. Exposed Concrete: Fiberglass rod ties, tinted to color to match concrete; "SuperTie" by RJD Industries, Inc., or equal, in tensile strength as selected by form designer.
2. Wire ties and wood spreaders will not be allowed except that such devices may be permitted for footings, shallow foundations and similar other totally concealed below grade surfaces. Wood spreaders shall not remain in concrete.

D. Form Release Agents:
1. Concealed Concrete: Contractor option.
2. Exposed Concrete: Colorless, free from oils, chemically active, guaranteed to provide clean, stain-free concrete release and not to interfere with future applied coatings and finishes.

2.03 REINFORCING

A. Materials:
   1. Reinforcing Steel: Deformed billet steel bars, ASTM A615, Grade 60 for No. 5 and larger, Grade 40 for No. 4 and smaller.
   2. Tie Wire: ASTM A82, black annealed.
   3. Spacers, Bar Supports, and Other Accessories: In accordance with ACI 315. Galvanize metal items exposed to moisture, or use approved other non-corrodible, non-staining supports.
   4. Smooth Dowels for Expansion Joints: ASTM A615, Grade 40 smooth, billet-steel bars, shop painted with iron-oxide zinc-chromate primer.

B. Reinforcing steel shall be cut and bent cold to exact lengths and shapes to comply with Drawings, reviewed shop drawings, and referenced codes and standards.

C. Comply with the additional requirement shown on the Drawings.

2.04 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type II, low alkali brand, with a proven history of successful use with proposed aggregates. Cement shall be same brand and from same source throughout the Project.

B. Hardrock Aggregate: ASTM C33.

C. Water: Clean, potable concrete mixing water free from injurious amounts of salts, oils, acids, alkalis, organic materials or other deleterious matter.

2.05 CONCRETE ADDITIVES

A. Pigment for Integrally Colored Site Concrete: ASTM C979, synthetic mineral-oxide pigments or colored water-reducing admixtures, color stable, nonfading, and resistant to lime and other alkalis; “Chromix Admixture for Color-Conditioned Concrete” by L. M. Scofield Co. as specified, or equal.
   1. If added to mix at Project site, additive shall be furnished in manufacturer’s “Mix-Ready” disintegrating bags.
   2. Dosage Rate: As required to achieve color of approved sample but not exceeding 10 percent of weight of cementitious materials in mix.
   3. Colors: n/a

B. Waterproofing: Crystalline type; “Xypex Admix C-1000” by Xypex Chemical Corporation, or equal.

C. Additional Additives: As approved for structural concrete and recommended by concrete mix designer.

2.06 ACCESSORIES

A. Curing Materials:
   1. Liquid Curing Compounds: ASTM C309, Type 1.
   2. Sheet Material: Waterproofed Kraft paper, ASTM C17, regular type.

B. Fiber Expansion Joint Material: Preformed cellular fiber complying with ASTM D1751; 1/2 inch thick unless otherwise indicated; "SealTight Fiber Expansion Joint Filler" by W.R. Meadows or equal precut to proper size.

2.07 CONCRETE MIXING

A. General:

1. Mix designs for concrete shall be Contractor-designed at its expense. Designs shall be prepared by a qualified agency approved by the Owner's Representative.
2. Use admixtures according to manufacturer's written instructions.
3. Ensure equipment and plant will afford accurate weighing, minimize segregation, and will efficiently handle materials.
4. Deposit concrete into final position within 90 minutes of introduction of cement.

B. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

C. Waterproofing: Crystalline waterproofing powder shall be added to the concrete mix at water features at rate of 3 percent by weight of Portland cement content, unless otherwise recommended by manufacturer for mix design.
1. Waterproofing shall be added to the concrete mix at time of batching.
2. Thorough blending of the admixture throughout the concrete mix to ensure a homogeneous mixture is obtained.

D. Minimum ultimate compression strength of concrete at 28 days is as follows:

Item	Strength	Maximum slump	Size of aggregate	Cement (# of 94 lb. sacks per yard)	W/C Ratio
Slab-On-Grade	3,000	4 inches	3/4"-1"	5	0.60
Walls and Footings	3,000	4 inches	3/4"-1"	5	0.60

E. Adjustment to Concrete Mixes:
1. Mix design adjustments may be requested by Contractor when job conditions, weather, test results warrant, or to meet appearance of accepted samples or mockup.
2. Test data for revised mix design shall be submitted to and accepted by Architect before using in work.

PART 3 - EXECUTION

3.01 PREPARATION

A. Use templates for anchor plates, bolts, inserts and other items embedded in concrete. Accurately secure so that they will not be displaced during placing of concrete.

B. Piping and Conduit: Do not embed piping, other than electrical conduit at irrigation sleeves, in structural concrete.
1. Locate conduit to maintain strength of structures at maximum. Verify size, length, and location of electrical conduit.
2. Provide sleeves for irrigation lines provided under Section 32 84 00 - Irrigation.

C. Aggregate Base Course: Compact base course to thickness shown on Drawings in accordance with recommendations of the Geotechnical Engineer.

3.02 INSTALLATION OF FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
1. Forms shall be tight enough to prevent loss of concrete mortar.
2. Wavy surfaces and bulged vertical or slab surfaces in finished work will be rejected.

B. Ties for exposed concrete surfaces shall be arranged symmetrically and shall be aligned both vertically and horizontally. Do not stagger.

C. Extend forms for all exposed concrete at least 6 inches below finish grade.

D. Do not disturb earth at bottoms of excavations for footings or foundations. Maintain these areas free of water, properly cleaned and leveled off.

E. Assemble forms so that all construction joints appear only as shown on Drawings and as accepted by Owner's Representative Incorporate all formwork joints into required reveal and expansion joints. No exposed form joints will be permitted.

F. Ease all exposed edges, unless otherwise shown on Drawings. Do not chamfer.

G. Thoroughly clean all formwork prior to pouring concrete. Where no form coating is used, wet down all wood.

H. Place and secure anchorage devices and other embedded items. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

I. Leave no wood in concrete, except pressure-treated nailers.

3.03 PLACING REINFORCEMENT

A. Comply with Comply with CRSI's "Manual of Standard Practice" and additional requirements for placing reinforcement specified for structural concrete on the Drawings.

B. Reinforcement shall be free of paint, oil, dirt, scale, or loose rust or coating that might reduce bond with concrete.

C. When there has been a delay in placing concrete, reinforcement shall be inspected and, if necessary, cleaned, relocated, and tied at no additional cost to Owner.

D. Wherever conduits, piping, inserts, sleeves, and similar item interfere with placing of reinforcing steel, obtain Owner's Representative's approval of method of procedure before concrete is placed.

E. Securely tie and support reinforcement to prevent displacement by construction traffic and during casting of concrete.

F. Splices not shown on the Drawings shall be accepted by Owner's Representative, in writing.

G. Unless permitted in writing, reinforcement shall not be bent after being partially embedded in hardened concrete.

H. Dowels shall be tied securely in place before concrete is deposited.

3.04 PLACING OF CONCRETE

A. Notify Owner's Representative minimum 5 working days prior to pour.

B. Preparation:
   1. Protect finished surfaces adjacent to areas to receive concrete.
   2. Verify that the Project Engineer and City Inspector, if required, have inspected reinforcement.
   3. Notify Project Engineer, City Inspector if required, and Contractor's testing laboratory at least two working days before placing concrete.

C. Placing:
   1. Moisten earth, and spray forms and reinforcement with water before placing concrete.
   2. Place concrete in continuous operation to permit proper and thorough integration and to complete scheduled placement.
   3. Hot-Weather Concreting: Conform to ACI 305 when mean daily temperature rises above 80 degrees F.
   4. Use vibrators for thorough consolidation of concrete.
      a. Provide vibrators at each point of deposit during simultaneous placing to ensure timely consolidation around reinforcement, embedded items, and into corners of forms; ensure availability of spare vibrators in case of failures.
      b. Do not place vibrators against reinforcement, attach to forms, or use to spread concrete.
   5. Distribute concrete in maximum 18-inch layers, unless otherwise accepted.
   6. Space points of deposit to eliminate need for lateral flow.

3.05 REMOVING AND REUSING FORMS

A. Formwork for a given area shall be removed at the same time to enhance uniformity of final appearance.

B. Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

C. Remove forms for exposed concrete so as to avoid damage to finish. Do not use pinch bars and similar tools for prying against exposed surfaces.

D. Upon removal of forms, remove bolts, wires, and similar metal items not necessary to finished work to minimum 1 inch from surface. Remove them in such a way as to eliminate danger of rust stains from form-tie materials or other unprotected ferrous materials embedded in or adjacent to exposed concrete surfaces.

E. Re-use of forms will only be permitted as specified. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Apply new form-release agent. Align and secure joint to avoid offsets.

3.06 FINISHING FORMED SURFACES

A. Rough-Formed Finish on Unexposed Concrete: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R.

B. Formed Finish on Exposed Concrete: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
   1. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
   2. Finish appearance shall match concrete on Building.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

D. Adjusting:
   1. Remove projecting fins, bolts, wire, nails, and similar items not necessary for the work, or cut them back 1 inch from the surface and patch in an inconspicuous manner.

2. Immediately after removal of forms, cut off snap ties extending from the face of concrete to at least 1 inch deep in the concrete. Fill or plug as detailed in Drawings.
3. Remove in its entirety and replace defective concrete work which after corrective patching, rubbing, or similar procedures fail to duplicate the appearance of unpatched work, conform to the standards set forth in these Specifications, or is determined as unacceptable by the Owner's Representative.

3.07 CONCRETE FINISHING

A. General:
   1. Provide each concrete finish where shown in the Drawings.
   2. Provide samples and mockups as specified of all concrete finishes for review and acceptance prior to pouring concrete.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.

3.08 EXPANSION JOINTS

A. General:
   1. Provide construction and expansion joints as shown. Where not shown, coordinate locations with the Owner's Representative.
   2. Form construction and isolation joints and tool edges true to line, with faces perpendicular to surface plane of concrete.
   3. Use only experienced personnel and forms or templates to achieve consistent lines.

B. Unless noted otherwise on the Drawings, expansion shall be 1/2-inch wide, the full depth of the concrete section and conforming to Section 51 of the Caltrans "Standard Specifications."
   1. Extend joint fillers full width and depth of joint.
   2. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
   3. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   5. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

C. Sealant Filling of Expansion Joints:
   1. After the curing period, strip out all depth gauge strips and carefully clean expansion joints.
   2. Fill with joint compound in accordance with sealant manufacturer's instructions and ASTM C1193. Avoid spilling compound on adjacent surfaces or overflowing from joint.

3.09 PROTECTION AND CURING

A. Protection:
   1. Protect concrete against rapid drying and damage by rain.
   2. Keep concrete moist for at least 7 days.
   3. Protect with liquid curing compound, or a covering that will not stain or discolor finished concrete surfaces.
   4. Obtain acceptance of proposed method prior to use.

B. Curing: Cure concrete in accordance with the ACI Manual of Concrete Practice and all applicable requirements for curing and protection of concrete included in Sections 90-7 and 90-8 of the Caltrans "Standard Specifications."

C. Integral Color Concrete: Cure colored concrete with only products approved by the manufacturer of the integral color pigments.

3.10 FIELD QUALITY CONTROL

A. Samples: Owner's testing agency will take samples for laboratory testing during the course of the work when required by Code. Other specified and required testing shall be by the Contractor's testing laboratory.

B. Contractor shall pay for full costs of removal of rejected concrete and its replacement with concrete of specified strength and retesting.

END OF SECTION

SECTION 32 33 00

SITE FURNISHINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Site furnishings and installation accessories as shown on the Drawings including, but not necessarily limited to, the following:
      a. 5 Row Bleachers.
      b. Baseball pitching rubbers.
      c. Softball pitching rubbers.
      d. Baseball/softball bases
      e. Baseball/softball plates
      f. Foul poles.
      g. BaseZone field wall padding
      h. Batting cage netting.
      i. Net barrier system.
      j. Flagpole.
      k. Drinking fountain.
      l. Drinking fountain in dugout.
      m. Two tier team benches.
      n. Scoreboard.
      o. Outfield Distance Banners
      p. Fence Cap
      q. Guard Rail System (dugouts)
      r. Bat rack
      s. Bat and Helmet Cubby
   2. Site Furnishings Product Matrix

B. Related Requirements:
   1. Section 32 12 16 – Asphalt Paving
   2. Section 32 13 13 – Concrete Paving

1.02 REFERENCES

A. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Scheduling and Sequencing:
   1. Do not install site furnishings prior to acceptance by Owner's Representative of area to receive items.
   2. Coordinate construction timing of installation of site furnishings in conformance with other work interfacing with installation of the site furnishing items.

1.04 ACTION SUBMITTALS

A. Shop Drawings: Submit complete shop drawings for all materials or furnishings requiring field or shop fabrication.

B. Product Data: Manufacturer's catalog cut sheets of materials and equipment to be provided.
   1. Include the manufacturer and distributor name, and subcontractor as applicable.
   2. Cut sheets clearly describe the specific product by catalog number and that additional non-specified products that may appear on the same cut sheet are crossed out where applicable.

C. Samples: Colors and finishes for products and furnishings requiring selection by the Owner's Representative.

1.05 INFORMATIONAL SUBMITTALS

A. Statement of qualifications for manufacturers and installer if requested by the Owner's Representative.

1.06 CLOSEOUT SUBMITTALS

A. Provide operation and maintenance data for items with operable, movable, or replaceable parts, for items with mechanical connections, and for other items as applicable.

B. Extended warranties as specified.

1.07 QUALITY ASSURANCE

A. Furnishings shall be reviewed for conformance with the intent of the Contract Documents and accepted by the Contractor prior to installation.

B. Site furnishings shall be in a new, "first-class" condition as determined by the Owner's Representative at the time of Final Acceptance.

C. Field Samples and Mockups: As requested by the Owner's Representative.

1.08 DELIVERY, STORAGE AND HANDLING

A. General:
   1. The Contractor is responsible for coordination of the delivery, acceptance, handling, and storage of site furnishings.
   2. Store and handle site furnishings as acceptable to the Owner's Representative and so that work or access of others is not impeded.
   3. Protect site furnishings from theft or damage until such items have been accepted by the Owner.

B. Packaging and Labeling: Furnish materials in manufacturer's unopened, original packaging, bearing original labels showing quantity, description, and name of manufacturer. Verify that materials and components are adequately padded and securely bound in such a manner that no damage occurs to the product during delivery and unloading at the site.

