SECTION 323213
CAST-IN-PLACE CONCRETE RETAINING WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes cast-in-place retaining walls with soil reinforcement.

B. Related Sections:
   1. Division 32 Section 320523 "Cement and Concrete for Exterior Improvements".
   2. Division 31 Section 312000 "Earth Moving" for excavation for retaining walls.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineering design shall be based on the following loads.
   1. Gravity loads due to soil pressures resulting from grades and sloped backfill indicated.

B. Seismic Performance: Engineering design shall be based on the following loads and factors.
   1. Gravity loads due to soil pressures resulting from grades and sloped backfill indicated.
   2. Horizontal Peak Ground Acceleration (A) for Project: see Geotechnical Investigation Report per C.H.J. Incorporated dated October 9, 2009.

1.4 SUBMITTALS

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

B. Samples for Verification: For each color and texture of concrete unit required. Submit sections of units not less than 3 inches square.

C. Delegated-Design Submittal: For retaining walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Compliance Review: Qualified professional engineer responsible for retaining wall design shall review and approve submittals and source and field quality-control reports for compliance of materials and construction with design.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects.

   1. Build mockup of retaining wall as shown on Drawings.
      a. Include typical base and cap or finished top construction.
      b. Include backfill to typical finished grades at both sides of wall.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Pre-installation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to segmental retaining walls including, but not limited to, the following:
      a. Structural load limitations.
      b. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

c. Field quality-control procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle concrete units and accessories to prevent deterioration or damage due to contaminants, breaking, chipping, or other causes.

B. Store geosynthetics in manufacturer's original packaging with labels intact. Store and handle geosynthetics to prevent deterioration or damage due to sunlight, chemicals, flames, temperatures above 160 deg F or below 32 deg F, and other conditions that might damage them. Verify identification of geosynthetics before using and examine them for defects as material is placed.

PART 2 - PRODUCTS

2.1 REINFORCING STEEL

A. Reinforcing steel shall be deformed billet structural steel. Grade 60, conforming to ASTM A615. Splices in the stem section shall have a minimum overlap of 48 bar diameters.

B. All reinforcement shall be 2" clear unless otherwise shown.

C. Vertical reinforcement shall be held in place at top, bottom and intervals exceeding 192 bar diameters.

D. Minimum splice length shall be: 38: for #4, 48" for #5, 56" for #6 and 80" for #7. Other rebar details shall be per ACI 318 newest edition (currently ACI 318-08).

2.2 CEMENT AND CONCRETE

A. Portland cement shall be type II, and shall conform to ASTM C150, latest revision. The combined aggregate grading shall be Class C as listed in Table 201-1.3.2(A) of the Standard Specifications for Public Works Construction (SSPWC) "Greenbook".

B. Concrete shall have a maximum slump of 4", with an ultimate compressive strength at 28 days of 3,000 psi minimum for the wall footings.

2.3 SOIL MATERIALS

A. Nonreinforced-Soil Fill: Comply with requirements in Division 31 Section 312000 "Earth Moving" for satisfactory soils.

2.4 PERFORATED-WALL PIPES AND FITTINGS

A. Subdrainage Pipe: Comply with requirements in Division 33 Section 334600 "Subdrainage."

B. Perforated Poly Vinyl Chloride (PVC) Pipe and Fittings: ASTM D1785 and D2665.

C. Subdrainage Pipe to be 4" diameter, Schedule 40 perforated PVC drain pipe encased in one square foot of gravel and wrapped in filter fabric.

2.5 GEOTEXTILE FILTER FABRIC

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

B. Structure Type: Nonwoven, needle-punched continuous filament.
   1. Survivability: AASHTO M 288 Class 2.
   2. Styles: Flat and sock.

2.6 WATERPROOFING

A. Material: Dehydratine #4 bitumastic compound or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of retaining walls.

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

3.2 FILL PLACEMENT

A. General: Comply with requirements in Division 31 Section "Earth Moving".

B. Place a layer of drainage fill at least 12 inches wide behind wall to within 12 inches of finished grade. Place a layer of drainage geotextile between drainage fill and soil fill.

C. Wrap subdrainage pipe with filter fabric and place in drainage fill as indicated, sloped not less than 0.5 percent to drain.

D. Place impervious fill over top edge of drainage fill layer.

E. Slope grade at top of wall away from wall unless otherwise indicated. Slope grade at base of wall away from wall. Provide uniform slopes that will prevent ponding.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Level: For bed-joint lines along walls, do not exceed 1-1/4 inches in 10 feet, 3 inches maximum.

B. Variation from Indicated Wall Line: For walls indicated as straight, do not vary from straight line by more than 1-1/4 inches in 10 feet.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. In each compacted backfill layer, perform at least 1 field in-place compaction test for each 24 inches of fill depth and each 50 feet or less of retaining wall length.

END OF SECTION

SECTION 323214
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The provisions of the "Standard Specifications for Public Works Construction," latest edition, Section 201-2, shall apply except as modified herein.

1.2 SCOPE OF WORK

A. Work of this Section includes all material, equipment, and labor necessary for and incidental to completing all Concrete Reinforcement, as shown on the Drawings as reasonably implied, or as specified herein, including, but not limited to, the following:

1. Reinforcing steel.
2. Control during concrete placement.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Paving: Section 321313

1.4 STANDARDS

A. Materials and workmanship shall conform to the requirements of all applicable building codes, except that requirements specified herein shall govern where they exceed those in the Building Code. Refer and comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified.

1. American Concrete Institute, ACI 318, "Building Code Requirements for Reinforced Concrete."
2. Concrete Reinforcing Institute, "Manual of Standard Practice."
3. American Concrete Institute, ACI 315, "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
4. American Welding Society, AWS D12.1, "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction."

1.5 INSPECTION

A. Contractor shall notify the City and Landscape Architect prior to pouring of concrete in order to inspect placement of all reinforcement.

1.6 TESTING

A. Tests will be conducted as required by the City and in accordance with Section 201-2.5 of the Standard Specifications.

PART 2 - MATERIALS

2.1 REINFORCING STEEL BARS

A. Shall be deformed steel bars conforming to ASTMA-615 and UBC Standard 26-4, and shall be Grade 40 or Grade 60. Refer to Section 201-2.2 of the Standard Specifications.

2.2 WELDED WIRE FABRIC

A. Conform to ASTM A 185 and Standard Specifications, Section 201-2.4.

2.3 TIE WIRE

A. Annealed steel, 16-gauge minimum, galvanized where concrete is exposed.

2.4 SUPPORTS FOR REINFORCING

A. All supports for work exposed to view or weather shall be galvanized steel, or plastic-coated units so that finished surfaces will not be marred nor stained; supports shall be suitably sized and spaced for proper load distribution on earth or membrane so that membrane is not perforated and rebar does not set. Use no supports of wood or other cellulose material.

PART 3 - EXECUTION

All work shall conform to the requirements of Section 303-1.7 of the Standard Specifications.

3.1 GENERAL

A. Coordinate with other trades and expedite materials and labor to avoid omissions and delay in job progress.

B. Clean reinforcement of loose mill scale, oil or other foreign coatings that might destroy or reduce bond prior to placement of concrete or grout.

3.2 FABRICATION AND DELIVERY

A. Fabricate bars of indicated size and accurately form to shapes and lengths indicated and required, by methods not injurious to materials. Do no heat reinforcement for bending. Bars with bends or offsets not conforming to Drawings will be rejected.

B. Bundle reinforcement and tab with suitable identification to facilitate sorting sand placing and sufficient supply of proper reinforcement at site to avoid delays; transport and store at site so as not to damage material.

3.3 SECURING IN PLACE

A. Accurately place reinforcement and securely wire tie in precise position at points where bars cross. Tie stirrups to bars at both top and bottom. Bend wire ties away from forms. Use galvanized wire ties in exterior walls, beams, columns, and slabs. Support horizontal bars in strict accordance with the "Manual of Standard Practice," latest edition, published by concrete Reinforcing Steel Institute.

B. Maintain proper placement of all reinforcement during entire pouring or grouting operation.

3.4 PLACING REINFORCING BARS

A. Splice reinforcement as indicated on the Drawings and as specified herein. Avoid splices at critical connection and stress points. Lap as indicated or necessary to develop fulls strength or stress of bars. Stagger top splices and in horizontal wall reinforcement separate at least ten feet (10') longitudinally in alternate bars of opposite tiers. Extend stubs and dowel required to receive and engage subsequent work as sufficient length to develop full strength of bar or as indicated. Place dowel and stub bar in forms, and maintain placement during pouring of concrete or grout.

B. Where reinforcement is interrupted by sleeves and openings, provide additional bars as indicated on the Drawings.

C. When necessary, perform welding of reinforcing bars in accordance with "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections for Reinforced Concrete Construction" (AWSD12.1).

3.5 PLACING FABRIC REINFORCEMENT

A. Roll out, straighten, cut to required size, and lay reasonably flat in place. Lap fabric one full mesh at sides and ends; securely wire together and to other reinforcement at frequent intervals.