C. Storage: Damaged materials will be rejected. Remove damaged materials from job site immediately and pay cost of replacement. Determination of damage shall be the sole authority of the Owner's Representative.

D. Painted Finishes: Provide non-scratching, non-staining, firmly bound covering for shop-painted finishes until installed and accepted.

E. Protect wood materials from stains.

1.09 WARRANTY

A. Manufacturers: Provide Owner with manufacturer's written extended product warranties as available for the specified products.

PART 2 - PRODUCTS

2.01 SITE FURNISHINGS - GENERAL

A. In addition to those described in the following Articles, refer to the Site Furnishing Matrix included at the end of this Section for complete list of items to be provided.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to commencement of work described in this Section, carefully inspect installed work, and verify all such work is correct and complete. Immediately notify the Owner's Representative of any discrepancy before proceeding with work.

3.02 INSTALLATION - GENERAL

A. Conform to layout shown on Drawings. Final placement shall be field verified with the Owner's Representative.

B. Installation of products shall be as shown in the Drawings, or according to manufacturer's instructions. If discrepancies are found, or if information is lacking, consult with the Owner's Representative prior to beginning the work.

C. Concrete footings shall conform to requirements of Section 32 32 15 – Landscape Concrete unless noted otherwise.

D. Furnish anchorage and fastening required for installation to ensure proper fit and accurate placements. Bolts, where exposed, shall be cut back to within three threads of the nut.

3.03 TRASH RECEPTACLES

A. Install level and plumb in accordance with manufacturer's instructions at locations indicated on the Drawings.

3.04 BLEACHERS

A. Temporary bleachers shall be installed on a concrete pad and bolted to concrete pad as shown on the Drawings.

B. Three of the bleacher skids shall be bolted with a 3-inch concrete bolt with 4 bolts per skid.

3.05 CLEANING AND ADJUSTMENT

A. Protect furnishings from damage until acceptance of work. Do not remove protective wrappings from furnishings until so instructed by the Owner's Representative.

B. Clean soiled site furnishings prior to acceptance by Owner.

C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by the Owner's Representative.

D. Replace damaged items to the satisfaction of the Owner's Representative. Replace missing accessories at no cost to Owner.

3.06 SITE FURNISHINGS MATRIX

ITEM	DESCRIPTION	MANUFACTURER	MODEL NO.	QTY.	FINISH/COLOR	DISTRIBUTOR/CONTACT
A.	4 Row Bleachers	BSN Sports	#1375306 4 row 21' preferred tip n roll 56 seat,	6 ea.	Anodized Aluminum	BSN Sports Dallas, TX 1-800-856-3488
B.	Baseball/Softball Pitcher's Rubber	Sportsfield Specialties	VB043 – Champro Four Way Pitcher's Rubber	6 ea.	White	Sportsfield Specialties Alex Fletcher (408) 659-6055
C.	Baseball/Softball Bases	Sportsfield Specialties	VB001PW – Champro "The Hall" Base Set	2 sets	White	Sportsfield Specialties Alex Fletcher (408) 659-6055
D.	Baseball/Softball Home Plates	Sportsfield Specialties	VB0301 – Champro Pro Style w Hollywood Anchor System	6 ea.	White	Sportsfield Specialties Alex Fletcher (408) 659-6055
E.	Foul Pole Sets	Sportsfield Specialties	FPW420 – Softball FPW630 - Baseball	2 ea.	Yellow	Sportsfield Specialties Alex Fletcher (408) 659-6055
F.	Basezone Field Wall Padding	Sportsfield Specialties	BFWPCL46/BFW PCL46DG	8 ea	Chain Link Bolt & Plate Mount	Sportsfield Specialties Alex Fletcher (408) 659-6055
G.	Batting Cage Netting	Sportsfield Specialties	BSSN60	TBD	Black	Sportsfield Specialties Alex Fletcher (408) 659-6055
H.	Barrier Netting System	Sportsfield Specialties	TFBSS420P-SG StormGuard Ball Netting System	1 ea.	Black Netting and Posts	Sportsfield Specialties Alex Fletcher (408) 659-6055
I.	Scorer's Table	Sportsfield Specialties	ST58EMKLSC Custom – Panel to read: "Kennedy High School"	2 ea.	TBD	Sportsfield Specialties Alex Fletcher (408) 659-6055
J.	Flag Pole	Concord American Flagpole	IRW25D61	2 ea.	TBD	Concord American Flagpole 800-527-3902
K.	Drinking Fountain (Pedestal)	Elkay	LK4420BFU1U	2 ea.	Evergreen	Elkay 18002606640 https://www.elkay.com/us/en.html
L.	Drinking Fountain (wall mount)	Murdock	A172.8-VR-BF12 Series	2 ea.	Stainless	Murdock 800-453-7465 www.murdockmfg.com

ITEM	DESCRIPTION	MANUFACTURER	MODEL NO.	QTY.	FINISH/COLOR	DISTRIBUTOR/CONTACT
M.	Two-Tier Team Benches	Sportsfield Specialties	PTBTT8	2 ea.	Polyboard: TBD Frame: TBD	Sportsfield Specialties Alex Fletcher (408) 659-6055
N.	Baseball Scoreboard	Nevco	1608 with ADO	1 ea.	TBD	Steve Warner (916) 716-4201
O.	Softball Scoreboard	Nevco	1608 with ADO	1 ea.	TBD	Steve Warner (916) 716-4201
P.	Outfield Distance Banners	BSN Sports	SKU#1079647 BSN Sports 38" x 56" Banner w/ 24" Numbers	6	TBD	BSN Sports Dallas, TX 1-800-856-3488
Q.	Fence Cap	Aer-Flo, Inc.	PlastiCap	Per Plans	Yellow Black	Aer-Flo, Inc., Bradenton, FL 1-800-823-7356
R.	Guard Rail System	Sportsfield Specialties	GRS42	Custom section per plans	Custom size Color: Forest Green	Sportsfield Specialties Alex Fletcher (408) 659-6055
S.	Bench with Backrest	Sportsfield Specialties	ATBBRSP 10	6 ea.	Powder Coat Black	Sportsfield Specialties Alex Fletcher (408) 659-6055
T.	Helmet Cubby and Coat Rack Wall	Sportsfield Specialties	SUWHCCRWM	2 ea.	TBD	Sportsfield Specialties Alex Fletcher (408) 659-6055
U.	Helmet, Bat Bin & Side Storage	Sportsfield Specialties	SUAHCBBSS	2 ea.	Powder Coat Black	Sportsfield Specialties Alex Fletcher (408) 659-6055
V.	Portable Batting Cage	C&H Baseball	CAG100 **Netting:** #60 Knotted Nylon **Padding:** Peoria Option **Ballstop:** Unpadded **Upgrade Tires (Flat-less):** 3 Amerityre Flat-less Tires	2 ea.	STD	C& H Baseball 800 248 5192 Home - C & H Baseball (chbaseball.com)
W.	Batting Practice hitting screen set	C&H Baseball	Pro Set Package SCR100 L Screen, (2) SCR200 First/Third Base Screen, (1) SCR300 Second Base Screen, (1) Ball Caddy Wheel Axle System #96 Upgrade	2 ea	STD	C& H Baseball 800 248 5192 Home - C & H Baseball (chbaseball.com)
X.	Ball Caddy-Baseball	C&H Baseball	BCD100	2 ea	STD	C& H Baseball 800 248 5192 Home - C & H Baseball (chbaseball.com)
Y.	Ball Caddy-Softball	C&H Baseball	SBCD200	2 ea	STD	C& H Baseball 800 248 5192 Home - C & H Baseball (chbaseball.com)

ITEM	DESCRIPTION	MANUFACTURER	MODEL NO.	QTY.	FINISH/COLOR	DISTRIBUTOR/CONTACT
Z.	Homeplate batting practice mat	Beacon Athletics	110-340-309	4	green	Beacon Athletics 800 747 5985 Beacon Athletics | The Ultimate Ballfield Resource
AA.	Infield Turf Protector-baseball	Beacon Athletics	280-107-110 15'x26x56'	1	Forest Green	Beacon Athletics 800 747 5985 Beacon Athletics | The Ultimate Ballfield Resource

END OF SECTION

SECTION 32 80 00

IRRIGATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Landscape irrigation system work is shown on the Drawings including, but not necessarily limited to, the following:
   1. New Booster Pump.
   2. Water backflow prevention and flow sensing system.
   3. Automatic irrigation controls and systems.
   4. Line voltage connections to the irrigation controllers and low voltage control wiring from controllers to remote control valves.

B. Work Included Under Other Sections:
   1. 120 Volt A.C. electrical stub-out for irrigation controller.
   2. Irrigation sleeves.

C. Related Requirements:
   1. Section 31 01 90 - Landscape and Site Maintenance
   2. Section 31 23 00 - Excavation and Fill
   3. Section 32 90 00 - Planting
   4. Section 33 11 00 - Domestic Water Utilities

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. D1785 - Standard Specifications for (PVC) Plastic Pipe, Schedules 40 and 80.
   2. D2241 - Standard Specifications for PVC Pressure-Rated Pipe (SDR Series).
   3. D2564 - Standard Specifications for Solvent Cements for (PVC) Plastic Pipe and Fittings.
   4. F2768 - Standard Specification for Modified Stub ACME Thread Joint with Elastomeric Seal in Plastic Piping Components.
   5. D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
   6. F512 - Standard Specification for Smooth-Wall Poly (Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation.
   7. D2672 - Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.

B. National Sanitation Foundation (NSF), requirements for Seal of Approval.

C. Plastics Pipe Institute (PPI), recommendations for hydrostatic design stresses for PVC pipe.

D. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

E. Permits and Fees: Contractor is responsible to obtain all required permits and pay all associated fees unless otherwise noted.

F. Irrigation Association/American Society of Irrigation Consultants, Landscape Irrigation Best Management Practices, 2014 edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Substitutions for specified products shall be submitted for approval in accordance with Section 01 25 00 – Substitution Procedures.

B. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

C. Coordination, Sequencing, and Scheduling:
   1. Contractor shall be solely responsible for coordinating, sequencing and scheduling work with applicable trades and subcontractors so as to ensure proper and timely installation of the irrigation system.
   2. The entire irrigation system shall be under full automatic operations for a period of two days prior to beginning of planting. Coordinate with Section 32 90 00 – Planting.

D. Permits and Fees: Contractor is responsible to obtain all required permits and pay all associated fees unless otherwise noted.

1.04 ACTION SUBMITTALS

A. Shop Drawings: A diagrammatic drawing of proposed mainline route and equipment locations for approval by the Owner's Representative. The Drawings may be marked and used for marking layout and equipment locations.

B. Product Data: Manufacturer's literature or cut sheets of products specified and to be incorporated into the irrigation system. Specific products being submitted shall be highlighted or shown on boxes on cut sheets to designate which items are being submitted. Submittals not marked appropriately will be rejected.

C. Materials List: Prior to installation, submit a materials list. Include manufacturer, model number, and description of all materials and equipment. List shall also include sealants, cements, lubricants and other proprietary items.

1.05 CLOSEOUT SUBMITTALS

A. Record Drawings as specified.

B. Maintenance equipment as specified.

C. Warranties and Guarantees

1.06 RECORD DOCUMENTS

A. Comply with Section 01 78 39 – Project Record Documents.

B. Accurately record locations of all piping and equipment that varies from what is shown on the Drawings. Locations are to be clearly dimensioned horizontally to within 1 foot and vertically to within 0.5 feet from a hardscape edge or permanent site feature.
   1. The valve size, station number and gallons per minute shall be legible at each valve and shall match how the controller is wired.
   2. Additionally, each valve shall be annotated to describe which type of irrigation it is; rotor, rotator, spray, bubbler, drip tubing or other.
   3. Symbols for valves shall be annotated as: meter (M), backflow preventer device (BFP), master valve (MV), flow sensor (FS), hydrometer (H), quick coupler valve (QCV).

C. Contractor shall record and scan and submit PDF files of full size plan set of Record Drawings (As-builts Drawings) to the Owner's representative, and two sets of color coded plans shall be produced, one for placement at or within the irrigation controller cabinet reduced to 11" x 17", and one full size set for submittal to the Owner or stored at another location selected by the Owner's Representative.
   1. Both sets shall have all the irrigation valve zone lateral lines color-coded so as to readily distinguish between adjacent zones.
   2. The color-coded copies shall then be professionally laminated in minimum 5 mil clear plastic.

1.07 QUALITY ASSURANCE

A. Unless otherwise specified, install all materials in accordance with manufacturer's details, specifications and recommendations.

B. The Contractor shall be responsible to assure the irrigation installer personally or through an authorized and competent representative, supervises the work and retains the same supervisor on the job from commencement to completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store PVC pipe in a neat and orderly manner fully supported and protected from sunlight.

B. Equipment and materials shall be delivered, unloaded, and handled so as to protect from damage at all times.

1.09 FIELD CONDITIONS

A. PVC shall not be cemented during wet conditions at the discretion of the Owner's Representative.

B. Trench excavation and backfilling shall not be performed during excessively wet conditions at the discretion of the Owner's Representative.

C. Water Supply: Connections to, or the installation of, the water supply shall be at the locations shown on the Drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.

D. Discrepancies: In the event of discrepancy, immediately notify the Owner's Representative. Do not proceed with installation or irrigation components or system in areas of discrepancy until discrepancies have been resolved.

1.10 MAINTENANCE EQUIPMENT

A. Turn-over Materials: Provide 1 each of the following to the Owner's Representative:
   1. One quick coupler attachment key equipped with standard thread hose bib for each 5 quick couplers installed on the project.
   2. One key for locking quick coupler covers for each 5 quick coupler valves installed on the project.
   3. One key for hose bib operation for each 5 hose bibs installed on the project.
   4. One set of keys to irrigation controller and other installed locking cabinets or pedestals.

B. Full set of remaining nozzles for each rotor sprinkler.

1.11 GUARANTY

A. Contractor: Provide Owner with a separate written guaranty for the entire irrigation system against defects in installation, workmanship and equipment, for a period of 1 year from the date of Final Acceptance.

B. Contractor shall make necessary repairs to the system as well as to other work affected by defects in the system during guaranty period. Repairs shall be made at the Contractor's sole expense.

PART 2 - PRODUCTS

2.01 GENERAL

A. Use only new materials of brands shown on Drawings, specified herein or as acceptable to the Owner's Representative.

2.02 PIPE

A. General:
1. Plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASTM D2672, ASTM D2241 or ASTM D1785.
2. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.

B. Plastic Pipe: Polyvinyl chloride PVC (Type I) 1120.
1. Intermittent-Pressure Lateral Piping: 1120-Schedule 40 PVC plastic pipe with Schedule 40, Type 1, Grade 1, PVC solvent weld fittings.
2. Constant-Pressure Mainline Piping 2 inches and Smaller: Schedule 40 with solvent weld fittings.
3. Constant-Pressure Mainline Piping 2-1/2 Inches and larger: Class 200 SDR-21 or 2-1/2" to 3" Class 315 SDR-14, if requested by Owner, or C900 Class 200 DR-14, if the system is using recycled or well water.
4. Constant-pressure mainline piping 4 inches and larger shall be Class 200 PVC ring-tite with IPS ductile iron fittings and mechanical restraints at all bell fittings and fittings at changes in direction.
5. Constant-pressure mainline piping 3 inches and larger on systems with booster pumps shall be Class 200 PVC ring-tite with IPS ductile iron fittings and mechanical restraints at all bell fittings and fittings at changes in direction.
6. If the system is operated with recycled water, PVC pipe shall be "Purple Pipe."

2.03 FITTINGS

A. PVC Fittings: Polyvinyl chloride (Type I) plastic 1120, Schedule 40 or Schedule 80 where noted on the Drawings.

B. PVC Nipples: Polyvinyl chloride (Type I) plastic 1120, Schedule 80.

C. Joint Restraint for Ductile Iron Fittings: Shall be manufactured of ductile iron per ASTM A536. Gripping surfaces shall be machined serrations. As cast gripping surfaces are not permitted.
1. Sizes 1 ½" to 4": Joint Restraint shall be Knuckle Restraint by The Harrington Corporation or approved equal. Grip Ring shall be one piece residing within a housing that engages the fitting lugs. Grip Ring shall be activated by one bolt.
2. Sizes 4" to 12": Joint Restraint shall be Clam Shell Restraint by The Harrington Corporation or approved equal. Restraint shall not require separate restraining rods. The pipe gripping structure and fitting connection structure shall be integral and one piece.
3. Flange Bolts are to be 316 Stainless Steel.

D. PVC fittings used with UVR pipe shall be Schedule 40 UVR PVC type.

2.04 SWING JOINTS

A. Swing joints for Rotator and pop-up heads shall be as detailed on the Drawings.

B. Swing Joints for rotors shall be by LASCO Fittings, Inc. with ASTM F2768 Standard for Swing Joint ACME Threads, or equal.

2.05 BACKFLOW PREVENTER

A. Device: As specified on Drawings.
   1. If the system is using recycled water, label all potable water backflow preventers with tags or labels reading: "potable water" in black letters on blue background, per details.

B. Enclosure: Low profile, vandal-resistant; "Strongbox" Model series SBBC-CR powder coated cold-rolled steel or stainless steel Model series SBBC-SS by V.I.T. Products, Inc., or equal.
   1. Enclosure size to be verified with size of installed backflow device by Contractor.

C. Insulation Blanket: "WeatherGuard Blanket" by Best Choice USA, or equal.

2.06 VALVES AND SENSORS

A. General:
   1. Each valve shall be installed with unions before and after the valve.
   2. Control Valves shall be labeled with tags denoting the associated controllers and station numbers.
   3. Gate Valves and Ball Valves:
      a. Valves shall have a minimum working pressure of not less than 150 psi and shall conform to AWWA standards.
      b. Provide purple tags on all valves if system is designed for recycled water.

B. Master Valve: As specified on Drawings.

C. Flow Sensors: As specified on Drawings.
   1. Flow Sensor wiring conduit shall be Schedule 80 grey PVC electrical conduit complying with ASTM F512, size as required.

D. Gate Valves and Ball Valves: As specified on Drawings.

E. Remote Control Valves: As specified on Drawings.

F. Quick Coupling Valves: As specified on Drawings. Provide purple lid if system is designed for recycled water.

G. Drain Valves:
   1. Drain Valves shall be 2" Nibco T113 or approved equal.

H. Isolation Valves for Air/Vacuum Relief
   1. Isolation valves for air/vacuum relief shall be bronze ball valves.

2.07 CONCRETE VALVE BOXES

A. General:
   1. Manufacturer: Christy as specified and the basis of design, or equal. All concrete lids to be traffic rated unless located in planting areas and bullpens.
   2. Valve Boxes shall have bolt down type lids with locking where specified.

B. Master Valve, Rectangular:
   1. Valves 1" and 1'1/2": Model equivalent to Christy N16 with N16T bolt down lid.
   2. Valves 2" and 3": Model equivalent to Christy N36 with N36T bolt down lid.
   3. Boxes shall be labeled as "Irrigation - MV" on lid.

C. Gate Valves and Ball Valves:
   1. Valves 1-2 Inches: Christy model N09 box with N9T locking lid and N99HHB-2 bolts.
   2. Valves 2-1/2 Inches and Larger: Christy model N12 box with N9T lid and N99HHB-2 bolts, or equal.
   3. Boxes shall be labeled as "Irrigation – Valve" on lid.

D. Remote Control Valves:
   1. Valves 1 and 1-1/2 Inches: Christy model N16 with N16T bolt down lid.
   2. Valves 2 inches and larger: Christy model N36 with N36T bolt down lid, or equal.
   3. Boxes shall be labeled as "Irrigation - RCV" on lid.

E. Quick Coupling Valves, Round:
   1. Model equivalent to Christy Model G05T with G05CT locking Lid.
   2. Boxes shall be labeled as "Irrigation – QC" on lid.

F. Valve Boxes: Valve boxes shall have locking or bolt down type lids.

2.08 AUTOMATIC CONTROLLER AND ENCLOSURE

A. Controller: Manufacturer, model, size, and type as specified on Drawings.

B. Enclosure: Manufacturer, model, size, and type as specified on Drawings.

C. Grounding: 5/8"x8' copper grounding rod (one per controller) including #6 solid copper ground wire.

2.09 ELECTRICAL

A. General:
   1. Electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.
   2. Electrical work shall conform to local codes and ordinances.
   3. Remote control wire shall be UL rated for direct burial.
   4. Where two or more controllers are used, the control wires shall be a different color for each controller. These colors shall be noted on the "Record Drawings" placed in the controller cabinet.

B. Low Voltage Control Valve Wiring:
   1. Conductors:
      a. Control Wires: Type UF, 14-gauge wire. Insulating jacket color shall be red.
      b. Common Wires: Type UF, 12-gauge wire. Insulating jacket color shall be white.
      c. Spare Control Wires: Type UF, 14-gauge wire, insulating jacket color shall be blue.
      d. Spare Common Wire: Type UF, 12-gauge wire. Insulating jacket color shall be green.
   2. Splice connectors: 3M DBR-Y6 splice connectors, 3M Scotchcast #3570G-N Connector seal packs, or Spears DS-100 connectors with DS-300 sealant.

2.10 CONNECTING COMPOUNDS

A. Primer: I Weld-On "P-70" Primer by IPS Corporation.

B. Cement: Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.

1. Pipe Diameter up to 6 Inches: Weld-On #705 by IPS Corporation, Low VOC PVC solvent cement for Class 200 PVC or schedule 40 PVC.
2. Pipe Diameter Larger than 6 Inches and Schedule 80 PVC: Weld-On #711 by IPS Corporation, Low VOC PVC solvent cement.
3. Flexible PVC to Rigid PVC Connections: Weld-On #795 by IPS Corporation, Low VOC PVC solvent cement.

2.11 SPRINKLER HEADS

A. Rotors, Rotators and Spray Heads: As specified on the Drawings.

B. Install with purple rotor covers or head caps if system is designed for recycled water.

2.12 TREE AND SHRUB BUBBLERS

A. Bubbler Nozzle Assemblies: As specified on the Drawings.

B. Install bubblers with purple caps if system is designed for recycled water.

2.13 ADDITIONAL MATERIALS

A. Tape:
   1. General:
      a. On-site buried recycled water piping shall be identified by warning tape with a minimum width of 3 inches reading “caution – recycled water” (in black or white lettering on purple background). Tape shall run continuously on top of main line piping and shall be attached to piping with plastic tape banded around the warning tape and the pipe every 5 feet on center.
   2. Pipe Detection Tape: 3-inch-wide, detectable type; “Terra Tape” "Sentry Line Detectable” from Reef Industries, Inc., 713.507.4251; or equal.
      a. Text: "Caution Water Line Buried Below."

B. Tracer Wire: Polyethylene insulated, copperclad steel; “SoloShot XTreme Tracer Wire” by Copperhead Industries, LLC. 877-726-5644, or equal.

C. Sleeves: Class 200 PVC. Install sleeves in locations and at the depths shown on the Drawings. Sleeves shall extend a minimum of 6 inches past the edge of the above hard surface for ease of location.

D. Teflon Tape: Variety commonly used for wrapping threaded connections.

E. Valve Tags: Plastic pre-labeled station tags.

F. Drain Rock: 3/4-inch wash drain rock complying with requirement specified in Section 32 11 00 – Base Courses.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to starting work, test and verify that water pressure levels meet the requirements specified on the Drawings. Notify the Owner’s Representative immediately of any discrepancies.

B. Irrigation Drawings are diagrammatic. Main lines and lateral lines shown parallel in the Drawings may be placed in a common trench, provided that a minimum horizontal distance of 3 inches is maintained between buried lines, as per Drawings.

C. Sprinkler heads are shown schematically. Suspected discrepancies in coverage or sizes of areas to be irrigated shall be brought to the attention of the Owner's Representative prior to installation. Contractor shall re-direct work to avoid delay while awaiting resolution.

3.02 PREPARATION

A. Contractor shall make provisions and take necessary precautions to protect existing and completed work or features.

B. Layout:
1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of backflow preventer, all valves, sprinkler heads, bubblers, drip tubing, and automatic controller for review by the Owner's Representative.
2. Layout irrigation system and make minor adjustments required due to differences between site and Drawings. Where piping is shown on Drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.

3.03 TRENCHING

A. Conform to Section 31 23 00 – Excavation and Fill.

B. Excavate trenches with vertical walls, uniform bottom, free of deleterious materials, and wide enough for pipes to lay side by side, fully supported on trench bedding. There shall be a minimum 3-inch clearance between all pipes.
1. No lines shall be installed parallel to and directly over another line.
2. When lines must cross, the angle shall be forty-five to ninety degrees, and a minimum of three inch (3") vertical clearance shall be maintained.

C. Provide minimum coverage depths as follows:
1. Mainline: 24 inches in landscape areas, 30 inches in sleeves under paving.
2. Lateral Lines: 18 inches in landscape areas, 30 inches in sleeves under paving.

D. Hydraulic driving methods shall not be used under paved surfaces.

3.04 PIPE INSTALLATION

A. Comply with manufacturer's instructions as applicable.

B. Rubber Ring Seal Joint:
1. Use factory-made male end or prepare field-cut male end to exact specifications of factory-made end.
2. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's specifications.
3. Lubricate male end according to manufacturer's instructions and insert male end to specified depth. Use hands only when inserting PVC pipe.

C. Thrust Blocks:
1. Thrust blocks shall be provided on 3 inch and 4-inch main lines where specified and as necessary to resist system pressure on, and pipe movement of, pressurized lines and fittings. Thrust blocks shall be concrete and the size shall be based on an average soil safe bearing load of 3,000 pounds per square foot.

2. Form thrust blocks in such a manner such that concrete comes in contact only with the fittings, not over the fitting joint. Thrust blocks shall be between solid soil undisturbed and the fitting.
3. Install thrust blocks as shown in Drawings and as described above.
4. Main lines of 3 inches and 4 inches with operating pressures of 85 psi or more, and systems with a booster pump, shall have mechanical restraints at all fittings and changes of flow direction.
5. Main lines 6 inches and larger shall have ductile iron fittings with joint restraints installed at all couplings and changes in flow direction.

D. Solvent Welded Joints:
1. Assemble above ground where possible.
2. Cut square, ream, and thoroughly clean shavings and burs from pipe ends.
3. Make joint using specified primer and cement, continuously wiping off excess.
4. Allow 60 minutes of set-up time before handling and 24 hours curing before applying water pressure.

E. Threaded Joints:
1. Use Teflon tape on all pressurized, threaded plastic to plastic and plastic to metal joints.
2. Hand tighten and use only light strap-type friction wrench pressure to complete.

F. Snake pipe to provide a minimum of 1 additional foot for each 100 feet of pipe to allow for expansion and contraction.

G. Pipe shall be installed as specified and generally as shown in Drawings.

H. Cap or plug pipe openings as soon as pipes have been installed to prevent intrusions of debris.

I. Sleeves:
1. Install pipe sleeves where necessary, where shown and at all points where pipes pass through concrete or masonry. In footings, install sleeving that allows 1-inch minimum clearance around pipes.
2. Each end of sleeve shall extend a minimum of 6 inches beyond edge of paving or structure above. Provide removable non-decaying plug or cap at each end of sleeve, to prevent earth from entering pipe.

J. Thoroughly flush system prior to installing valves, screens and nozzles.

K. Install pipe detection tape and tracer wire above mainline.

3.05 EQUIPMENT AND INSTALLATION

A. Reduced Pressure Backflow Prevention Device: Install in accordance with local codes and as shown on the Drawings.

B. Master Valve:
1. Install as shown in Drawings.
2. Valve boxes shall be set plumb, flush, and square with adjacent structures.
3. Valves shall be installed in valve boxes to provide 2-inch clearance between the highest point of the valve and the bottom of the valve box lid.
4. Install valve tags in an acceptable manner indicating valve station and controller number.
5. Provide 12-inch minimum separation when valve boxes are grouped together, and align in a straight, parallel, even, and orderly manner.
6. Locate all boxes a minimum of 10 feet from striping of any field of play.
7. Locate valves in shrub/ground cover areas whenever possible.

C. Gate Valves and Ball Valves:
1. Install as shown on the Drawings.

2. Valves shall be installed in valve boxes to provide a minimum of 2-inch clearance between the highest point of the valve and the bottom of the valve box lid.
3. Valves shall not be installed in any area that is within the athletic field of play. All valves shall be located within valve boxes set 12 inches from fencing or edge bands as shown.
4. Locate all boxes a minimum of 10 feet from striping of any field of play.