3.6 CLEARANCES

A. Exercise particular care to maintain proper distance and clearance between parallel bars and between bars and forms. Provide metal spreaders and spacers to hold steel in position as necessary. Use metal or plastic chairs to support reinforcing steel and mesh in concrete placed on earth and in footings. Transverse steel bars with hangers, or in another manner, as necessary.

B. Minimum clear distances between reinforcing steel and face of concrete shall be as indicated on the Drawings, or as follows:

1. Concrete footings formed against earth:	3"
2. Concrete in forms with exposed faced in contact with earth:	2"
3. Walls:	As detailed
4. Slabs:	Centered

3.7 PAYMENT TERMS

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

END OF SECTION

SECTION 328000
IRRIGATION SYSTEM

PART I - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

The provisions of the "Standard Specifications for Public Works Construction, (SSPWC)" latest edition, shall apply except as modified herein.

1.2 DESCRIPTION

A. Work Included: Unless otherwise specified, the construction of irrigation systems shall include the furnishing, installing and testing of mains, laterals, risers and fittings, quick couplers, gate valves, back flow preventers, furnishing and installing of irrigation controllers, booster pumps, excavation and backfill, and all other work in accordance with the plans and specifications for a complete operating system.

1. The intent of the drawings and specification is to indicate and specify a complete and efficient irrigation system ready for use in accordance with the manufacturer's recommendations and meeting the recommended approval of the Landscape Architect. All work shall be in accordance with applicable County and County codes, and these plans/specifications.
2. Irrigation systems shall be constructed to the sizes and grades and at the location shown on the drawings. Lines shown on the plans are essentially diagrammatic. Locations of all heads, valves, etc., shall be reviewed by the Landscape Architect at the time of construction. Do not exceed spacing of the heads as shown on plans.
3. The applicable provisions of the General Conditions and the Special Conditions of these specifications shall govern the work of this section as if herein written in full.
4. The Contractor shall maintain, continuously, a competent superintendent or foreman, satisfactory to the Owner, during the progress of work, with authority to act for him in all matters pertaining to the work.
5. Work noted as "N.I.C.", "existing" or "to be supplied and/or installed by others" is not a part of this section.
6. The work in this section shall be coordinated with all underground utilities and trades responsible for their installation.

B. Field Conditions: Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Landscape Architect all conditions which prevent proper execution of this work.

C. Permits and Fees: The contractor shall apply and pay for all necessary fees and permits required in the pursuit of his work as required by governing codes.

D. All assemblies specified herein shall be installed in accordance with the respective details. In the absence of detail drawings or specifications pertaining to the specific items required to complete the work, the Contractor shall perform such work in accordance with the best standard practice and to the satisfaction of the Landscape Architect.

E. Irrigation Contractor is responsible for replacing or repairing any acts of theft or vandalism during construction and the maintenance period.

F. Permission to shut off any water lines must be obtained from the Owner. Disruption of existing systems shall be kept to a minimum.

G. Contractor shall maintain irrigation system throughout plant establishment and maintenance period.

H. Contractor shall provide one year guarantee.

1.3 RELATED WORK DESCRIBED ELSEWHERE

A. Landscaping: Section 329000

1.4 QUALITY ASSURANCE

A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the latest rules of the National Electrical Code and the Electrical Safety Orders of the State of California, Division of Industrial Safety, for all electrical work and materials.

B. of Installers: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the materials manufacturer's recommended methods of installation, and who shall direct all work performed under this Section.

1.5 SUBMITTALS

A. Product Data: Within 45 days after award of the Contract, and before any materials of this Section have been delivered to the job site, submit to the Architect:
   1. A complete materials list of all items proposed to be furnished and installed under this Section.
   2. The manufacturer's recommended methods of installation which, when recommended for approval by the Architect, shall become the basis for review and accepting or rejecting actual installation methods used on the work when not otherwise specified or detailed.

B. Materials and Samples: If materials are to be employed, other than designated on the plans, the Contractor shall, prior to the installation of any irrigation work, submit for recommended approval by the Landscape Architect, a list of materials and equipment he proposes to use. The material and equipment list shall include, but not be limited to, polyvinyl chloride pipe, automatic controllers and control valves, quick coupling valves and irrigation heads.
   1. Should the Contractor propose to use materials or equipment other than those listed on the plans, he shall submit samples of the make and type proposed. Samples shall be submitted a sufficient time in advance of the start of construction to allow a period of not less than seven (7) days for testing and recommended approval.
   2. Recommended approval of irrigation equipment and materials shall depend on the following:
      a. Conformance to specification requirements.
      b. Acceptable test results and/or field performance.
      c. Durability and low maintenance.
      d. Availability of parts and service.
      e. Compatibility with owner's materials inventories.

C. Project Record Drawings: Provide separate and complete Project Record Drawings prepared in accordance with the provisions of these Specifications, Sub-section 3.8, following.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Delivery: Polyvinyl chloride pipe shall be delivered to the work site in unbroken bundles or rolls packaged in such a manner as to provide adequate protection for the pipe ends, threaded or plain.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the recommended approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 PIPE

A. Plastic Pipe:
   1. Unless otherwise specified, the construction of lateral lines and main lines shall include excavation and backfill, the furnishing, installing and testing of pipe, tube and fittings, the furnishing and installing of anchors, thrust blocks and location wire, the improvements, line flushing and testing, and all other work in accordance with the plans and specifications.
   2. Main supply pressure lines shall be PVC; 4" and larger Class 200, 2" - 3" Class 315, 1 1/2" and smaller Schedule 40, as manufactured by Lasco Industries, or approved equal.
   3. Lateral non-pressure lines shall be PVC. Schedule 200 polyvinyl chloride, as manufactured by Lasco Industries, or approved equal.
   4. Irrigation Lines Sleeves shall be PVC. Schedule 40 polyvinyl chloride, as manufactured by Lasco Industries, or approved equal.
   5. Low Voltage Control Wire Sleeves (valve wires) shall be PVC Schedule 40 polyvinyl chloride, as manufactured by Lasco Industries, or approved equal. All exposed wires shall be sleeved in PVC Schedule 40 ULV electrical conduit with ULV Schedule 40 fittings.

B. Identification: All pipe shall be continuously and permanently marked with the following information: The normal pipe size, the type and schedule or class of material, the working pressure or pressure rating at 73.4 degrees F., the manufacturer's name or trade mark, and the National Sanitation Foundation (N.S.F.) seal of approval.
   1. All plastic pipe shall be guaranteed by its manufacturer to have passed, or be capable of passing, the Anhydrous Acetone Immersion Test and to be free from manufacturing defects.

C. Polyvinyl Chloride Pipe Fittings and Connections:
   1. Polyvinyl chloride pipe fittings and connections approved for irrigation systems shall be polyvinyl chloride, Type II, Grade I, Schedule 40, high impact molded fittings, manufactured from virgin compounds.
   2. The Schedule 40 fittings shall be tapered socket type, or molded thread type, suitable for either solvent weld or screwed connections.
   3. Machine threaded fittings will be acceptable only if thread-stripping resistance test results are submitted and approved.
   4. In line fittings, such as couplings, unions and bushings may be machined from extruded stock.
   5. Plastic saddle and flange fittings will not be acceptable.
   6. All fittings shall be permanently marked with the following information: The normal pipe size, the type and schedule of material, and the National Sanitation Foundation (N.S.F.) seal of approval.

D. Galvanized Pipe and Fittings:
   1. All galvanized steel pipe shall be Schedule 40, threaded, coupled and hot-dip galvanized, and shall comply with ASTM A120 and A53.
   2. All fittings for galvanized steel pipe shall be 150 PSI rated galvanized malleable iron, banded pattern.
   3. Pipe sizes indicated on the drawings are nominal inside diameter unless otherwise noted.

2.2 VALVES

A. Ball Valves:
   1. All ball valves shall be all bronze construction full port; 1/2" thru 2", Nibco T585.
   2. Working Pressure Rated: 150 PSI stem, 400 PSI W.O.G.

B. Butterfly Valves:
   1. All butterfly valves shall be 2 1/2" and larger, Nibco WD2000.
   2. Covered under valve boxes.

C. Automatic Control Valves (Electric):
   1. All automatic control valves (electric) shall be as called for on plans, electrically controlled, hydraulically operated, single seat, normally closed no equivalents or equals.

2. The valves shall be actuated by a normally closed solenoid valve operator using 24 volts, 60 cycle alternating current. The wires in the coil of the solenoid shall be embedded in an epoxy resin. The entire solenoid shall be enclosed in Spears dry splice DS-400 water proof connectors. Valves shall automatically close in event of electrical power failure.
3. All automatic control valves shall have a flow control device for manually adjusting the amount of flow of water through the valve. The flow control device shall be adjusted so that the pressure at the nozzle of the sprinkler head farthest from the automatic control valve shall be that as specified in the irrigation legend per plan. The pressure at the sprinkler head shall be measured by means of a pilot pressure gauge while the sprinkler head is operating.
4. Automatic control valves shall be constructed of brass or stainless steel springs and screens, and composition material (neoprene) seals and seat washers.
5. Valve stems shall have a brass cross handle.
6. All automatic control valves shall be equipped with an all brass pet clock for manual operation control.
7. The Contractor shall furnish one valve box key for each six or less valve boxes installed.
8. All valves shall have a T.C. Christy valve marking plastic tag.