D. Remote Control Valves:
1. Install as shown in Drawings.
2. Valve boxes shall be set plumb, flush, and square with adjacent structures.
3. Valves shall be installed in valve boxes to provide 2-inch clearance between the highest point of the valve and the bottom of the valve box lid.
4. Install valve tags in an acceptable manner indicating valve station and controller number.
5. Provide 12-inch minimum separation when valve boxes are grouped together, and align in a straight, parallel, even, and orderly manner.
6. Locate all boxes a minimum of 10 feet from striping of any field of play.
7. Locate valves in shrub/ground cover areas whenever possible.
8. Two Wire decoders, as specified, are to be located within the valve boxes with 36 inches of wire coil to allow for easy maintenance and reading of decoder code bar.

E. Quick Coupler Valves:
1. Install as shown on the Drawings.
2. Quick coupling valves shall be installed in valve boxes to provide 2-inch clearance between the highest point of the valve cover and the bottom of the valve box lid.
3. Locate all boxes a minimum of 10 feet from striping of any field of play.
4. Quick couplers in synthetic fields shall be located against synthetic turf edgeband and curbs.

F. Valves in Bullpens:
1. Center the valves in the bullpens between the pitching rubber and home plate.
2. Boxes shall be 12 inches from and parallel to hardscape edge of bullpen, and evenly spaced.

G. Controller:
1. Install as shown in Drawings.
2. Owner's Representative shall determine final approved controller locations.
3. Label cabinet door exterior with permanent, minimum 1-inch tall letter or number of controller designations corresponding with designations on the Drawings and Record Documents.
4. 120 power, pull/splice box, conduit and sweeps from power source to controller shall be provided and installed by an electrical contractor.
5. All above grade conduit shall be steel electrical conduit.
6. Affix reclaimed water warning on controller enclosure (as applicable).

H. Control Wire:
1. Install control wire along main line, or as shown in Drawings.
2. Connect control wires to controller in sequential arrangement according to identification number in the Drawings. Label each controller station with permanent non-fading labels indicating valve identification number and controlled.
3. Bundle multiple wires with tape or ties at 20-foot intervals maximum. Do not tape wires in sleeves.
4. Make all splices in control valve boxes using only specified connectors.
5. Provide 36-inch wire coil at each remote control valve and at all mainline directional changes.
6. Install 2 spare control wires and one looped spare common wire to run by, and loop into, every remote control valve box of system. Terminate wires inside controller enclosure unconnected and clearly labeled as extra.
7. All wiring under paving shall be installed in a PVC pipe sleeve large enough to allow withdrawal and insertion of individual proposed wires and room for 12 additional wires.
8. Control wire under 2,000 feet in length shall be 14 gauge.
9. If control wire run is over 2,000 feet, shall be 12 gauge.
10. Two Wire decoder cable up to 10,000 feet from controller to decoder shall be 14 gauge.

11. Two Wire decoder cable over 10,000 and up to 15,000 feet from controller to decoder shall be 12 gauge.
12. Distance between Two Wire Decoder and Solenoid shall be in accordance with manufacturer's specifications.
13. Install terminus ends of two wire cable with 36-inch loop in 8-inch round valve box and record location of each box on the Record Drawings.
14. Install Two Wire Lightning Diffusers per manufacturer's details and recommendations.

I. Rotor, rotator and Spray Heads:
1. Install as shown in Drawings.
2. Install plumb with finish grade.
3. Thoroughly flush all lines prior to installing nozzles.

J. Tree Bubbler Assemblies:
1. Install in perforated pipe sump as shown on the Drawings.
2. Coordinate installation with planting operations to ensure timely and proper placement of heads.

K. Shrub Bubbler Assemblies
1. Install as shown on the Drawings.

3.06 FIELD QUALITY CONTROL

A. General:
1. Notify Owner's Representative for the following reviews, with minimum 2 working days' notice:
   a. Pressure testing mains prior to installing heads.
   b. Coverage test prior to planting turf shrubs and or groundcover.
   c. Pre-maintenance observation prior to acceptance of installed irrigation system.
   d. Final observation prior to release of project to Owner.
2. Contractor shall provide all equipment and personnel required to conduct tests.
3. Provide up-to-date Project Record Drawings at each review.
4. If Owner's Representative is called out for review prior to the system being ready as specified, the contractor shall be back charged for the full cost of the review time, report, and travel.

B. Pressure Tests:
1. Testing shall occur with trenches open. Small amounts of backfill between fittings shall be allowed to prevent pipe displacement. All fittings shall be visible prior to testing.
2. Test all pressure supply lines under a minimum hydrostatic pressure of 125 psi. Pipe shall hold pressure for a period of 6 consecutive hours with no more than 5 psi loss in order to pass test.
3. Lateral lines shall be tested under full line pressure for a period of 1 hour prior to backfilling. Cap all heads and center load pipe between fittings prior to testing.
4. Correct all deficiencies revealed by tests to the satisfaction of the Owner's Representative.

C. System Flushing:
1. After lateral lines, swing joints and sprinkler heads are in place and connected, and prior to installation of sprinkler nozzles, thoroughly flush all lines with water to completely clean lines of debris.
2. Install sprinkler filters and nozzles only after lines have been flushed to the satisfaction of the Owner's Representative.

D. Coverage Tests:
1. Perform coverage tests after systems are completed and operational, after finish grading as specified in Section 32 90 00 - Planting has been completed, but prior to any planting, in the presence of the Owner's Representative.
2. Correct all deficiencies to the satisfaction of the Owner's Representative prior to planting.
3. No overspray or runoff of recycled water is allowed on any non-approved use area.

3.07 BACKFILLING

A. General:
1. Backfill only after specified tests have been performed and accepted.
2. Clean trenches of debris and deleterious material before backfilling.
3. Backfill as shown on the Drawings with native material granular in nature and free from deleterious material rocks and clods 2" or larger.
4. Install pipe detection tape over entire run of mainline as shown in Drawings.
5. Compact trenching to 95 percent relative density under pavement and 85 percent relative density within planting areas.
6. Dress off and compact trench surfaces with finish grade in a manner to ensure no settling of trenches will occur. If settling occurs, contractor is to bring in additional topsoil, recompact and grade to be flush with adjacent finish grade.
7. Comply with additional requirements specified in Section 31 23 00 – Excavation and Fill.

3.08 ADJUSTING

A. Adjust and balance system to eliminate overspray, fogging or misting and as directed by Owner's Representative.

3.09 DEMONSTRATION

A. Instruct Owner's personnel in complete and proper operation and maintenance of system prior to Final Acceptance.

3.10 MAINTENANCE

A. Contractor shall service and maintain irrigation system during specified Landscape Maintenance Period as specified in Section 31 01 90 - Landscape and Site Maintenance.

B. The entire irrigation system shall be under fully accepted automatic operations for a period of 2 days prior to commencement of planting.

C. Final Acceptance and start of guaranty period shall occur no later than the end of the specified Landscape Maintenance Period.

3.11 FINAL REVIEW

A. Provide Owner's Representative with Record Documents and other specified closeout submittals prior to Final Review.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Landscaping as shown on the Drawings including, but not be limited to the following:
   1. Soil preparation.
   2. Fine grading of landscape areas.
   3. Turf planting.
   4. Plant material.
   5. Turf Establishment Period.
   6. Landscape Maintenance Period.

B. Related Requirements:
   1. Section 02 41 13 - Site Clearing and Demolition.
   2. Section 31 01 90 - Landscape and Site Maintenance.
   3. Section 32 80 00 – Irrigation.

1.02 REFERENCES

A. American Joint Committee on Horticulture Nomenclature (AJCHN): Standardized Plant Names.

B. American Association of Nurserymen, Inc. (AAN): American Standard for Nursery Stock.

C. Sunset Western Garden Book, Lane Publishing Company.

D. Agricultural Code of California.

E. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Coordination:
   1. Irrigation and drainage systems shall be inspected and tested before start of any Work of this Section. Before covering subsurface drains and any subsurface drainage weeps, Contractor shall inspect and be responsible for their performance.

1.04 ACTION SUBMITTALS

A. Plant Materials and Products:
   1. Thirty days prior to planting, submit 4 copies of documentation that plants specified have been ordered. Include names and addresses of suppliers.
   2. Substitutions: If substitutions are required, they shall be brought to the attention of the Owner's Representative, at time of submittal. Refer to Section 01 25 00 – Substitution Procedures for additional requirements.

B. Product Data:

1. Manufacturer's descriptive literature for products proposed for use.
2. Certified chemical analysis of the following:
   a. Fertilizers.
   b. Herbicides.

C. Samples: Submit 4 samples of the following in minimum 1-quart size "zip-lock" plastic bag:
   1. Soil amendment. Include current evaluation and sieve analysis.
   2. Bark mulch top dress.
   3. Topsoil, as applicable. Include current fertility and structure analyses.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Perform work in accordance with all applicable laws, codes, and regulation required by authorities having jurisdiction over such work and provide for all review and permits required by Federal, State, and local authorities in furnishing, transporting, and installing materials.
   2. Certificates of review required by law for transportation shall accompany invoice for each shipment of plants. File copies of certificates with the Owner's Representative after acceptance of material. Review by Federal or State governments at place of growth does not preclude rejection of plants at project site.
   3. Control of Work: Comply with Section 5 of the Standard Specifications.
   4. Control of Materials: Comply with Section 6 of the Standard Specifications.

B. Contractor shall employ on-site supervisor at all times during execution of the planting. Supervisor shall be thoroughly familiar and experienced with the materials and products being installed and proper methods of their installation. Notify the Owner's Representative immediately of changes in supervisory personnel.

C. Products and materials shall be new, first quality, and acceptable to the Owner's Representative.

D. Tree, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock." Provide healthy, vigorous stock, grown in a recognized nursery in accordance with good horticultural practice and free of disease, insects, larvae, and other defects such as girdling or bound roots, knots, sunscald, injuries, abrasions, and disfigurement.

E. Analysis and Standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

F. Quality Review: The Owner's Representative will review trees and shrubs before planting for compliance with specified requirements for genus, species, variety, size and quantity. Owner's Representative retains right to further review trees and shrubs for size and condition of root systems, trunks, stems branches or structure, buds, and other required features, and to disqualify unsatisfactory or defective material at any time during the progress of work. Remove disqualified trees or shrubs immediately from project site and replace with materials acceptable to Owner's Representative.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General:
   1. Ship plant material and seed with certificates of inspection required by governing authorities. Comply with regulations applicable to plant materials.
   2. Handle and store all products of this Section in such a manner as to protect them from damage at all times.
   3. Storage of products on-site shall be coordinated by the contractor in an orderly manner so as not to unnecessarily impede the work or reasonable use of project site.

B. Plants:
   1. Delivery: Coordinate with Owner's Representative. Provide proper identification for landscape labor force and vehicles at all times while on site.
   2. Storage: Coordinate with Owner's Representative. Provide exposure as required by plant variety and provide wind protection for all plants. Water regularly to maintain thorough moisture in root zone. Temporary, automatic irrigation system will be required at discretion of Owner's Representative if extended storage period becomes necessary. Protect dark colored plant containers from direct exposure to the sun.
   3. Labeling: At least one plant of each variety or type shall be legibly labeled at all times clearly indicating correct plant name as indicated on Drawings. Labels shall be durable with waterproof ink.

C. Fertilizers:
   1. Deliver in original, unopened containers with original labels intact and legible which state the guaranteed chemical analysis.
   2. Fertilizer, lime, soil sterilant, and all other potentially toxic products shall not be stored with any other landscape materials.

D. Bulk Material:
   1. Coordinate delivery and storage of bulk material with Owner's Representative.
   2. Confine materials to neat piles in areas acceptable to the Owner's Representative.

1.07 FIELD CONDITIONS

A. Planting operations shall not be conducted under the following conditions, subject to the discretion of the Owner's Representative:
   1. Freezing weather.
   2. Excessive heat.
   3. High winds.
   4. Excessively wet conditions.

1.08 WARRANTY

A. Contractor shall warrant work executed and all materials provided or used under this Section shall be free of defects and poor workmanship for a period of 1 year after Final Acceptance.

B. Contractor wall warrant plant materials shall be in a healthy and thriving condition 1 year after Final Acceptance, unless it can be proven that the unhealthy or non-thriving material is due to causes other than the Contractor's materials or workmanship.
   1. Replace dead plants and plants not in vigorous condition immediately upon notification by Owner's Representative during Warranty Period.
   2. Replaced plants shall be subsequently guaranteed by the Contractor for an additional year following date of replacement.
   3. Repair defective materials and work shall be acceptable to the Owner's Representative.

1.09 TURF ESTABLISHMENT PERIOD

A. Turf Establishment period shall include complete rooting of turf and at least 2 mowings as specified herein, prior to the commencement of the specified Landscape Maintenance Period.

1.10 MAINTENANCE PERIOD

A. Refer to Section 31 01 90 - Landscape and Site Maintenance for information.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be clean on-site material that has been previously stripped from the top 6 inches of original grade or import material as applicable. Acceptable topsoil shall be free from rocks, stones, rubble, and clay clods over 1.5 inches in diameter, roots, toxins, and other deleterious materials.

B. Imported topsoil shall have an agricultural suitability test by a qualified soils laboratory, dated within 30 days of purchase.
   1. Submit samples and current soil fertility and structure analyses in the quantity specified.

2.02 FERTILIZERS

A. General:
   1. Fertilizers shall be of an acceptable brand with a guaranteed chemical analysis as required by USDA regulations.
   2. Fertilizers shall be dry and (except plant tabs) free flowing.