2.3 CONTROLLERS & WIRE

A. Automatic Controllers (Electric):
   1. Controller shall as called for on plans.
   2. All automatic controllers treated in this specification shall be for use with solenoid operated (24-volt electric), normally closed, control valves.
   3. Automatic controllers shall meet the following requirements:
      a. Be completely automatic in operation with remote control.
      b. Shall electrically start the sprinkling cycle.
      c. Shall electrically time the individual stations.
      d. Shall operate on single phase, 120 volt, 60 cycle, alternating current.
      e. Shall contain electrical circuits for pump and master valve operations.
      f. Shall have complete operating instructions and charts indicating controller station to valve locations mounted inside the controller in full view when controller is open.

B. Control Wire:
   1. All control wire shall be of the Underwriter's Laboratory type UF (underground feeder), single conductor, solid copper, plastic insulated, 600 volt rated, for direct burial applications. Maximum conductor operating temperature, 60 degrees C. for both wet and dry locations. Wire composition is as follows:
      a. Conductor - The conductors shall be solid annealed uncoated copper meeting the applicable requirements of the latest revisions of A.S.T.M. B-3.
      b. Insulation - The insulation shall be colored plastic which meets the test requirements of I.P.C.E.A. (The Insulated Power Cable Engineer's Association) Pub. No. S-61-402, dated July 1961, Section 3.7 for 60 degrees C. polyvinyl chloride insulation. The insulation shall be flame retardant, resistant to fungus, resistant to corrosive fumes, suitable for wet locations and furnish some degree of inherent protections against mechanical abuse. Insulation thickness shall be 47 mils for AWG #14, 12 & 10, and 62 mils for AWG #8.
      c. Color Coding - The conductor insulation shall be color coded as follows:
         1) All common ground wire shall be white.
         2) All pilot (valve control) wire shall be black.

2.4 VALVE BOXES

A. Valve Boxes: Remote control valve boxes shall be rectangular concrete boxes with non-hinged locking cast-iron covers. Valve station number shall be stenciled in two-inch-high (2") numerals on cover using epoxy resin base paint of a contrasting color. Ball valve boxes shall be round concrete boxes with non-hinged cast iron covers marked either "Ball Valve" or "G. V." with letters cast or tooled in the cover.

B. Butterfly valve boxes shall be rectangular concrete boxes with non-hinged locking cast-iron covers.

2.5 SPRINKLER HEADS

A. Sprinkler Heads:
   1. Sprinkler heads shall be as called for on plans. Sprinkler heads shall be of the types and sizes, with the diameter (or radius) of throw, pressure, discharge and any other designations necessary to determine the types and sizes, as indicated on the plans.
   2. All sprinkler heads of a particular type of function in the system shall be of the same manufacture and, with the exception of shrubbery heads, shall be marked with the manufacturer's name and model number. This identification shall be visible without having to remove the sprinkler head from the system.
   3. Unless otherwise specified, all irrigation heads & body shall be constructed of cycolac with the following exceptions: bearings, washers, gaskets, seals, spray pins and rocker arms.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
   1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the reference standards and the manufacturer's recommendations.

B. Discrepancies:
   1. In the event of discrepancy, immediately notify the Architect.
   2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 FIELD MEASUREMENTS

A. General:
   1. Trenches and other excavations for irrigation pipe and appurtenances shall be excavated true to alignment and grade, and shall be of ample size for the proper performance of installation work, review, testing and backfill.
   2. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots.
   3. Protect all existing utilities and repair any damage to existing utilities with matching new materials, at no increase in contract price.
   4. Generally, piping under concrete shall be installed by jacking, boring or hydraulic driving. Where any cutting or breaking of sidewalks and/or concrete work is necessary, it shall be removed and replaced by the Contractor. Permission to cut or break sidewalks and/or concrete shall be obtained from the Architect. No hydraulic driving will be permitted under asphaltic concrete paving.
   5. Coordinate with planting operations, as 10" deep cross-ripping is required prior to irrigation systems installation. (cross-ripping is part of the planting work).

B. Plastic Pipe Trenches:
   1. Minimum trench width shall be six (6) inches.
   2. Minimum trench depth below bottom of pipe shall be two (2) inches.
   3. Minimum cover shall be based on finished grades, unless otherwise noted on Drawings.
      a. Lateral Line minimum cover shall be twelve (12) inches.
      b. Main Line minimum cover shall be eighteen (18) inches.
      c. Pipe and Wire Sleeves minimum cover shall be twenty-four (24) inches.

C. Backfill Material:

1. All plastic pipe shall be bedded and encased with approved backfill material free of rocks and clods as indicated in the following table and/or shown on the plans.

	Thickness Under Pipe Minimum	Thickness Above Pipe Minimum	Thickness at Side of Pipe Minimum
a.	Two (2) inches	Four (4) inches	Two (2) inches

2. The balance of backfill material shall be approved soil. Unsuitable material, including clods and rocks over 2 to 2-1/2 inches in size, shall be removed from the premises and disposed of legally at no cost to the Owner.
3. Backfill material shall be sufficiently compacted under and on each side of the pipe to provide support free of voids. On slope areas over 3:1 gradient compaction shall be 85% (min) or equal to the requirements of the grading plans, which ever is greater. Pipe joints shall remain exposed until the completion of pressure and leakage test, unless authorized by the Architect. The top six (6) inches of backfill shall be free of rocks over one (1) inch, subsoil, rubbish and debris.
4. The remainder of the backfill material shall contain no lumps or rocks larger than two and one-half (2-1/2) inches, nor contain rubbish and debris.
5. Backfill shall be tamped or puddled to the dry density of adjacent soil. Backfill within areas of structurally compacted soils shall be returned to the original relative density as before trenching.

D. Location Wire:

1. Location wire shall be placed on top of the four-inch select backfill over all mainline (pressure bearing) pipes, except copper pipe. Wire shall be No. 12 gauge copper, new or used or an approved substitute, and shall provide a continuous electrical conductor between gate valves and control valves. Each end shall be brought to the valve sleeve and two feet of wire looped free in the trench beside the valve body. This location wire may be omitted where copper hydraulic control tubing or electric control wire follows the water main.

3.3 INSTALLATION OF POLYVINYL CHLORIDE PIPE

A. Polyvinyl chloride pipe shall be installed in such a manner so as to provide for expansion and contraction as recommended by the manufacturer.

B. All polyvinyl chloride pipe shall lay free in the trench with no induced strain. Where there is evidence of induced pipe strain, the Contractor shall be required to make pipe cuts and install angle fittings as necessary to eliminate the strain.

C. When a connection is plastic to metal, a female adapter shall be used. The metal nipple shall be hand-tightened, plus one turn with a strap wrench. Joint compound shall be Permatex, Type 2, or Teflon Tape.

D. The Contractor will be required to remove and replace any fitting which induces a torque strain to the pipe.

E. Polyvinyl chloride pipe shall be cut with a PVC. pipe cutter, hand saw or hack saw with the assistance of a square and sawing vise or in a manner so as to ensure square ends. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.

F. All plastic to plastic joints shall be solvent-weld joints. Only the solvent recommended by the pipe manufacturer shall be used.

G. The solvent-weld joints shall be made in the following manner:

1. Thoroughly clean the mating pipe and fitting with a clean dry cloth.
2. Try the parts for fit. The parts should "dry-mate" between one-third and two-thirds the depth of the socket. If adequate insertion is not obtained, or bottoming occurs, try another part until a satisfactory "dry-fit" is obtained.
3. Apply a uniform coat of solvent to the outside of the pipe with a non-synthetic bristle brush.

NOTE: *For PVC. Type I, 1120-1220, pipe mating surface shall first be cleaned with the application of Methyl Isobutyl Ketone (MIBK) solvent. This cleaning shall be accomplished by applying MIBK solvent to the full mating surface area and wiping off with a clean cloth, repeating the process, if necessary, until no trace of shine remains (neither streaks nor spots). The use of commercial PVC. solvent-cement thinners as a substitute of MIBK is not allowed.*

4. Apply a uniform coat of solvent-weld to the fitting socket.
5. Re-apply a light coat of solvent-weld to the pipe and quickly insert it into the fitting.
6. Give the pipe or fitting a quarter turn to ensure even distribution of the solvents and make sure that the pipe is inserted to the full depth of the fitting socket.
7. Hold in position for at least 15 seconds.
8. Wipe off excess solvent that appears at the outer shoulder of the fitting.

3.4 INSTALLATION OF CONTROL WIRE

A. Unless otherwise specified, the installation of control wire shall include excavation and backfill, the furnishing, installing and testing of the wires, the removal and/or restoration of existing improvements and all other work in accordance with the plans and specifications.

B. Unless otherwise specified all neutral (common ground) wire shall be AWG #12 and all pilot (valve control) wire shall be AWG #14.

C. At least one spare wire shall be installed from the controller clock to the most distant valve. When wire runs go in different directions from the controller clock, a separate spare wire shall be installed from the controller clock to the most distant valve in each different wire run direction.

D. Tape and bundle all control wires at 10' o/c maximum; place wiring with 18" minimum cover. When wiring is placed in common trenches with piping, set wiring 2" from any piping.

E. All wire splicing shall take place in the valve boxes and/or pull boxes. All splices shall be made with a mechanical connector encased in a self-curing epoxy resin which provides a permanent watertight connection.

F. All direct burial control wires shall be identified as to their respective valve number and controller clock letter in all pull boxes and at all wire termination. Spare wires and "future valve" wires, if any, shall also be identified. Labels and tags shall be used for identification which are not affected by moisture or temperatures between minus 30 degrees F. and plus 200 degrees F. The labels and tags shall be resistant to abrasion, dirt, grease, and chemicals used in lawn fertilizers and conditioners. The labels and tags shall be firmly attached to the wire in every case. The Contractor shall submit samples of the labels or tags to be used, to the Architect for recommended approval, prior to the installation of the control wire. Examples of nomenclature of tags or labels are as follows:

Neutral (common ground) wire= "Neutral" Clock "A"
Pilot (valve control) wire= "A.V. #1." Clock "A"
Spare Wire= "Spare" Clock "A"

G. The final operating sequence of the remote control valves, within each individual controller clock, shall be as called out on drawings.

H. Testing:
   1. All direct burial control wire installed shall be tested in the following manner.
      a. Before any backfill material is placed over the control wires in the trench, the wires shall be tested with a meter for insulation resistance. Minimum insulation resistance to ground shall be fifty (50) megohms. Any conductor not meeting this requirement shall be replaced.
      b. After backfill encasement, the wires shall again be tested with a meter. The minimum acceptable insulation resistance to ground on this test shall be one (1) megohm. Any conductor not meeting this requirement shall be replaced.
   2. Provide separate common wire for each controller installed.

3.5 INSTALLATION OF VALVES

A. General: Unless otherwise specified, the installation of the valves shall include excavation and backfill, the furnishing, installing and testing of risers, fittings and valves, the furnishing and installing of appurtenances, accessories, anchors and thrust blocks, the removal and/or restoration of existing improvements and all other work in accordance with the plans and specifications.

B. Ball / Butterfly Valves: Valves installed underground shall be housed in a Christy concrete valve box, no equivalents or equals.

C. Automatic Control Valves: Automatic control valves shall be set upright and housed in Christy concrete valve box. The Contractor shall mark, the identification number of the valve and clock on the outside cover of the box. Per 2.D- Valve boxes this section.

3.6 INSTALLATION OF AUTOMATIC CONTROLLERS

A. Unless otherwise specified, the installation of automatic controllers shall include the furnishing, the installing, making necessary electrical connections, the testing of controllers and connection, and all other work as called for on the plans and/or in the specifications.

B. All electrical conduit shall be P.V.C. Sunstop ULV Schedule 40 pipe & fittings.

C. Install controllers at 5' min. away from 3 phase power.

D. Unless otherwise specified the installation of controllers shall be as detailed on plan.

E. Controllers shall be tested for fourteen (14) calendar days after complete installation of the sprinkler system. System shall operate automatically in the manner shown on the drawings and/or specified herein.

3.7 INSTALLATION OF SPRINKLER HEADS

A. Unless otherwise specified, the installation of sprinkler heads shall include excavation and backfill, the furnishing, installing and testing of risers, fittings and heads, the furnishing and installing of anchors and thrust blocks, the furnishing and installing of cone shaped screens at base of each head, the removal and/or restoration of existing improvements and all other work shall be in accordance with the plans and specifications.

B. Flushing: All water lines shall be thoroughly out before heads are installed.

C. Location and arc of heads shall be adjusted, if required to eliminate any dry spots, over water or spillage on adjacent areas.

D. All seeded area sprinkler heads shall be installed adjacent to existing walks, curbs, or other paved areas, shall be set to the grade of the improvements. Sprinkler heads which are to be installed in areas where the turf has not yet been established shall be set one (2) inches above the proposed finished grade. Heads installed in this manner shall be lowered by the Contractor prior to final acceptance. In established lawn areas the sprinkler heads shall be set to existing grade.

E. All shrubbery heads to be installed within three (3) feet of curbs shall be set to a maximum height of six (6) inches above the grade of the curb. Shrubbery heads installed in all other areas shall be twelve (12) inches above finished grades unless otherwise indicated on the plans. Pop-up shrub heads shall be installed as detailed.

3.8 DRAWINGS OF RECORD & TURNOVER ITEMS

A. Record Drawings: The Contractor shall provide and keep up to date, a complete record set of blue line ozalid prints which shall be corrected daily and show every change from the original drawings and specifications and the exact locations, sizes and kinds of equipment. Prints for this purpose may be obtained from the Owner. This set of drawings shall be kept on the site and shall be used only as a record set.

B. The drawings shall also serve as work progress sheets, and the contractor shall make neat and legible annotations thereon daily as the work proceeds, showing the work as actually installed. These drawings shall be available at all times for inspections and shall be kept in a location designated by the Owner.

C. In order to complete the record drawings in a neat, legible manner, the contractor shall employ a competent draftsman, satisfactory to the Owner's authorize representative, to indicate the necessary changes on mylar tracings procured from the Owner and deliver same to the Owner two weeks prior to the final review by the Architect.

D. The contractor shall dimension from two (2) permanent points of reference, building corners, sidewalks, or road intersections, etc., the location of the following items:
   1. The routing of the sprinkler main lines
   2. Connections to the existing water lines
   3. Control valves and Butterfly valves
   4. Hose Bibs
   5. Any other pertinent underground item, if so deemed by the Landscape Architect.

E. Controller Charts:
   1. Provide one controller chart for each controller supplied.
   2. Record drawings shall be recommended for approval by the Landscape Architect before charts are prepared.
   3. These charts shall be completed and reviewed prior to final observation of the irrigation system, and prior to final payment.
   4. Update and prepare new controller charts at end of the 1 year maintenance period.
   5. The chart shall show the area controlled by automatic controller and shall be no larger than the 24" x 36" original.
   6. The chart is to be a reduced drawing of the actual system. However, the chart shall only be reduced to a size which is completely legible.
   7. Chart shall be black line print and shall be colored with a different color for each station.
   8. The chart shall be mounted using Velcro, or an approved equal type of tape.
   9. When completed and recommended for approval, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils thick.

F. Turnover Items:
   1. Supply as part of this contract the following items:
      a. Four (4) additional sprinkler heads of each type and spray pattern shown on plans.
      b. Two (2) wrenches for disassembly and adjustment of each type of sprinkler head shown on plans.
      c. Two (2) keys for each automatic controller.
      d. Two (2) quick couplers with a 3/4" bronze hose bib, bent nose type with hand wheel and two (2) quick coupler keys to match quick couplers shown on plan.
      e. Two (2) valve box cover keys or wrenches.
      f. One (1) 5-foot tee wrench for operating butterfly valves 3 inches or larger.
      g. Backflow device valve handles and Water Department inspection documentation.

3.9 TESTS

A. Pressure Tests:
   1. All pressure lines shall be tested under hydrostatic pressure of 125 pounds per square inch, and all non-pressure lines shall be tested under the existing static pressure and both be proved watertight. Contractor shall provide all equipment for hydrostatic tests at no cost to the Owner.
   2. Pressure shall be sustained in the lines for not less than two (2) hours. If leaks develop, the joints shall be replaced and the test repeated until the entire system is proved watertight.
   3. Tests shall be observed and recommended for approval by the Landscape Architect prior to backfill.

B. Coverage Test:

1. When the irrigation system is completed, the Contractor, in the presence of the Architect, shall perform a test coverage of water afforded the planting areas, complete and adequate. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage disclosed arising from his work.
2. Contractor shall inform the Owner`s representative of any deviation from the plan required due to wind, planting, soil or site conditions that bear on proper coverage; and upon approval, perform changes to provide for proper coverage at no additional cost to the Owner.

3.10 REVIEWS

A. Normal Progress Reviews: Normal progress reviews shall be requested from the Architect at least 48 hours in advance of any anticipated review. A review will be made by the Architect on each of the steps listed below. The Contractor will not be permitted to initiate the succeeding steps of work until he has received written approval to proceed by the inspector.
   1. Immediately prior to the commencement of the work of the section.
   2. Irrigation materials and equipment to be used.
   3. After trenching and before backfill.
   4. Completion of line testing, test to be made prior to backfill.
   5. After placement of all heads, valves and controllers for coverage.
   6. Final review and receipt of "Record Drawings"/"Controller Charts".
   7. Final acceptance of project by Owner.
   8. In no event shall the Contractor cover up or otherwise remove from view any work under this contract without prior approval. Any work covered prior to review shall be opened to view by the Contractor, at his expense.