B. Pre-Plant Fertilizer: Shall be of the following chemical analysis:

Nitrogen:	6 percent.
Phosphoric Acid:	20 percent
Soluble Potash:	20 percent

C. Post-Plant Fertilizer: Shall be of the following chemical analysis:

Nitrogen:	16 percent
Phosphoric Acid:	6 percent
Soluble Potash:	8 percent

D. Plant Tabs: 7-gram tabs designed for 12-month slow release with the following chemical analysis by weight; "Gro-Power" or equal:

Nitrogen:	12 percent
Phosphoric Acid:	8 percent
Soluble Potash:	8 percent
Humus:	20 percent
Humic Acid:	4 percent
Sulfur:	3.5 percent
Iron:	2 percent
Micronutrients	

2.03 SOIL ADDITIVES

A. Soil Amendments: Organic Humus Compost
   1. Fully composted aerobic humus compost without presence of decomposition products. The organic matter content shall be at least 50% on a dry weight basis. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%.
   2. The pH of the material shall be between 6% and 7.5%.
   3. The salt content shall be less than 10 millimho/cm @ 25° C in a saturated paste extract.
   4. Boron content of the saturated extract shall be less than 1.0 parts per million.
   5. Silicon content (acid-insoluble ash) shall be less than 50%.
   6. Calcium carbonate shall not be present if to be applied on alkaline soils.
   7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.

8. Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
9. Sludge-based materials are not acceptable.
10. Carbon:nitrogen ratio is less than 25:1.
11. The compost shall be aerobic without malodorous presence of decomposition products
12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen for soil amending.
13. Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

Arsenic	20	Lead	200	Silver	10
Cadmium	15	Mercury	10	Vanadium	500
Chromium	300	Molybdenum	20	Zinc	200
Cobalt	50	Nickel	100		
Copper	100	Selenium	50		

14. Soil Amendments for consideration are listed below:

    a. Soil Amendment: "Super Humus" Compost available from BFI Organics Inc., 1995 Oakland Road, San Jose, CA, 408-262-1401;

    b. "Organic Compost" available from Z-Best Products Inc. 705 Los Esteros Road, San Jose CA, 408-934-6152;

B. Soil Conditioner: 4 percent sulfur; "Gro-Power Plus (5-3-1) by Gro-Power Inc., 800-473-1307, or equal.

C. Soil Sulphur: Agricultural grade, 99 percent pure, pelletized or granular form, not powdered.

D. Iron Sulphate: Non-staining iron with micro-nutrients, soil penetrant, trace minerals, and humic acids; "Gro-Power Premium Green" by Gro-Power Inc., 800-473-1307, or equal.

2.04 BIORETENTION SOIL MIX

A. Bioretention soil mixture in rain gardens shall have the following general characteristics:
   1. Properties of bioretention soil mix:
      a. Consisting of the following mixture, measured by volume:
         1) 60-70% Compost
         2) 30-40% Sand
      b. Supportive of vigorous plant growth
      c. Able to achieve a long-term, in-place infiltration rate of at least 5 in/hr. and no more than 10 in/hr.
   2. Supplier: Biotreatment soil mix' by TMT Enterprises. Contact: Matt Moore (408) 432-9040

2.05 MULCH TOP DRESS

A. Material: Medium-sized, 3/4 inch to 2 inches, decorative chipped wood, homogenous in appearance, free of deleterious and inorganic material, sticks, shredded, stringy, and fibrous materials; "Medium Decorative Bark" from Redi-Gro, 800-654-4358; or equal.

2.06 PLANTS

A. General:
   1. Plants shall conform to the species and minimum sizes shown on the Drawings.

2. Quantities shown on the Drawings are for the Contractors convenience only. Contractor shall provide plant material to fulfill the intent of the Planting Plan at the discretion of the Owner's Representative.

B. Condition: Plants shall conform to the following minimum requirements:
   1. Nursery grown unless otherwise specified.
   2. Supplied in appropriate container, balled and burlapped, or bare root as specified on Drawings.

C. Mix: Turf seed mix subject to acceptance by the District's Representative, shall be as follows:
   1. Sports Field Turf: "Sportsclub 60/40 Tournament Blue/Rye Mix" from Pacific Coast Seed, Inc., 800-733-3462, or equal, in the following percentages and applied at a rate of 305 pounds per acre:

Percentage	Grass
20%	Kentucky Blue – Midnight
20%	Kentucky Blue – Bedazzle
20%	Kentucky Blue – Waterworks
13.3%	Perennial Rye – Academy III
13.3%	Perennial Rye – Apple SGL
13.3%	Perennial Rye – Blackstone

   2. Native Grass and Wildflower Mix: The following applied in pounds per acre:

Pounds per Acre	Product
30	Festuca rubra, Molate Red Fescue
20	Festuca idahoensis, Idaho Fescue - Sonoma County Source
20	Festuca occidentalis, Western Fescue
1.5	Eschscholzia californica – Alameda County California Poppy
1.5	Lasthenia glabrata – Goldfields
3	Lupinus nanus - Sky Lupine
1.25	Clarkia bottae – Showy Clarkia
0.25	Castelleja exerta – Purple Owls Clover
1.5	Collinsia heterophylla – Chinese Houses
Note: Add 6 pounds of Vulpia microstachys or 20 pounds of Regreen per acre if erosion control is to be accomplished primarily through the growth of winter germinating plants.	

   3. Quality:
      a. Seed shall be in conformance with the California State Seed Law of the Department of Agriculture.
      b. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee and dates of test. Prior to seeding at the request of Owner Representative, the contractor shall provide a letter of certification, original Association of Official Seed Analysts (AOSA) seed test results.
   4. Mix Source: Pacific Coast Seed, Inc., 800-733-3462, or equal.

2.07 TURF SOD

A. Harvest and Delivery:
   1. Harvest from source and deliver to project site within 24 hours.
      a. Deliver only as much sod as can be installed in one day's work.
      b. Sod not transplanted within this time period shall be reviewed prior to installation.
   2. Comply with requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in Turfgrass Producers International's (TPI) "Guideline Specifications to Turfgrass Sodding."
   3. Protect sod from breakage and drying.

B. Sod shall be as follows:
   1. Tiffway II Hybrid Bermuda
   2. Sod shall have a 3/4 inch cut or thickness.
   3. Sod shall be large roll cut.
   4. Sod shall have a peat or sand / peat base.

C. Source: Delta Bluegrass, West Coast Turf, Pacific Sod, or equal.

2.08 HYDROSEED SLURRY

A. Hydroseed slurry shall contain the following (or acceptable equal), thoroughly mixed and applied per acre. Method for hydroseeding shall be a two-step hydraulic straw treatment as follows:

Step One		
	Lbs/acre	hydroseed mix
o	2000	Hydro straw™ straw and tack mulch
o	1000	7-2-3 Biosol
o	As specified	Native grass and wildflower seed mix
o	60	AM 120 mycorrhizal inoculant
Step Two		
	Lbs/acre	hydroseed mix
o	2000	Hydro straw™ straw and tack mulch

B. Hydroseed slurry shall contain green dye at a rate common to the industry so that hydroseed coverage can be confirmed visually from a distance.

C. Equipment used for application of hydroseed slurry shall be a commercial type hydro-seeder and have built-in agitation system with an operational capacity sufficient to agitate, suspend and homogeneously mix slurry. Tank capacity shall be a minimum of 1,500 gallons and shall be mounted on a truck to allow access to site. Distribution lines shall be large enough to prevent stoppage and allow for even distribution of slurry over the site. Pump shall be able to generate 150 psi at the nozzle.

D. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

2.09 HERBICIDES

A. Pre-Emergent: "Ronstar-G" pelletized, "Surflan" liquid, or equal.

B. Other Herbicides: Submit for review and accepted by Owner's Representative prior to use.

2.10 ADDITIONAL MATERIALS

A. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of plants.

B. General: Products and materials shall be new, first quality as acceptable to the Owner's Representative.

C. Tree Stakes and Ties: As shown and specified on the Drawings.

D. Header Board: As shown and specified on the Drawings.

E. Root Barriers: Model #UB 24-2 "Universal Barrier" by Deep Root Partners L.P, 800-458-7668, or equal.

F. Weed Barrier: "Pro Weed Barrier" Model 24003080 DeWitt Co., Sikeston MO, 800-888-9669, or equal.
   1. Roll Size: 12 feet by 250 feet.
   2. Anchorage: 8 inch jute staples.

PART 3 - EXECUTION

3.01 TOPSOIL INSTALLATION

A. Subgrade soil shall be cut or filled to the depth required such that after placement of required amount of topsoil and specified preparation procedures have been accomplished, specified finish grades will be attained.

B. Subgrade soil shall be cross-ripped as specified.

C. Planting areas shall contain a minimum of 6 inches of acceptable topsoil applied as applicable and where required. Only previously accepted topsoil shall be installed.

D. Refer to Section 31 20 00 – Earth Moving for rough grading information.

3.02 PREPARATION

A. Make provisions and take necessary precautions to protect existing and new improvements from damage during execution of planting work.

B. Initial Preparations:
   1. Prior to beginning of planting, thoroughly cross-rip, with second rip shall be performed at 90 degrees to first rip, planting area soil to a depth of twelve 12 inches.
   2. Remove all rocks, sticks, clods, debris, and other deleterious materials over one-half (1/2) inch in diameter from top 6 inches of soil.
   3. Float, rake, and roll all planting areas as necessary to establish smooth, clean, non-yielding planting beds.
   4. Prevent erosion of the soil between completion of soil preparation and planting.

C. Concrete Mowbands and Wood Header Boards: Install in accordance with the Drawings and repeat specified initial preparations as necessary.

3.03 SOIL PREPARATION AND FINISH GRADES

A. Soil Preparation:
   1. Thoroughly roto-till the following additives into the top 6 inches of planting area soil at the following rates per 1,000 square feet:
      a. Soil Amendment: 6 Cubic Yards.
      b. Soil Conditioner: 200 Pounds.
      c. Pre-Plant Fertilizer: 35 Pounds.
      d. Soil Sulfur: 20 Pounds.
   2. The above additive recipe shall be used by Contractor for establishing the cost of soil additives in the Contract sum.
      a. A site specific fertility test will be performed by the Owner's Representative at the Owner's cost after rough grading and applicable topsoil placement or replacement operations are complete.
      b. The results of the testing will be reviewed by the Owner Representative and confirmation of the amendment additives ratio will be provided to the Contractor.
      c. The Contract sum will be modified, in accordance with the procedures for changes in the work included in the Contract, if there is a variance from the above additives or quantities.
   3. After additives are fully incorporated into the soil, the Owner's Representative will perform further testing at the Owner's expense to verify conformance with the newly recommended materials and quantities. If deficiencies are found, the Contractor shall be solely responsible for the cost of adding deficient material as necessary and re-testing required to verify conformance.
   4. The Contractor shall notify the Owner's Representative a minimum of 2 working days prior to the completion of finish grading and soil preparation operations so that fertility testing can be arranged. Contractor shall also schedule 7 working days after soil samples have been taken to allow for receipt and evaluation of soil tests with no cost or delay to the project.

B. Planting Area Finish Grades:
   1. After tilling in additives and re-compaction to 85 percent relative compaction, rake planting areas smooth and set finish grades as follows.
   2. After soil preparation, finish grades of planting areas shall be 1 inch below adjacent paving, headers, utility boxes, irrigation boxes, and other in-grade items. Finish grade slopes shall be consistent.
   3. Drainage structures, including catch basins, area drains, and concrete swales, shall be flush with finish grade to allow for proper drainage. Soil shall be sloped consistently from spot elevations provided to drain.
   4. In planting areas to receive mulch, depth of mulch shall taper within 3 feet of paving edge to a depth from 3 inches to 1 inch at edge of pavement.
   5. Irrigation head elevation relative to finish grade shall be installed as shown.
   6. After sand channel drainage system, finish grade shall be re-established.
   7. Infield fines and warning tracks shall be graded to be flush with depth of sod soil. If sod is at 3/4 inches, then that will be the difference of the sod subgrade to the infield fines finish grade prior to placement of the sod.

3.04 NATIVE GRASS AND WILDFLOWER HYDROSEEDING

A. Verify that soil is prepared and finish graded as specified prior to hydroseeding.

B. Slurry preparation shall be performed at job site.
   1. Water, mulch, fertilizer and other ingredients shall be added to the tank simultaneously so that the finished load is a homogenous mix of specified ingredients.
   2. Seed shall be added last and shall be discharged in 2 hours.
   3. Slurry held over 2 hours shall be recharged with 1/2 the seed rate before application.

4. Once fully loaded, the complete slurry shall be agitated for 3-5 minutes to allow for uniform mixing.

C. Apply hydroseed evenly and uniformly over areas to be seeded at rates specified. Apply in a sweeping motion to form a uniform application and form a mat at the specified rates.

D. Seeding shall occur before first germinating rains in the fall.

E. If mixture remains in the tank for more than 8 hours it shall be removed from the job site.

F. Remove or clean areas not intended to receive hydroseed treatment.

3.05 SOD INSTALLATION

A. General:
1. Soil preparation and fine grading shall be as specified.
2. Prior to sod installation, roll turf bed until a smooth, firm surface with uniform grade has been produced.
3. The turf bed shall be reviewed and accepted by the Owner's Representative prior to sod installation.

B. Placement:
1. Sod shall be unrolled into place with careful attention to tight joints with no overlapping or stretching.
2. Stagger the joints in each new row like rows of bricks with a minimum 18 inch minimum stagger. Use a sharp knife for shaping around trees, flower beds or borders. Immediately after placement, soak sod areas with water.
3. Roll sod after watering to smooth out bumps and air pockets, and roll again if sod is not even.
4. Water frequently for the first 10 to 14 days with enough water to saturate soil to a depth of 4 inches.
5. Do not allow sod dry out.

C. Provide and install temporary fencing around completed sod areas if not protected by other fencing. Use 6 foot high temporary fence for protection.

D. Refer to Section 31 0190 – Landscape and Site Maintenance for mowing and maintenance procedures. As applicable, the Contractor shall remove sod, re-grade any areas that have been rutted from mowers or otherwise damaged, and replace sod to the satisfaction of the Owner's Representative.

E. Until project Final Acceptance, should it become evident that certain sod areas have not grown, re-sod the areas immediately with sod of the same type as originally used and maintain as specified.

3.06 TURF ESTABLISHMENT PERIOD

A. Prior to commencement of specified maintenance period, turf shall be completely germinated and established, and a minimum of 2 mowings shall have taken place as follows:
1. First mowing shall take place when turf has reached a height of 3 inches and turf shall be mown to 2 inches. Submit written request to the Owner's Representative for acceptability of initiating first mowing.
2. Thereafter, turf shall be mown weekly until turf is sod-like in appearance and quality, and all other contract requirements shall be fulfilled prior to allowing the maintenance period to commence.
3. Contractor will receive a written notice of acceptance of turf establishment and to commence with landscape maintenance period.