B. Unprepared Review Requests: In the event the Contractor requests review of work and said work is incomplete, the Contractor shall be responsible for review cost.

C. Completion: The work will be accepted, in writing, when the whole shall have been completed satisfactorily to the Owner and the Architect. In judging the work, no allowance for deviation from the original plans and specifications will be made unless already approved by Owner, in writing, at the proper times.
   1. Leave the entire installation in complete operating order, free from any and all defects in material, workmanship or finish, regardless of any discrepancies and/or omissions in plans or specifications.
   2. Remove from the site all debris and rubbish resulting from the work, and leave the installation in clean condition.

3.11 GUARANTEE

A. General: The entire sprinkler system, including all work done under this contract, shall be guaranteed against all defects and fault of material and workmanship for a period of one (1) year following the filing of the Notice of Completion. All materials used shall carry a manufacturer's guarantee of one (1) year.
   1. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to the County within ten (10) calendar days of receipt of written notice from the County. When the nature of the repairs as determined by the County constitute an emergency (e.g. broken pressure line) the County may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the County by the Contractor, all at no additional cost to the County.

B. Form of Guarantee: Guarantee shall be submitted on Contractors own letterhead as follows:

FORM OF GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defects in materials or workmanship which may develop during the period of one year from date of filing of the Notice of Completion and also the repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the County. We shall make such repairs or replacements within 10 calendar days following written notification by the County. In the event of our failure to make such repairs or replacements within the time specified after receipt of written notice from the County, we authorize the County to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

SIGNED: _____

ADDRESS: _____

_____

_____

PHONE: _____

C. After the system has been completed, the Contractor shall instruct the Owner in the operation and maintenance of the system and shall furnish a complete set of operating instructions.

D. Any setting of trenches which may occur during the one-year period following acceptance shall be repaired to County's satisfaction by the Contractor without any additional expense to the County. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

3.12 MAINTENANCE

A. Maintenance of irrigation system prior to job completion, and during the Landscape Maintenance period, shall be the responsibility of the Contractor including, but not limited to, the following:

1. Cleaning of plugged irrigation heads.
2. Irrigation heads adjustments.
3. Volume of water being applied (coordinate with landscape maintenance.)
4. Programming of the controller (coordinate with landscape maintenance.)
5. Repairing leaking valves, etc.
6. Any other problem areas which occur after installation attributed to the irrigation system.
7. Repair or replace equipment due to acts of vandalism, theft or pest damage.
8. Lower all seeded area heads to final grades prior to final acceptance by Owner.

3.13 PAYMENT TERMS

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

END OF SECTION

SECTION 329000
LANDSCAPING

PART I - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

A. The provisions of the "Standard Specifications for Public Works Construction, (SSPWC)" latest edition, shall apply except as modified herein.

1.2 SCOPE

A. Work of this Section includes all material, equipment, and labor necessary for and incidental to completing all Landscape Planting work as indicated on the Drawings, or as reasonably implied, or as designated herein, including, but not limited to, the following.

1. Soil testing approvals.
2. Weed abatement.
3. Soil preparation.
4. Finish grading.
5. Preparation of all planting holes.
6. Furnishing and installation of all plant materials unless otherwise noted.
7. Sodding indicated turf area.
8. Furnishing and installation of all required fertilizers, planting backfill materials, top
9. Dressing and miscellaneous materials.
10. Staking and tying trees.
11. Providing plant establishment / maintenance (90 days after 1st mowing)
12. Clean-up and weeding of all landscape areas.
13. One year guarantee.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Selective Site Demolition: Section 024113

B. Irrigation system: Section 328000

1.4 QUALITY ASSURANCE

A. The Contractor shall provide at least one person who shall be present at all times during execution of this portion of the work, who shall be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation, and who shall direct all work performed under this Section.

B. All plants and planting material shall meet or exceed the specifications of Federal, State and County laws requiring inspection for plant disease and insect control.

C. Quality and size shall conform with the current edition of "Horticultural Standards" for number one grade nursery stock as adopted by the American Association of Nurserymen, and California Department of Agriculture regulations.

D. The Applicator of all weed control materials shall be licensed by the State of California as a Pest Control Operator and a Pest Control Advisor in addition to any subcontractor licenses that are required.

E. All materials and methods used for Weed Abatement must conform to Federal, State, and Local Regulations.

1.5 APPROVALS

A. All irrigation system work shall be inspected for recommended approval by the Landscape Architect and/or the County prior to start of any work in this section.

1.6 TESTING

A. An Agricultural Soil Suitability Report for all planting areas shall be obtained by the Contractor, after completion of rough grading, and prior to start of soil preparation work. The Contractor, at his own expense, shall submit at least four (4) site soil samples to a Soil Laboratory recommended by the Landscape Architect. Samples are to be taken from the top six inches (6") of soil in areas to receive planting. All test results and recommendations shall be provided to the Landscape Architect and/or the County. The requirements for fertilization and amendments as specified herein, may be modified as necessary prior to start of work in this section.

B. After the completion of soil preparation and prior to the start of any planting, soil samples shall again be taken. Quantity and methods shall be the same as previously executed. Contractor shall not commence planting until so directed by the Landscape Architect and the County.

1.7 SUBMITTALS

A. Materials lists: Within forty-five (45) days after award of the Contract, submit a complete list of all materials proposed to be furnished and installed under this Section, demonstrating complete conformance with the requirements specified.

B. Materials list shall include the weed control materials and quantities per acre intended for use in controlling the weed types prevalent and expected on the site, as supplied by the Pest Control Advisor. Pest Control Advisor shall furnish the Landscape Contractor and Landscape Architect data to demonstrate the compatibility of the weed control materials and methods with the intended plant and seed varieties.

C. Certificates: Deliver all certificates to the Landscape Architect upon delivery to job site. Include:
   1. Quantity of commercial fertilizers used.
   2. Quantity of soil amendments.
   3. Quantity of seed.
   4. Quantity of plant material.

1.8 PRODUCT HANDLING

A. Delivery and Storage:
   1. Deliver all items to the job site in their original containers with all labels intact and legible at time of Landscape Architect's review.
   2. Immediately remove from the site all plants which are not true to name, and all materials which do not comply with the specified requirements.
   3. Use all means necessary to protect plant materials before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the recommended approval of the Landscape Architect and at no additional cost to the County.

1.9 RESPONSIBILITY AND COORDINATION DURING WEED ABATEMENT

A. During Weed Abatement procedures, the Landscape Contractor is responsible for the erection of all signs and barriers required to prevent intrusion into the treated areas and to notify the public.

B. No material or methods used for Weed Abatement shall affect the landscape planting or hydroseed germination. No material or method shall render the job site unusable for more than ten (10) days from date of application.

PART 2 - MATERIALS

All materials shall conform to the requirements of Section 212 of the Standard Specifications, except as modified herein.

2.1 LANDSCAPE FINISH GRADING

A. Site topsoil material - No import soil.

2.2 NON-SELECTIVE HERBICIDES

A. Non-selective contact herbicide and/or non-selective systemic herbicides (as recommended by the Pest Control Advisor).

2.3 SELECTIVE HERBICIDES

A. Selective pre-emergent herbicides ('Ronstar G' or equal or as recommended by the Pest Control Advisor).

2.4 SOIL CONDITIONERS AND FERTILIZERS

A. Soil conditioners may include any or all of the conditioners herein specified and shall be applied at rates indicated on the plans or as determined by the Agronomical Soils Report.

1. Shavings: Nitrogen stabilized organic amendments derived from redwood sawdust, fir sawdust or finely ground bark of fir or pine containing the following physical properties:

Percent Passing	Sieve Size
95 - 100	6.33 mm (1/4 inch)
80 - 100	2.38 mm (No. 8, 8 mesh)
0 - 30	500 Micron (No. 35, 32 mesh)

2. Nitrogen Content - Dry weight 0.56% - 0.84%
3. Iron Content - Minimum 0.08% dilute acid soluble Fe. on dry weight basis.
4. Soluble Salts - 2.5 millimohos/centimeter at 25 degrees C. as determined by maximum saturation extract method.
5. Ash - (Dry weight) 0 - 6.0%
6. Fertilizer: Commercial fertilizers with an analysis of 5-3-1 Gro-Power Plus, 16-20-0, and 12-8-8 Gro-Power Controlled Release Nitrogen, as designated herein, or approved substitute as required by the Agronomical soils report.
   a) Fertilizer shall be delivered to the site in the original unopened containers, bearing the manufacturer's guaranteed analysis. Any fertilizer that becomes caked or damaged, making it unsuitable for use, will not be accepted. Available from: Gro Power (213) 245-6849 or (714) 750-3830.
7. Gypsum: To be agricultural grade gypsum and shall conform to Section 212-1.2 of Standard Specifications for Public Works Construction, Latest Edition.
8. Iron Sulfate: Pelleted or granular form containing not less than 18.5% expressed metallic iron and shall be registered as an agricultural mineral, with the State Department of Agriculture in compliance with Article 2 - "Fertilizer Materials," Section 1030 of the Agricultural Code.
9. Ammonium Sulfate: Granular form containing not less than 21% nitrogen and 24% sulfur and shall be registered as an agricultural miner, with the State Department of Agriculture in compliance with Article 2 - "Fertilizer Materials," Section 1030 of the Agricultural Code.