4. Owner's Representative will approve any phasing of turf areas to commence into the maintenance period. Areas may be approved in stages but will require contiguous areas of turf that are completely established.

3.07 TREE, SHRUB AND GROUND COVER PLANTING

A. These areas shall receive specified topsoil and soil amendments prior to commencing with tree, shrub and ground cover planting.

B. Layout: Coordinate layout of plants with Owner's Representative for review and acceptance.

C. Plant Pit Excavation:
1. Excavate pits to sizes indicated in Drawings.
2. Thoroughly scarify all sides of plant pits to remove "auger slick" and encourage root penetration.

D. Set trees and shrubs in pit on tamped backfill base as per Details. Set plumb and face for best appearance. Thoroughly scarify all plant root balls to eliminate any circling roots and to encourage root growth. Set plant so root crown will level with or be slightly above surrounding grade after settlement.

E. Backfilling:
1. Backfill mix for 1 gallon size and larger shall consist of 100 percent native site soil with plant tabs added per manufacturer's recommendations.
2. Tamp backfill mix under and around root balls.
3. Flood plant pit when half backfilled; allow to drain.
4. Complete backfilling. Tamp as necessary, do not over compact.

F. Watering:
1. Thoroughly water plants immediately after planting.
2. Construct water basins as specified in Drawings.

G. Finish Grade Restoration: Restore finish grades by hand raking. Dispose of excess subgrade soil.

3.08 TREE STAKING

A. Stake trees as shown in the Drawings.

B. Set stakes plumb, without damage to rootball and sufficiently deep to provide necessary support.

C. Tree ties shall be tied loosely enough to allow movement, yet taut enough to support tree.

3.09 HERBICIDE APPLICATION

A. Apply in accordance with manufacturers' recommendations.

B. Apply pre-emergent herbicide to soil prior to placement of bark mulch top-dress.

3.10 MULCH TOP DRESS

A. Apply 3 inches of specified bark mulch top dress to all non-turf and hydroseeded planting areas and other areas as may be specified in the Drawings. Trees in hyrdoseeded areas shall receive the tree well and mulch in the well.

B. Rake mulch top dress evenly to create a uniform surface and pull bark mulch top dress away from trunks or stalks of plants 1 to 2 inches.

C. Mulch shall not dictate finish grade in planting areas. Mulch is to be added to finish grade.

3.11 INSTALLATION OF ADDITIONAL MATERIALS

A. Header Board: Install as shown on the Drawings.

B. Root Barriers: Install as shown on the Drawings.

3.12 FIELD QUALITY CONTROL

A. New turf areas shall be fenced off during turf establishment and specified Landscape Maintenance Period subject to the discretion of the Owner's Representative.

B. The Owner's Representative will review and accept the following prior to the Contractor proceeding with subsequent work:
   1. Preparation: At completion of finish grading and prior to planting, grading tolerances and soil preparation will be checked for conformance to Contract Documents.
   2. Layout of plants, header board, and other major items shall be as directed and accepted by the Owner's Representative.
   3. Pre-Maintenance Review: At completion of planting, work shall be reviewed for conformance with Contract Documents. Acceptance shall mark beginning of the specified maintenance period. If acceptance is not given, a punch-list of items requiring attention will be issued to the Contractor. One more review will be allowed after Contractor certifies in writing that the punch-list has been completed. Punch-list shall be completed to the satisfaction of the Owner's Representative prior to commencement of the Specified Maintenance Period.

C. Costs incurred from repeat reviews required due to Contractor not being prepared and other non-conformance with Contract Documents will be back charged to the Contractor.

END OF SECTION

33 11 00

DOMESTIC WATER UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Domestic water and fire system work is shown on the Drawings including, but is not necessarily limited to, the following:
   1. Intermediate staking and layout for domestic water system.
   2. Pipes, fittings, valves, valve boxes, connections, and fire hydrants for systems.
   3. Field testing and disinfection.

B. Related Requirements:
   1. Section 32 11 00 - Base Courses
   2. Section 32 23 00 - Excavation and Fill
   3. Section 32 80 00 - Irrigation
   4. Section 32 90 00 - Planting

1.02 REFERENCES

A. American Water Works Association: Current edition of Standards as specified.

B. California Plumbing Code: Current Edition.

C. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Sequence and Scheduling:
   1. Refer to other Contract Documents, determine the extent and character of related work, and properly coordinate work specified herein with that described elsewhere to produce a complete, operational installation.
   2. Contractor shall be solely responsible for coordinating, sequencing, and scheduling work with other trades and subcontractors to insure proper and timely performance of the work under this Section.

1.04 ACTION SUBMITTALS

A. Product Data: Manufacturer's "cut-sheets" for products proposed for use.

1.05 INFORMATIONAL SUBMITTALS

A. Certification that ductile iron pipe supplied for this Project has been manufactured in compliance with all requirements of AWWA C151.

B. Certification that PVC pipe supplied for this project has been manufactured in compliance with all requirements of AWWA C900.

1.06 CLOSEOUT SUBMITTALS

A. Project Record Drawings that provide accurately record locations of utilities remaining, re-routed utilities, new utilities, and newly discovered utilities by horizontal dimensions, elevations, inverts, and slope gradients. Comply with additional requirements specified in Section 01 78 39 – Project Record Documents.

B. Warranty as specified.

C. Results of field testing of completed system.

D. Certificate of Compliance for disinfection.

1.07 QUALITY ASSURANCE

A. Unless otherwise specified, install materials in accordance with manufacturer's recommendations.

B. Contractor shall make necessary repairs to the domestic water system and other work affected by defects in the system through project Final Acceptance and specified warranty period. Repairs shall be made at the Contractor expense and at no additional cost to Owner.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store pipe in a neat and orderly manner fully supported and protected from sunlight.

B. Do not dump pipe off truck. Pipes are to be delivered, unloaded and handled so as to prevent damaging the material.

1.09 FIELD CONDITIONS

A. PVC pipe shall not be cemented during wet conditions as determined by the Owner's Representative.

B. Trench excavation and backfilling shall not be executed during excessively wet conditions as determined by the Owner's Representative.

1.10 WARRANTY

A. Contractor: Provide Owner with a special written 1-year warranty covering entire water system against defects in installation, workmanship, and equipment from date of final acceptance.
   1. Contractor shall make necessary repairs to the system as well as to other work affected by defects in the system during warranty period.
   2. Repairs shall be made at the Contractor's sole expense.

1.11 MAINTENANCE

A. Service: Contractor shall service and maintain domestic water system as necessary until project final acceptance.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. General:

1. Pipe materials for domestic and fire water lines shall be in conformance with the California Plumbing Code and local governing agencies.
2. Plans and details, if shown, are schematic in nature and do not necessarily identify all fittings and appurtenances required to provide a complete installation. The Contractor is responsible for providing complete and functional systems.
3. Materials and procedures not specifically addressed herein shall comply with the appropriate AWWA standard.
4. Materials proposed for use shall be in a new, "first class" condition unless otherwise noted.

B. Water Lines 3 Inches and Greater Diameter:
   1. Ductile Iron Pipe (DIP): Cement lined, of domestic manufacturer complying with ANSI/AWWA C151/A21.5, minimum Class 52; "Tyton Joint" by U.S. Pipe, Pacific States, or acceptable equal.
      a. Cement mortar lining shall comply with ANSI/AWWA C104/A21.4.
      b. Buried ductile iron pipe and fittings shall be wrapped in an 8-mil thick polyethylene film sleeve.
   2. Polyvinyl Chloride Pipe (PVC): Conform to AWWA C900, Class 200, of domestic manufacture, and meeting cast iron outside diameter sizes; C900 Series North American Specialty Products, JM Eagle, or acceptable equal.
      a. Pipe shall be furnished with integral bells.
      b. Spigot end pipe with separate double hub couplings is not acceptable.

C. Water Lines 2 Inches and Smaller Diameter: One of the following.
   1. Annealed (soft) Type "K" copper (Cu).
   2. Polyvinyl chloride (PVC) conforming to ASTM D1785, Schedule 80 PVC, of domestic manufacture, and meeting cast iron outside diameter sizes; ASTM D1785 Series North American Specialty Products, JM Eagle, or acceptable equal.
      a. Pipe shall be furnished with integral bells.
      b. Spigot end pipe with separate double hub couplings is not acceptable.

D. Couplings and Sleeves:
   1. General:
      a. Couplings and sleeves shall be a minimum of 200-psi working pressure-rated unless except as otherwise noted.
      b. Couplings and sleeves shall be mechanical joint type.
      c. Couplings, sleeves, and accessories shall be of domestic manufacture; "Trim Tyton" by U.S. Pipe, Union Foundry, Tyler Pipe and Couplings, or acceptable equal.
   2. DIP and PVC Pipe 3 Inches thru 12 Inches:
      a. Unless otherwise noted, couplings and sleeves for DIP and PVC shall be ductile iron conforming to AWWA C153, and shall be 350 psi working pressure rated.
      b. Unless otherwise noted, flanges on all DIP spools shall conform to ANSI/AWWA C115/A21.15.
   3. PVC Pipe 2 1/2 Inches and Smaller: Schedule 40, solvent-weld PVC socket couplings.
   4. Copper Tubing: "Mueller 110" compression connections by Mueller Company Ltd., or acceptable equal.

E. Gate Valves:
   1. Use gate valves designed for a working pressure of not less than 150 psi.
   2. Provide connections as required for the piping in which they are installed.
   3. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.

F. Thrust Blocks: Class "A" concrete construction with dimensions conforming to the California Plumbing Code.

G. Valve Boxes:
   1. Size: 10 inches round boxes for gate valves.
   2. Box lid shall be labeled with "water" and shall be bolted down.

3. Boxes located in landscape areas shall be round plastic; Carson Model 910-10 with 910-4 lid, or equal.
4. Boxes located in paving shall be concrete with concrete lid.

H. Pipe Detection Tape: 3 inch wide, detectable type; “Terra Tape” "Sentry Line Detectable” from Reef Industries, Inc., 713.507.4251; or equal.
1. Text: "Caution Water Line Buried Below."

I. Tracer Wire: Polyethylene insulated, copperclad steel; “SoloShot XTreme Tracer Wire” by Copperhead Industries, LLC. 877-726-5644, or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to starting work, test and verity that water pressure levels meet the domestic water system requirements. Notify the Owner’s Representative immediately of any discrepancies and re-direct work to avoid delay.

B. The utility plan and the piping details on the Drawings are diagrammatic. Pipe lines shown parallel in the Drawings may be placed in a common trench, provided that a minimum horizontal distance of 6 inches is maintained between buried lines, except for sanitary sewer lines, which require 10 feet horizontal clearance.

3.02 HANDLING

A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition.

B. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.

C. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other acceptable method.

D. Before installation, inspect each piece of pipe and each fitting for defects.

E. Replace material found to be defective, both before or after laying, with sound material meeting the specified requirements and without additional cost to the Owner.

F. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

3.03 PIPE CUTTING

A. Cut pipe neatly and without damage to the pipe.

B. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.

C. Use wheel cutters when practicable.

D. Cut pipe square, and remove all burrs prior to use.

3.04 TRENCHING

A. Conform to requirements specified in Section 31 23 00 – Excavation and Fill and the following.

B. Excavate trenches with vertical sides uniform bottom, free of deleterious materials, and wide enough for pipes to lay side by side, fully supported on bottom.
   1. No lines shall be installed parallel to and directly over another line.
   2. When lines must cross, the angle shall be 45 to 90 degrees, and a minimum of 6 inch vertical clearance shall be maintained.

C. Provide minimum coverage for pressurized service as follows:
   1. Landscape Areas: 24 inches.
   2. Paved Areas: 30 inches.

3.05 PLACING AND LAYING

A. General:
   1. Lower pipe and accessories into trench by means recommended by the manufacturer.
   2. Except where necessary in making connections to other lines, lay pipe with the wide bell end opening facing source.
   3. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate wells, couplings, and joints.
   4. Replace pipe that has been disturbed after laying.
   5. Do not lay pipe in water, or when trench conditions are unsuitable for the work. De-water trench until jointing is completed.
   6. Securely close open ends of pipe and valves when work is not in progress.
   7. Where any part of coating or lining is damaged, repair at no additional cost to the Owner.
   8. Follow manufacturer's detailed instructions in installing and assembling pipe.

B. Plastic Pipe:
   1. Position pipe and fittings in trench in a manner that identifying markings will be readily visible for inspection.
   2. Cutting and joining:
      a. Protect against abrasion from serrated holding devices.
      b. Remove burrs and glosses from surfaces to be jointed; use abrasive paper, file, or steel wool.
      c. Remove dirt, dust, and moisture by wiping clean with dry cloth.
   3. Align pipe system components without strain.
   4. Support plastic pipe in trenches with a 2 inch minimum layer of bedding Provide a minimum 3 inch bedding sand cover. Allow no rocks, debris, or potentially damaging substances within 6 inches of plastic pipe in trenches.

C. Connections: Use appropriate fittings to suit the actual condition where connections are made between new work and service points.

3.06 JOINTING

A. Mechanical Joints and Push-On Type Joints: Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer, to provide for special requirements of specified pipe.

B. Make connections between different types of pipe and accessories with transition fittings.

C. Rubber Gaskets:
   1. Handle and install in strict accordance with the recommendations of the manufacturer.
   2. Lubricants for gaskets shall be manufactured by or approved by the pipe manufacturer for use under the conditions found in the field.

3.07 SETTING VALVES AND VALVE BOXES

A. Center valve boxes on the valves, setting plumb.

B. Tamp earth fill around each valve box to a distance of four feet on all sides, or to be undisturbed trench face if less than four feet.

C. Tighten mechanical joints, and fully open and close each valve to assure that all parts are in working condition.

3.08 THRUST BLOCKS

A. Provide and install thrust blocks in accordance with California Plumbing Code requirements and installation guidelines.

3.09 TESTING, INSPECTING, AND DISINFECTION

A. General:
   1. Do not allow or cause the work of this Section to be covered up or enclosed until after it has been completely inspected, tested, and has been accepted by the Owner's Representative and governing authorities when applicable.
   2. Perform tests and disinfection in a manner acceptable to governmental agencies having jurisdiction.