1.5 PLANTING TABLETS

A. Fertilizer planting tablets shall be tightly compressed commercial grade planting tablets having a 12-8-8 formula, weighting 7 grams each, as "Gro-Power" planter tablets or equal. The planting tablets shall be delivered to the site in the original, unopened containers, bearing the manufacturer's guaranteed analysis. Any damaged tablets will not be accepted.

2.6 PLANT MATERIALS

A. Nomenclature: The scientific and common names of plants herein specified conform to industry standards. (Refer to list of plant materials on Drawings).

B. Labeling: Each group of plant materials delivered to the site shall be clearly labeled as to species and variety and nursery source.

C. Quality and Size:

1. Plants shall be in accordance with the California State Department of Agriculture's regulation for nursery inspections, rules and grading. All plants shall have a normal habit of growth and shall be sound, healthy, vigorous, and free of insect infestations, plant diseases, sun scalds, fresh abrasions of the bark, excessive abrasions, or other objectionable disfigurements. All plants shall have normally well-developed branch system, with vigorous and fibrous root systems which are not root or pot bound. In the event of disagreement as to condition of the plants furnished by the Contractor in containers will be determined by removal of earth from the roots of not less than two plants or more than 2% of the total number of plants of each species or variety. Where container grown plants are from several sources, the roots of not less than two plants of each species or variety from each source will be inspected. In case the sample plants reviewed are found to be defective, the Landscape Architect and the County may judge acceptability. Any plants rendered unsuitable for planting because of this review will be considered as samples and will be provided at the expense of the Contractor.
2. The size of the plants will correspond with that normally expected for species and variety of commercially available nursery stock, or as specified in the special Conditions or Drawings. The minimum acceptable size of all plants measured before pruning with the branches in normal position, shall conform with the measurements, if any, specified on the Drawings in the list of plants to be furnished. Plants larger in size than specified may be used with the recommended approval of the Landscape Architect, but the use of larger plants will make no change in contract price. If the use of larger plants is recommended for approval, the ball of earth or spread of roots for each plant shall be increased proportionately.

D. Rejection or Substitution: All plants not conforming to the requirements herein specified shall be considered defective, and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site of the work and replaced with new plants at the contractor's expense. The plants shall be of the species, variety, size and condition specified herein or shown on the drawings. Under no condition will there be any substitution of plants or sizes for those listed on the accompanying plans, except with the expressed consent of the Landscape Architect.

E. Pruning: At no time shall the tree or plant materials be pruned, trimmed or topped prior to delivery, and any alteration of their shape shall be conducted only with the recommended approval and when in the presence of the Landscape Architect.

F. Protection: All plants at all times shall be handled and stored so that they are adequately protected from drying out, from wind burn, or from any other injury.

G. Right of Review: The Landscape Architect reserves the right to recommend approval or rejection at any time upon delivery or during the work, any or all plant material regarding size, variety or condition.

2.7 SEED MIX

A. Seeds shall be fresh, clean, new crop seed. Conforming to Section 212-1.3 of the Standard Specifications. Seed shall be pre-mixed by mechanical mixer. Contractor to submit seed mix specifications from supplier, prior to purchase of seed.

Turf Seed Mix	by weight	Purity	Germination	
Perennial Rye	(50% 'Caliente Fine', 50% 'Prelude')	60%	95%	90%
PJ Bluegrass	(50% 'Rugby' 50% 'Parade')	10%	98%	80%
Un-Hulled Bermuda	(Certified Arizona Common)*	30%	98%	85%

Seeding rate: 218 pounds per acre (5 LBS/1,000 SF)
*Note: For applications in May through September, use Hulled Bermuda.

2.8 HYDROSEEDING AND HYDROMULCHING MATERIALS

A. Water: General precautions should be observed when drawing water from sources other than domestic water supply.

B. Seed: As specified in this Section 2.07. (For Hydroseed areas only; do not include for Stolon application).

C. Mulch Fiber: Conweb '2000' or equal, shall be produced from cellulose such as wood pulp or similar organic materials and shall be of such character that it will disperse into a uniform slurry when mixed with water. The fiber shall be of such character that when used in the applied mixture, an absorbent or porous mat, but not a membrane will result on the surface of the ground. Materials which inhibit germination or growth shall not be present in the mixture.

D. Binding Agent: Ecology Controls M-Binder or equal. Dry powder organic concentrate.

E. Available from: Robinson Fertilizer Company (714) 632-9710.

F. Commercial Fertilizer: Gro-Power Hi-Nitrogen, 14-4-9

G. Chemical Analysis: Nitrogen 14% Phosphate 4%, Potash 9%, Sulfur 3%, Humus 30%, Humic acids 6%, Gro-Power bacterial "stimulator" included.

H. Physical Properties: Each bead contains the same 14-14-9(S) formulation in addition to humus and humic acids - a water soluble biodegradable binder is used to insure fast breakdown.

I. Available from: Gro-Power (213) 245-6849 or (714) 750-3830.

2.9 STOLONS

A. Stolons shall be fresh, clean, living section of hybrid Bermuda grass as specified on plan conforming to Section 212-1.4.5 of the "SSPWC".

B. Stolon rate: Ten (10) bushels per one thousand square feet (1,000 sq.ft.)

2.10 SODDED TURF

A. Sod type and supplier per planting legend.

2.11 MULCH

A. Ground wood product shall be Type I, as specified in the "Standard Specifications for Public Works Construction," latest edition, Section 212-1.2.4.

2.12 TREE SUPPORTS

A. Tree ties shall be "CINCH-TIE" black rubber ties, and shall be uniform throughout the project. Or, County approved equal.

B. Tree support stakes shall be minimum two inches (2") diameter lodge pole pine, copper naphthenate treated, ten feet (10') length.

2.13 JUTE NETTING

A. Jute netting shall be new and shall be of uniform, plain weave, flame-retardant mesh. The mesh shall be dyed green and shall be made from unbleached single jute yarn. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than one-half its normal diameter. Jute netting shall be furnished in rolled strips and shall meet the following requirements:

1. Width 48 inches, with a tolerance of one inch wider or narrower.
2. Minimum 78 warp ends per width of roll.
3. Minimum 41 weft ends per yard of length.
4. Weight shall average 1.22 pounds per linear yard, with a tolerance of 5 percent heavier or lighter.

PART 3 - EXECUTION

Installation shall conform to the requirements of Section 308 of the "Standard Specifications," except as modified herein.

3.1 GENERAL

A. Prior to the start of work of this Section, all trash and deleterious materials on the surface of the ground shall be removed and legally disposed of.

3.2 WEED ABATEMENT

A. Prior to the installation of the irrigation system, all weed growth shall be removed within the areas designated to be cleared and grubbed. Refer to plans for limit of work.

1. If in the opinion of the Pest Control Advisor, perennial grasses and weeds existing in the planting areas will require control prior to removal, spray these areas per Pest Control Adviser's recommendations. Allow herbicide to kill all weeds. Rake or hoe off all dead weeds to a depth of one to two inches (1" to 2") below the surface of the soil. Physically remove all weeds from the site.

B. Upon completion of the irrigation system and rototilling of soil amendments into the soil and immediately preceding the installation of plant material, perform weed abatement as follows, and per Pest Control Advisors recommendation.

1. Apply Sulfate of Ammonia at the rate of five pounds (5 lbs.) per one thousand square feet (1,000 sf.) to all planting areas.
2. Irrigate area for fourteen (14) consecutive days, to germinate existing weed seeds.
3. Apply by spray a non-selective herbicide to eradicate all existing weeds. Do not irrigate for seven (7) days after application.
4. Remove weeds after herbicide has had time to sufficiently kill. Remove all dead weeds by rake or hoe to a depth of one to two inches (1" to 2") below the surface of the soil. Remove all weed residue and top growth and dispose of in a legal manner.

3.3 SOIL PREPARATION AND FINE GRADE

A. Soil Preparation: Prior to spreading soil amendments and prior to installation of irrigation systems, crossrip or otherwise till to a depth of ten inches (10") all planting areas to receive soil preparation. All rock one inch (1") and larger shall be removed to a depth of twelve inches (12"). Dispose of all debris off-site in a legal manner.

B. Planting Areas: To all planting areas (turf, shrub and groundcover), uniformly broadcast soil amendments and thoroughly incorporate to a minimum six inch (6") depth by means of a rototiller or equal.