B. Testing:
   1. Except for joint material setting, or where concrete reaction backing necessitates a five day delay, pipelines joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.
   2. Testing of water service shall be in accordance with the requirements of AWWA C600 for hydrostatic testing.
   3. Contractor shall keep records of each piping test, including date and time of test, name of witnessing Owner Representative, test pressure, description of piping tested, and clarifying comments including those related to leaks and repairs made.
   4. Tests shall last 4 hours and be tested at 200 psi.

C. Disinfection:
   1. Before acceptance of the domestic water system, disinfect each unit of completed service line in accordance with AWWA C601 and criteria of the local governing jurisdiction.
   2. Proposed method for disinfection shall be submitted to the Owner's Representative for review and acceptance.
   3. Furnish two copies of a Certificate of Compliance to the Owner.

3.10 BACKFILLING

A. Backfill only after specified tests have been performed and accepted.

B. Clean trenches of debris and deleterious material before backfilling.

C. Backfill, as specified or shown in Drawings, shall be free from deleterious material.

D. Compact trenching to 95 percent relative compaction under pavement and 85 percent relative compaction within planting areas.

E. Trench surfaces shall be flush with finish grade. Trench settlings shall be corrected by the Contractor at no additional cost to the Owner.

F. Install pipe detection tape and reinforced tracer wire above pressurized lines.

3.11 DEMONSTRATION

A. Contractor shall instruct Owner's personnel in complete and proper operation of domestic water system per prior to Contract closeout.

3.12 FINAL REVIEW

A. Provide Owner's Representative with specified closeout submittals prior to Final Review.

END OF SECTION

SECTION 33 30 00

SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Site sanitary sewerage and related work as shown on the Drawings and specified including, but is necessarily limited to, the following:
   1. Sanitary sewerage system installation for drinking fountains.
   2. Restroom facilities

B. Related Requirements:
   1. Section 31 20 00 - Earth Moving
   2. Section 31 23 00 - Excavation and Fill
   3. Section 32 11 00 - Base Courses
   4. Section 32 32 15 - Landscape Concrete
   5. Section 32 33 00 - Site Furnishings
   6. Section 33 11 00 - Domestic Water Utilities

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C700 Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
   2. D3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

B. American Water Works Association (AWWA):
   1. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.
   2. C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   3. C151: Ductile-Iron Pipe, Centrifugally Cast, for Water.

C. California Plumbing Code, current edition, Sections as specified.

D. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

E. “The Greenbook: Standard Specifications for Public Works Construction,” current edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Sequencing and Scheduling:
   1. Refer to all other Contract Documents, determine the extent and character of related work, and properly coordinate work specified herein with work included under other Sections to produce a complete, operational installation.
   2. Contractor shall be solely responsible for coordinating, sequencing, and scheduling work with applicable trades and subcontractors to insure proper and timely performance.

1.04 ACTION SUBMITTALS

A. Product Data: Manufacturers' data sheets for the following:
   1. Piping materials and fittings.
   2. Special pipe couplings.
   3. Precast concrete cleanout boxes and box covers.

1.05 INFORMATIONAL SUBMITTALS

A. Design Mix Reports and Calculations: Submit for each class of cast in place concrete.

B. Field Test Reports: Indicate and interpret test results for compliance with specified performance.

1.06 QUALITY ASSURANCE

A. Control of Work: Conform to Section 5 of the Standard Specifications.

B. Control of Materials: Conform to Section 6 of the Standard Specifications.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store pipe neat and orderly stacked and blocked to prevent damage. Cracked, checked, spalled or otherwise damaged pipe shall be removed from site.

B. Use of chain slings shall not be permitted.

C. Pipe, fittings, precast sections, cast iron fittings, covers and all other materials shall be carefully handled at all times.

D. All pipelines and fittings shall be kept clean and closed during construction.

1.08 FIELD CONDITIONS

A. Make provisions to take the necessary precautions to protect existing work from damage during execution of this work.

B. Work of this Section shall not be executed when site conditions are detrimental to quality of work as determined by the Owner's Representative.

C. PVC pipe shall not be solvent welded during wet conditions.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. General: Pipe and fittings shall be clearly and permanently marked to identify manufacturer, type, class, or schedule and NSF approval as applicable.

B. Polyvinyl Chloride Pipe (PVC) and Fittings: SDR 26 bell and spigot, Type I PVC 1120, and complying with ASTM D3034.

C. Ductile Iron Pipe (DIP) Joints and Fittings: Class 50, rubber gasket push-on type, in compliance with AWWA C151, C111, and C110.

D. Vitrified Clay Pipe (VCP) and Fittings: Extra strength, unglazed for socket and spigot joint, complying with ASTM C700.

2.02 STRUCTURES

A. Clean Outs: As detailed on Drawings and as follows.
   1. Non-Vehicular Travel Areas: Christy "F8" by Oldcastle Precast clean out boxes, or equal.
   2. Vehicular Travel Areas: Christy "G5" Oldcastle Precast clean out boxes, or equal.

2.03 MISCELLANEOUS MATERIALS

A. Crushed Rock: 3/4-inch bedding rock as specified in Section 32 11 00 – Base Courses.

B. Mortar: Conform to applicable sections of the Standard Specifications. Mixture shall be a 1:2 Portland cement to sand mixture with a minimum of water.

C. PVC Solvent Cement: Conform to pipe manufacturer's recommendations.

D. PVC Primer: Conform to pipe and solvent cement manufacturer's recommendations.

E. Reinforcing Bars: Refer to Section 32 32 15 – Landscape Concrete.

F. Minor concrete shall comply with Section 32 32 15 – Landscape Concrete and applicable sections of the Standard Specifications.

PART 3 - EXECUTION

3.01 PIPE LAYING

A. General:
   1. The Owner's Representative will review and accept pipe prior to installation.
   2. Pipe shall be installed in conformance with Section 31 23 00 – Excavation and Fill.
   3. Sanitary sewer installations shall be reviewed and accepted by the Owner's Representative prior to backfilling.

B. Pipe:
   1. Pipe shall be laid in trench to specified lines and grades fully and evenly supported layer of bedding material as specified and identified on the Drawings. Excavate bedding so bell fittings are clear from soil 6 inches on each side of joint and to a depth sufficient to avoid contamination of joint. Refer to Drawings for additional information.
   2. Pipe shall be laid beginning at the outlet and proceeding with each bell end opening facing upgrade.
   3. Cut pipe square and ream to remove burrs prior to use.
   4. Connections:
      a. Thoroughly clean and dry all components to be joined.
      b. Apply primer and sufficient cement to coat joint surfaces of both components and fill gaps but not in excess.
      c. Join pipe, wipe off excess cement, and fully support pipe until joint has cured.

C. Provide sleeving where shown, and where pipes penetrate walls, using schedule 40 PVC pipe minimum 1/4-inch diameter larger than pipe or other method acceptable to the Owner's Representative.

3.02 STRUCTURES AT GRADE

A. General:
   1. Set rim or cover elevations to specified grades.
   2. Adjust as required to set flush with proposed grades and pavement sections.

B. Clean Outs:
   1. Excavate as required.
   2. Set on firm unyielding base. Set on compacted select backfill material unless otherwise indicated.

3.03 SANITARY SEWER CONNECTIONS

A. Sanitary sewer connections to existing sewer mains shall be made watertight, straight, and true to line, grade and "crown to crown" unless noted otherwise.

3.04 FIELD QUALITY CONTROL

A. The Owner's Representative shall review and accept work at the following stages:
   1. Excavated trench with bedding in place prior to any pipe being laid.
   2. Pipe laid prior to backfilling. Any pipe covered prior to acceptance shall be uncovered for review and re-backfilled at contractor's expense.

B. The Contractor shall furnish the necessary labor, equipment and materials necessary to perform air tests of the completed sewerage project before the system is placed in operation or connected to other lines.

C. In no case shall the Contractor place the newly constructed sewer in operation without acceptance by the Owner's Representative.

3.05 PIPELINE TESTING AND FLUSHING

A. New sections of sanitary sewer main shall be air tested using the following procedures:
   1. Test is conducted between 2 consecutive manholes, or as directed by the Owner's Representative.
   2. The test section of the sewer line is plugged at each end. One of the plugs used at the manhole must be tapped and equipped for the air inlet connection for filling the line from the air compressor.
   3. Service laterals, stubs and fittings into the sewer test section should be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowouts.
   4. Connect air hose to tapped plug selected for the air inlet. Then connect the other end of the air hose to the portable air control equipment which consists of valves and pressure gauges used to control the air entry rate to the sewer test section, and to monitor the air pressure in the pipe line. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve and a monitoring pressure gage having a pressure range from 0-5 psi. The gage shall have minimum divisions of 0.10 psi and an accuracy of 0.40 psi.
   5. Connect another air hose between the air compressor, or other source of compressed air, and the air control equipment. This completes the test equipment set-up. Test operations may commence.
   6. Supply air to the test section slowly, filling the pipeline until a constant pressure of 3.5 psi is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psi.
   7. When constant pressure of 3.5 psi is reached, throttle the air supply to maintain the internal pressure above 3.0 psi for at least 5 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap or plug, release the pressure in the line and tighten all leaky caps and plugs. Then start the test operation again by supplying air. When it is

necessary to bleed off the air to tighten or repair a faulty plug, a new 5-minute interval shall be allowed after the pipeline has been refilled.

8. After the stabilization period, adjust the air pressure to 3.5 psi and shut-off or disconnect the air supply. Observe the gage until the air pressure reaches 3.0 psi. At 3.0 psi commence timing with a stopwatch which is allowed to run until the line pressure drops to 2.5 psi at which time the stopwatch is stopped. The time required, as shown on the stopwatch, for a pressure loss of 0.5 psi is used to compute the air loss.
9. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at that time.
10. If the time, in minutes and seconds, for the 0.5 psi drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

Requirements for Air Testing:		
Pipe size in Inches	Time	
	Minutes	Seconds
4	2	32
6	3	50
8	5	06
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	45
21	13	30
For larger diameter pipe use the following: Minimum time in seconds = 462 x pipe diameter in feet		

11. For 8 inch and smaller pipe, only: If, during the five-minute saturation period pressure drops less than 0.5 psi after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.
12. Multi-Pipe Sizes: When the sewer line undergoing test is 8 inches or large diameter pipe and includes 4 inch or 6 inch laterals, the figures in the Table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, compute the average size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psi for the averaged diameter pipe.
13. Adjustment Required for Groundwater:
    a. An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased 0.433 psi for each foot the ground water level is above the invert of the pipe.
    b. Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.
        1) Install a pipe nipple, threaded one or both ends and approximately 10 inches long, through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.
        2) Seal pipe nipple with a threaded cap.
        3) Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the pipe nipple to remove any obstructions, and then connecting a clear plastic tube to the pipe nipple.
        4) Hold plastic tube vertically permitting water to rise in it to the groundwater level.

5) After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
6) Determine air pressure correction, which must be added to the 3.0 psi normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.

Example: If the vertical height of water from the sewer invert to the top of the water column measures 11.55 feet, the additional air pressure required would be:

(11.55) / (2.31) = 5.0 psi

Therefore, the starting pressure of the test would be 3.0 plus 5 or 8.0 psi, and the 0.5-pound drop becomes 7.5 psi. There is no change in the allowable drop (0.5 psi) or in the time requirements established for the basic air test.

B. After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove rock and other debris that is flushed out during cleaning.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Storm drainage system improvements and related work as shown on the Drawings and specified including, but is necessarily limited to, the following:
   1. Pipe and fittings.
   2. Nonpressure transition couplings.
   3. Expansion joints and deflection fittings.
   4. Backwater valves.
   5. Cleanouts.
   6. Drains.
   7. Channel drainage systems.
   8. Catch basins.
   9. Stormwater inlets.
   10. Stormwater treatment systems.
   11. Pipe outlets.

B. Related Requirements:
   1. Section 31 20 00 - Earth Moving
   2. Section 31 23 00 - Excavation and Fill
   3. Section 32 11 00 - Base Courses
   4. Section 32 32 15 - Landscape Concrete
   5. Section 32 33 00 - Site Furnishings
   6. Section 33 10 10 - Domestic Water Utilities

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
   2. C923: Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
   3. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   4. D2412: Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
   5. D2729: Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   6. D3034: Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   7. D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
   8. D4101: Standard Specification for Polypropylene Injection and Extrusion Materials.

B. California Building Code, Current Edition.

C. State of California, Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."

1.03 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures: Action and Informational Submittals shall be submitted in accordance with Section 01 33 00 - Submittal Procedures.

B. Coordinate work of this section with all other work contained in the Contract Documents.

1.04 ACTION SUBMITTALS

A. Shop Drawings:
   1. Catch basins, and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

B. Product Data: Manufacturer's cut-sheets of products to be used.

1.05 INFORMATIONAL SUBMITTALS

A. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1-inch equals 50 feet (1:500) and vertical scale of not less than 1-inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Field Test Reports indicating and interpreting test results for compliance with performance.

1.06 CLOSEOUT SUBMITTALS

A. Record Drawings:
   1. Accurately record location of new piping, drain structures, and connections to existing systems using horizontal dimensions, elevations, inverts, and slope gradients as applicable.
   2. Comply with the additional requirements of Section 01 78 39 – Project Record Documents.

1.07 QUALITY ASSURANCE

A. Control of Work: Conform to Section 5 of the Standard Specifications.

B. Control of Materials: Conform to Section 6 of the Standard Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store pipe neatly and orderly, stacked and blocked to prevent damage. Cracked, checked, spalled, or otherwise damaged pipe and precast concrete units shall be removed from site.

B. Use of chain slings shall not be permitted.

C. Piping, fittings, and related materials shall be carefully handled. Comply with manufacturer's rigging instructions for precast items. Use of chain slings is not be permitted.

D. All pipelines, fittings and drainage structures shall be kept clean and closed during construction.

1.09 FIELD CONDITIONS

A. Make provisions for, and take the necessary precautions to, protect existing and new work from damage during entire life of project.

B. Work of this Section shall not be executed when site conditions are detrimental to quality of work as determined by the Owner's Representative.

C. Do not interrupt service to facilities occupied or used by Owner without the Owner's written permission.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. General:
1. Pipe and fittings shall be clearly and permanently marked to identify manufacturer, type, class, or schedule and NSF approval as applicable.
2. Unless otherwise noted, Contractor has option of using either CHDPE or PVC pipe as specified.