1. Soil Amendments are to be thoroughly incorporated at the following rates per one thousand square feet (1,000 sf.) by rototilling or other approved method:

3 cu. yds.	Nitrogen stabilized organic amendment
200 lbs.	5-3-1 commercial fertilizer
10 lbs.	Iron Sulfate*
50 lbs.	Agricultural Gypsum

(Mix to be used for bidding purposes only, to be verified with Agronomical Soils Test.)

*** Care shall be taken when using or handling Iron Sulfate to avoid contact with cement.**

C. Finish Grade:

1. Rough grade has been left within one tenth (1/10) of one foot (1') of finish grade.
2. Work such as fine grading and light cultivation are required of all planting areas indicated on plan to prepare grades prior to seed or stolon planting.
3. After approximate finished grades have been established, all soil areas shall be compacted and settled by application of heavy irrigation to a minimum depth of twelve inches (12").

D. EROSION CONTROL: Add new Section to the Standard Specifications:

"308-4.9.6 Jute Netting. All slopes areas greater than 5 feet in height and exceeding 3:1 shall receive jute netting. Netting shall also be provided during the Plant Establishment & Maintenance Period, when and as directed by the Landscape Architect, along flow lines and other locations where erosion is evident. Jute netting shall be installed loosely, up and down the slope. The installed netting shall fit the soil surface contour and shall be held in place by 9-inch long, 11-gauge (minimum) steel wire staples driven vertically into the soil at approximately 24-inch spacing. Jute netting strips shall overlap along the sides at least 6 inches. Ends of strips shall be buried into the soil at least 6 inches. Lap all ends of rolls a minimum of 24"."

3.4 FINAL GRADES

A. After the foregoing specified deep watering, minor modifications to grade may be required to establish the final grade. These areas shall not be worked until the moisture content has been reduced to a point where working it will not destroy soil structure.

B. Finish grading shall ensure proper drainage of the site.

C. Finished earth berm surfaces shall be smooth and even between contours; shapes shall be to the satisfaction of the Landscape Architect.

D. All areas shall be graded so the final grades will be two inch (2") for shrub areas and one inch (1") for turf below adjacent paved areas, sidewalks, valve boxes, clean-outs, drains, manholes, etc.

E. All shrub areas to receive two inch (2") of bark chips.

F. Surface drainage shall be away from all building foundations.

G. Eliminate all erosion scars.

H. The Contractor shall request a review by the Landscape Architect for recommended approval of the final grades and elevations before beginning planting operations.

3.5 TREE AND SHRUB INSTALLATION

A. All planting and bare dirt areas (except areas to receive hydroseed) are to be treated with a pre-emergent chemical (subject to approval by Landscape Architect prior to application). Chemicals are to be applied by a licensed by a Pest Control Agent at the rates recommended by the manufacturer. This treatment shall be applied at the following times during the contract: a) before planting, b) at the beginning of plant establishment period and c) at the end of the plant establishment period. No chemicals shall be applied other than in the presence of the inspector.

B. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as reviewed by the Landscape Architect.

C. All irrigation work shall have been reviewed by the Landscape Architect prior to beginning any planting.

D. Installation of all plant material shall be in accordance with the details on the Planting Plans.

E. Locations for plants and outlines of areas to be planted shall be marked on the ground by the Contractor before any plant pits are dug. All such locations shall be reviewed by the Landscape Architect and Owner/Agent. If an underground construction or utility line is encountered in the excavation of planting areas, notify Landscape Architect so that other locations for planting may be selected.

F. Excavation for Planting:
   1. Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits and planting beds.
   2. Protect all areas from excessive compaction when trucking plants or other material to the planting site.
   3. All excavated holes shall have vertical sides with roughened surfaces and shall be of a size that is at least two times the width and depth of the original plant container. The holes shall be, in all cases, large enough to permit handling and planting without injury or breakage to the roots or root ball.

G. Planting:
   1. No planting shall be done in any area until the area concerned has been satisfactorily prepared in accordance with these Specifications.
   2. No more plants shall be distributed in the planting area on any day than can be planted and watered on that day.
   3. Containers shall be cut and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken, and they shall be planted and watered as herein specified immediately after the removal from the containers. Containers shall not be cut prior to placing the plants in the planting area.
   4. Over excavate 12" and recompact native soil.
   5. The amended surface soil can be used for backfill around trees and shrubs; where additional quantities are required, use the following formula (thoroughly blended):
      a. Native On-Site Soil (No rock larger than 1") 6 parts
      b. Nitrolized Wood Shavings 4 parts
      c. Commercial Fertilizer Gro-Power Plus, 5-3-1 15 lbs/cy
      d. Iron Sulfate 2 lbs/cy
   6. For Acid Loving Plants
      a. 80% Course Peat Moss
      b. 20% Sponge Rock or Light Soil Mix

      (Mix to be used for bidding purposes only, to be verified with Agronomical Soils Test).
   7. After the water has completely drained, fertilizer tablets shall be placed as indicated below:
      a. 3 tablets per one gallon container.
      b. 6 tablets per five gallon container.
      c. 12 tablets per fifteen gallon container.
      d. 14 tablets per 24" box container.
      e. 18 tablets per 36" box container.

8. The remainder of the hole shall then be backfilled.
9. Set the tablets to be used with each plant on the top of the root ball while the plants are still in their containers so the required number of tablets to be used in each hole can be easily verified.
10. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be of a depth sufficient to hold at least two inches (2") of water. Basins shall be of a size suitable for the individual plant. In no case, shall the basin for a fifteen (15) gallon plant be less than four feet (4') in diameter; a five (5) gallon plant less than three feet (3') in diameter; and a one (1) gallon plant less than two feet (2') in diameter. the basins shall be constructed of amended backfill material. Rake out basins prior to planting lawn areas or groundcover areas.

H. Pruning: Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to compensate for loss of roots during transplanting, but never to exceed one-third (1/3) of the branching structure. Upon recommended approval of the Landscape Architect, pruning may be done before delivery of plants, but not before plants have been reviewed and recommended for approval. Cuts over three quarters of an inch (3/4") in diameter shall be painted with an approved tree wound paint.

I. Staking and Tying:
1. Support stakes tall enough to support the particular tree shall be driven thirty-six inches (36") into the soil outside of rootball. Stakes shall be placed on the leeward side of the tree from the most troublesome direction, refer to details on Drawings.
2. Ties shall be placed as low on the trunk as possible but high enough so the tree will return to upright after deflection.
3. To find the proper height for tie locations, hold the trunk in one hand, pull the top to one side and release. The height at which the trunk will just return to the upright when the top is released is the height at which to attach the ties.
4. Ties are to form a loose loop around the tree trunk so that the trunk cannot work towards the support stakes.
5. One tree of each size shall be staked and reviewed by the Landscape Architect prior to continued staking.

3.6 HYDROSEED TURF AND GROUND COVER INSTALLATION

A. Grade smooth all surfaces to be seeded. Soil surface shall be three-quarters inch (3/4") below adjacent pavement after settling. Roll lightly and fill in all soil depressions. All areas shall slope to drain. Remove all rocks one inch (1") or larger from the top two inches (2") of soil.

B. Soil shall be level, smooth and moist prior to hydroseeding.

C. The seed bed shall be reviewed by the Landscape Architect to determine its suitability prior to planting. The Contractor shall obtain such recommended approval prior to seeding grass. No seeding shall be performed until all other construction operations have been completed, except by authorization of the Landscape Architect.

D. Mixing of hydromulch slurry shall be performed in a tank with a built-in continuous agitation and recirculation system of sufficient operating capaCounty to produce a homogeneous slurry of mulch fiber, binding agent, fertilizer and water as specified in this Section 2.09, in the designated unit proportions:

1. Mulch Fiber	2,000 lbs. per acre
2. Seed Mix	As specified in this Section 2.09
3. Binding Agent	100 lbs. per acre
4. Fertilizer-Gro-Power Hi-Nitrogen	250 lbs. per acre
5. Water	3,000 gallons per acre

E. With agitation system operating at part speed, water shall be added to the tank, good recirculation shall be established. Materials shall be added in such a manner that they are uniformly blended into the following sequence.

F. When tank is 1/3 filled with water:
   1. Add binding agent, 1/2 acre requirement
   2. Add 3 - 50 lbs. bales of fiber
   3. Add seed, 1/2 acre requirement
   4. Add fertilizer, 1/2 acre requirement

G. When the tank is 1/2 filled with water:
   1. Agitate mixture at full speed.

H. Before tank is 3/4 filled with water:
   1. Add 7 - 50 lbs. bales of fiber.

I. As tank becomes filled with water:
   1. Add remaining requirements.

J. Slurry distribution should begin immediately.

K. Area to be hydroseeded shall be moistened to a depth of six inches (6") just prior to application.

L. Application: Hydromulched slurry shall be applied under high pressure, evenly and result in uniform coat on all areas to be treated. Care shall be exercised to assure that plants in place are not subjected to the indirect force of an application. Slurry shall be immediately removed from walks, structures, etc. that are inadvertently sprayed.

3.7 MECHANICAL STOLONIZING

A. Grade smooth all surfaces to be stolonized. Soil surface shall be three-quarter inch (3/4") below adjacent pavement after settling. Roll lightly and fill in all soil depressions. All areas shall slope to drain.