B. Corrugated High Density Polyethylene (CHDPE) Pipe: Dual wall, perforated and solid with an integrally formed smooth waterway; "N-12 "drainage pipe by Advanced Drainage Systems, Inc., 510-913-2211, or equal.
1. Nominal sizes shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway).
2. Corrugations may be either annular or spiral.
3. Sizes shall conform to the AASHTO classification "Type S."
4. Pipe manufacturer for this specification shall comply with the requirements for test methods, dimensions, and markings found in AASHTO Designations M252 and M294.
5. The minimum parallel plate stiffness values when tested in accordance with ASTM D2412 shall be as follows:

Diameter	Pipe Stiffness
4 inch (100 mm)	50 psi (340 kPa)
6 inch (150 mm)	50 psi (340 kPa)
8 inch (200 mm)	50 psi (340 kPa)
10 inch (250 mm)	50 psi (340 kPa)
12 inch (300 mm)	50 psi (340 kPa)
15 inch (375 mm)	42 psi (290 kPa)

6. Fittings: Virgin PE compounds conforming with the requirements of ASTM D3350, cell class 324420C, and supplied or recommended by the pipe manufacturer.
a. The fittings shall not reduce or impair the overall integrity or function of the pipeline.
b. Common Corrugated Fittings:
1) Couplers, reducers, and other in-line joint fittings.
2) "Tees", "wyes", end caps, and other branch or complimentary assembly fittings.
c. Acceptable Installation Methods: Snap-on, screw-on, bell and spigot, and wrap around.
d. Couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints.
e. Where designated on the Drawings and as required by the manufacturer, a neoprene or rubber gasket shall be supplied.

C. Smooth Polyvinyl Chloride Pipe (PVC) and Fittings: SDR 26, spigot end, Type I PVC 1120, NSF approved, and complying with ASTM D3034.

D. Smooth Polyvinyl Chloride (PVC) Perforated Drain Pipe and Fittings: Bell and non-pressure rated PVC SDR 35 pipe with two rows of perforations 120 degrees apart on bottom of pipe 5 inches on center, conforming with ASTM D2729 or ASTM D3034 and Section 68 of the Standard Specifications.

E. Reinforced Concrete Pipe (RCP) and Fittings: Conform to Section 65 of the Standard Specifications and AASHTO M 170 Class III, unless otherwise shown on the Drawings.

F. Flat Panel Pipe: Perforated HDPE pipe with internal pillars for structural support; "AdvanEDGE" by Advanced Drainage Systems, Inc., 510-913-2211 as specified, or equal.

1. Size: 1.5 inches by 12 inches wide.
2. Couplers, Wyes, Tees, End Caps, and Round Pipe Adapters: "AdvanEDGE" components.

G. Perforated Pipe for Slit Sand Drainage System: Spiral corrugated, single wall, 2-inch diameter;" Turf Flow" by Hancor, Inc., 888-367-7473 as specified, or equal.

2.02 DRAINAGE STRUCTURES

A. Precast Catch Basins:
   1. General:
      a. Grates in paved areas shall conform to ADA Standards for Accessible Design.
      b. All catch basins to have locking mechanism or screw down grate to frame.
      c. Provide two grade rings at each catch basin.
   2. 12-Inch Basin: "CB12" supplied by Central Precast – US Concrete, or equal.
      a. Grating: Round, galvanized steel, ADA compliant, lockable, and meeting AASHTO H20 heavy-duty loading, or equal.
   3. 18-Inch Basins: "RBT 1812" as supplied by Oldcastle Precast, 888-965-3220, or equal.
      a. Grating: Round, lockable.
   4. 24-inch Basins: "RBT 2412" as supplied by Oldcastle Precast, 888-965-3220, or equal.
      a. Grating: Round, ADA compliant, and lockable.
   5. 36-Inch Basins: Christy "CB-3" drain box Oldcastle Precast, 888-965-3220, or equal.
      a. Grating: Galvanized steel, ADA compliant, lockable, and meeting AASHTO H20 heavy-duty loading.

B. Overflow Risers:
   1. General:
      a. Grates shall conform to plans/details.
      b. Overflow risers to have locking mechanism or screw down grate to frame.
   2. Structure:
      a. Precast frame: 24-inch Overflow Risers: "RBT 2412" as supplied by Oldcastle Precast, 888-965-3220, or equal.
      b. Reinforced Concrete Pipe: 24-inch Standard reinforced class lll concrete pipe, cut to size per plans
      c. Grating: Manhole Ring and lockable Beehive Grate MH25BH by Olympic Foundry or approved equal.

C. PVC Catch Basins: Nyloplast, 866-888-8479, or equal.
   1. Basin Bodies: PVC.
   2. Connection to corrugated pipes shall be made with flexible rubber gasket meeting requirements of ASTM F477.
   3. Casting shall be ductile iron.
   4. Flashboards shall be constructed of a corrosion-resistant material.
   5. Inlet and Outlet Size: As indicated on the Drawings.

D. Extensions: Provide box extensions, junction boxes and grade rings compatible with structures as necessary to finish at the proper elevation and to facilitate future elevation adjustments as noted below.

E. Clean Outs: As shown or noted in the Drawings.

F. French Drain: As shown or noted in the Drawings.

G. Atrium Drains: 3-inch round, flat-top structural foam polyolefin with UV inhibitor; Part No. 70 by NDS, Inc., 888-825-4716, or equal.

H. Drop Inlet: 12 inches, Model #1240 by NDS, Inc., 888-825-4716, or equal.

I. Trench Drains Outside Baseball Paving: Pre-sloped slot channel drain; Model KS 100S by ACO Polymer Products, Inc., 888-490-9552, or equal.
   1. Provide appropriate end connections and 600 series catch basin with in-line trash bucket and outlet connections.
   2. Grates:
      a. Pedestrian Locations: No. 494Q with quick lock locking device and complying ADA Standards for Accessible Design.
      b. Vehicular Traffic Locations: Galvanized, No. 411Q.

J. Drinking Fountain Drain: Square with cast iron body and bronze grate; Z415 Series floor drain Model Z415SH by Zurn, or equal.
   1. Size: 8 inches by 8 inches.

2.03 ADDITIONAL MATERIALS

A. Drain Rock:

   1. Shall be 3/4-inch x 1/2-inch crushed virgin, un-recycled, washed rock, meeting the following general gradation requirements:

Sieve Size	Percent Passing
1”	100
3/4”	90-100
1/2”	10-40
3/8”	0-15
#4	0-5

   2. Soft rock materials, including sandstone, limestone, and shale, are not suitable. Rock supplier shall certify that all supplied rock will be void of this type of rock.
   3. Supplier: Stevens Creek Quarry, Inc., Cupertino, or TMT Enterprises, Inc., San Jose, or equal.

B. Pea Gravel:
   1. Pea gravel shall conform to the following gradation requirements:

U.S. Standard Sieve Mesh	Allowable Range Percent Retained on Sieve
1/2 inch (12.5 mm)	95% passing
1/4 inch (6.3 mm)	45% passing
10 mesh (2.0 mm)	No more than 10% passing
18 mesh (1.0 mm)	No more than 5% passing

   2. Supplier: Harbor Sand & Gravel, Redwood City, TMT Enterprises, Inc., San Jose; or equal.

C. Sand for Perforated Drain Pipe (Slit Sand) Applications: Washed sand that meets USGA Greens Specifications with the following characteristics and sieve range.

   1. Characteristics:
      a. 100 percent passing a #4 screen and no more than 4 percent passing a #200 screen.
      b. A total silt and clay percent of no more than 5 percent.
      c. Crushed or naturally angled sand. Rounded silica sand is not permitted.
   2. Sieve Range:

Classification	Sieve Number	Particle Size (mm)	Allowable Range (Percent Retained on Sieves by weight)
Fine Gravel	10	>2.00	
V. Coarse Sand	18	1.00 – 2.00	0% to 10%
Coarse Sand	35	0.5 – 1.0	82% to 100%
Medium Sand	60	0.25 – 0.5	
Fine Sand	140	0.1 – 0.25	
V. Fine Sand	270	0.05 – 0.1	0% to 8%
Silt & Clay	--	<0.05	
Note: 50 percent to 75 percent of particles shall be within diameter of 0.25 to 0.75 mm.			

3. Product and Supplier: The following, or equal.
   a. "G-8 Sand" by Brown Sand, Inc., 209-234-1500.
   b. TMT Enterprises, Inc. Contact: Matt Moore 408-432-9040.

D. Sand Bedding for Storm Drain Piping: Sand conforming to Section 19-3.02F(2) of the Standard Specifications.

E. French drains and Vertidrains shall have a backfill with the following general characteristics:
1. USGA Root Zone Sand,
   a. 65 percent USGA Root Zone sand conforming to the following sieve range:

Sieve Size	USGA Spec
	Individual % Retained
#4 (4.75mm)	0
#10 (2mm)	0-10% Combined
#18 (1mm)	
#35 (0.5mm)	Minimum 60% Combined
#60 (.25mm)	
#100 (.15mm)	20% Maximum
#140 (.1mm)	5% Maximum Combined
#270 (.05mm)	
Silt (.05-.002mm)	5% Maximum
Clay (<.002mm)	3% Maximum

   b. 15 percent Coconut Coir Fiber.
   c. 15 percent AXIS Calcined Diatomaceous Earth.
   d. 5 percent Worm Castings.
2. Supplier: 'Terra Vida French Drain Backfill Mix' by TMT Enterprises. Contact: Matt Moore 408-432-9040

F. Top Dress Sand
1. Sand conforming to the following sieve range:

Sieve Size	USGA Spec
	Individual % Retained
#4 (4.75mm)	0
#10 (2mm)	0
#18 (1mm)	<5
#35 (0.5mm)	Minimum 60% Combined
#60 (.25mm)	
#100 (.15mm)	20% Maximum
#140 (.1mm)	5% Maximum Combined
#270 (.05mm)	
Silt (.05-.002mm)	3% Maximum Combined
Clay (<.002mm)	

2. Supplier: 'G-8 Top Dress Sand' by TMT Enterprises. Contact: Matt Moore (408) 432-9040

G. Bioretention soil mixture in rain gardens shall have the following general characteristics:
   1. Properties of bioretention soil mix:
      a. Consisting of the following mixture, measured by volume:
         1) 60-70% Sand
         2) 30-40% Compost
      b. Supportive of vigorous plant growth
      c. Able to achieve a long-term, in-place infiltration rate of at least 5 in/hr. and no more than 10 in/hr.
   2. Supplier: 'Biotreatment soil mix' by TMT Enterprises. Contact: Matt Moore (408) 432-9040

H. Filter Fabric for French Drain: Mirafi 140N, or equal.

I. Filter Fabric Fasteners: Metal clip type staple.

J. Mortar: A 1:2 Portland cement to sand mixture with a minimum of water conform to the applicable sections of the Standard Specifications.

K. Steps at Manhole: Manufacture from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615/A615M and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step.

L. Structural Adhesives for Manholes, Catch Basins, and Junction Boxes: "Ram-Nek" by Henry Company, 800-523-0268, or equal as available.

M. Reinforcing Bars: As specified in Section 32 32 15 – Landscape Concrete.

N. Minor Concrete: Comply with requirements of Section 32 32 15 – Landscape Concrete.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 31 20 00 - Earth Moving.

3.02 PIPING INSTALLATION

A. General:
   1. Pipe shall be installed per manufacturers' instructions and in conformance with the Contracts Documents.
   2. Installation of thermoplastic pipe shall be in accordance with ASTM D2321.

B. CHDPE Pipe:
   1. Pipe shall be installed with a minimum cover under the H-20 live load equal to 12 inches to the top of subgrade elevation.
   2. Minimum compaction for pipe subject to H-20 live load is 90 percent in accordance with Section 19, Standard Specifications.
   3. CHDPE pipe shall be laid and jointed in accordance with generally accepted practice and the following provisions to provide the required work.

C. Flat Panel Piping:
   1. Install per the layout indicated on the Drawings and in strict compliance with Manufacturer's written recommended installation instructions.
   2. Contractor shall exercise caution to not crush or damage the piping during installation of the permeable rock base.

3.03 INSTALLATION OF DRAINAGE STRUCTURES

A. General: Set rim or cover elevations to specified grades utilizing a minimum of two grade rings (or extensions) at top of drainage structure to facilitate potential elevation adjustments in the future.

B. Catch Basins: Install as shown in the Drawings and as follows:
   1. Excavate as required.
   2. Set on firm, unyielding base. Set on compacted select backfill material if directed by Owner's Representative.
   3. Prefabricated units not having a bottom shall be set on a poured-in-place concrete slab with smooth trowel finish. Mortar and properly seal unit to slab, making a watertight connection.
   4. Install pipe inlets and outlets to specified elevations. Grout and/or seal all joints to a watertight condition with material per manufacturer's recommendation.

C. French Drains and Cleanouts: Install as shown in the Drawings.

D. Trench Drains: Install as shown in the Drawings and in accordance with the manufacturer's written recommendations.

E. Drywells, Drinking Fountain Drains, Atrium Drains and Drop Inlets: Install as shown in the Drawings and in accordance with the manufacturer's written recommendations.

F. [French Drainage System:
   1. Preparation:
      a. Provide protection to all prepared grades and/or turf areas.
      b. Amend turf areas per specifications.
      c. Ensure perimeter drains are installed and drain properly.
      d. Verify all grades prior to commencement.

e. Verify irrigation system functions properly.
f. Remove all irrigation heads, cap swing joints.
g. Compact topsoil to 85% relative compaction.

2. Drain Trench Installation:
   a. Utilize trenching equipment capable of trenching at 3" maximum width, removing spoils and installing pipe in one operation to ensure no spoils are remaining on the surface that may contaminate trenches.
   b. Piping shall be sloped to conform to finish grades and ensure positive drainage.
   c. Fill trenches with specified sand while compacting at the same time to ensure no settling or sidewall cave-in.
   d. Terminate 2-inch pipe in perimeter drain trench, fill to surface with specified sand.]

3.04 IDENTIFICATION

A. Materials and their installation are specified in Section 31 20 00 - Earth Moving. Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

B. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.05 FIELD QUALITY CONTROL

A. The Owner's Representative shall review and accept work at the following stages:
   1. Excavated trench with bedding in place prior to any pipe being laid.
   2. Pipe laid prior to backfilling. Pipe covered prior to review and acceptance shall be uncovered and re-backfilled at Contractor's expense.
   3. Drainage device location and pipe connection.
   4. New drainage system shall be flood tested and clean of debris.

END OF SECTION