B. Soil shall be level, smooth and moist prior to stolonizing.

C. The lawn bed shall be reviewed by the Landscape Architect to determine its suitability, prior to planting. The Contractor shall obtain such recommended approval prior to stolonizing lawn. No stolonizing shall be performed until all other construction operations have been completed, except by authorization of the Landscape Architect.

D. Stolonizing shall be done by using a mechanical stolonizer to punch or push the full length stolons into the soil at the rate of four (4) bushels per one thousand square feet (1,000 sq. Ft.) Or one hundred seventy two (172) bushels of stolon per acre. "TIF Green" to be treated similar to hybrid Bermuda Grass. Stolon rate: Four (4) bushels per one thousand square feet (1,000 sq.ft.) or two hundred sixty-two (262) bushels per acre.

3.8 SODDED COOL SEASON / DROUGHT TOLERANT TURF

A. Turf grass shall be planted by sod laying, as indicated per plan. Turf sod shall be specified on planting plan and legend.

B. Sodding - irrigate areas to be sodded prior to installation. Moisture shall be uniformly present to a depth of 2". Sod shall be installed within one day of delivery, rolls shall be placed in shaded areas prior to installation. Sod shall conform to all lawn shapes as designated per plan and shall be installed in such a manner as to visually eliminate all joints and edges of sod strips. Following installation, irrigate turf areas thoroughly to provide even moisture penetration. Roll all sod prior to beginning installation within two (2) hours - prior to beginning irrigation, sod shall be uniformly smooth in appearance and shall be flush with the finished grade of all walks, curbs, etc.

C. Maintenance - three (3) weeks following installation of turfgrass, areas shall be mowed regularly at intervals not exceeding once per week. Mowing shall be done with sharp, well adjusted mowers or cut more than half the existing top growth in one mowing. Mowing heights shall be 2" to 2 1/2", during hot weather seasons never less than 2" and shall be 1 1/2" TO 2" during cool weather seasons. Turfgrass areas that do not properly grow shall be resodded as necessary. At the termination of the maintenance period all turfgrass areas shall be completely covered, leaving not barren spots larger than three inches (3") x three inches (3").

3.9 WATERING

A. Apply water to all planted areas during operations and thereafter, until acceptance of the work.

B. Immediately after planting, apply water to each shrub by means of a hose. Apply water in a moderate stream in the planting hole until the material about the roots are completely saturated from the bottom of the hole to the top of the ground.

C. Apply water in sufficient quantities and as often as seasonal conditions require to keep the planted areas sufficiently moist at all times, well below the root system of grass and plants.

D. All turf and groundcover areas shall be kept damp at all times and irrigation should be adjusted accordingly. This normally would involve four (4) to six (6) watering periods daily, each watering period (ON) regulated to just dampen the mulch without creating run off.

E. Intervals between irrigation (OFF) sequence should be judged by the length of the time mulch remain damp. Once the mulch begins to dry out, the water (ON) sequence should be repeated.

3.10 ESTABLISHMENT AND MAINTENANCE PERIOD

A. The Contractor shall continuously maintain all areas involved in this contract during the progress of the work and during the establishment and maintenance period until final acceptance of the work by the County.

1. Plant Establishment & Maintenance Period: The contractual Plant Establishment & Maintenance Period shall be no less than ninety (90) continuous calendar days and shall begin after the first mowing of the turf and the planted areas are brought to a neat, clean and weed free condition.
    a. Mowing of turf will commence when turf grass has reached a height of two inches (2"). The height of cut will be one and one-half inches to two inches (1-1/2" to 2"). Mowing will be at least weekly after the first cut. Turf must be well established and free of bare spots and weeds to the satisfaction of the Landscape Architect prior to final acceptance by the County. Excess grass clippings, as determined by the Landscape Architect, shall be picked up and removed from the site and premises.
    b. All areas shall be kept free of debris, and all planted areas shall be weeded at intervals of not more than ten (10) days. Watering, trimming, fertilization, spraying and pest control, as may be required, shall be included in the maintenance period. Maintenance shall include gopher control. In order to carry out the Plant Establishment & Maintenance Period work, the Contractor shall furnish sufficient men and adequate equipment to perform the work
    c. Grading and Drainage: During the Plant Establishment & Maintenance Period all flow lines shall be maintained to allow for free flow of surface water. Displaced material which interferes with drainage shall be removed and placed as directed. Low spots and pockets shall be graded to drain properly. Jute netting shall be installed at flow lines and other locations where erosion is evident, when directed by the Landscape Architect.

2. Damage to planting areas shall be repaired immediately and throughout the Plant Establishment Period. Depressions caused by vehicles, bicycles, or foot traffic shall be filled and leveled. Replant damaged areas.
    a. All paved areas shall be washed and maintained in a neat and clean condition at all times.
    b. All subsurface drains and inlets shall be periodically cleared of debris, leaves and trash and flushed with clear water to avoid build up of silt and debris.

c. Debris and trash shall be removed from the site daily.

3. Any day when the Contractor fails to adequately maintain plantings, replace unsuitable plants or do weed control or other work, as determined necessary by the Landscape Architect, will not be credited as one of the Plant Establishment & Maintenance Period days.

4. Post fertilize all turf areas at the end of every 30 days (of maintenance) at the rate of five pounds (5 lbs.) per one thousand square feet (1,000 s.f.) using ammonium sulfate, evenly applied and thoroughly watered in. Post fertilize all groundcover areas at the end of every thirty (30) days (of maintenance) at the rate of thirty pounds (30 lbs.) per one thousand square feet (1,000 s.f.), using 5-3-1 Gro-Power. For the final feeding of all areas, use 12-8-8 Gro-Power Controlled Release Nitrogen at the rate of thirty pounds (30 lbs.) per one thousand square feet (1,000 s.f.).

B. The Contractor shall maintain the irrigation systems in a like new operating condition; adjusting head heights and spray arcs as necessary. The Contractor is responsible for proper watering of all planting areas, for providing any necessary supplemental water as may be required, and shall replace any material damaged due to improper moisture.

C. During the Plant Establishment & Maintenance Period, the Contractor shall be responsible for maintaining adequate protection for all planting areas. Any damaged areas shall be repaired and any plant materials replaced at the Contractor's expense. Improper maintenance or possible poor condition of any planting at the termination of the Plant Establishment & Maintenance Period may cause postponement of the final acceptance. Contractor shall bear all costs for extension of the Plant Establishment & Maintenance Period.

D. The Plant Establishment & Maintenance Period will be extended past ninety (90) days if these provisions are not filled.

3.11 GUARANTEE AND REPLACEMENT

A. All plant material installed under the contract shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship for a period of one (1) year. Any plant found to be dead or in poor condition due to such faulty materials or workmanship, as determined by the Landscape Architect, shall be replaced by the Contractor at his expense.

B. All palms shall be guaranteed by the contractor for twenty-four (24) months after final acceptance of the project. Contractor liability shall cover cost of labor, equipment, and materials to replace trees of similar size during the covered period.

C. Any material found to be dead, missing, or in poor condition during the establishment period shall be replaced immediately. The Landscape Architect shall be the judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the contractor within fifteen (15) days of written notification by the County.

D. Replacement shall be made to the same specifications required for original plantings within five (5) working days after written notification.

E. Material and Labor involved in the replacing of material shall be supplied by the Landscape Contractor at no additional cost to the County.

3.12 REVIEWS

A. Normal progress reviews shall be requested from the Landscape Architect at least forty-eight (48) hours in advance of an anticipated inspection. A review will be made by the Landscape Architect on each of the steps listed below. The Contractor will not be permitted to initiate the succeeding steps of work until he has received written recommendation of approval to proceed by the Landscape Architect.

1. Immediately prior to the commencement of the work on this Section.
2. Spotting of all shrubs, trees and palms, and minor adjustments prior to planting.
3. Preparation of areas to groundcover and turf installation.

4. Final review, start of establishment & maintenance period.
5. After thirty (30) day plant establishment & maintenance.
6. Final acceptance of project/ninety (90) day maintenance.

3.13 PAYMENT TERMS

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

END OF SECTION

SECTION 330500
COMMON WORK RESULTS FOR UTILITIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Piping joining materials.
   2. Identification devices.
   3. Piping system common requirements.

1.3 DEFINITIONS

A. HDPE: High Density Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Identification devices.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

PART 2 PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

B. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Plastic-to-Metal Transition Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Spears Manufacturing Co.
   b. Or approved equal.
2. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

C. Plastic-to-Metal Transition Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Colonial Engineering, Inc.
   b. NIBCO INC.
   c. Spears Manufacturing Co.
   d. Or approved equal.

D. Description: MSS SP-107, PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

2.3 IDENTIFICATION DEVICES

A. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

B. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

C. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

D. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

E. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.

2. Color: Comply with ASME A13.1, unless otherwise indicated.

2.4 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post hardening, volume adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5,000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping at indicated slopes.

D. Install piping to permit valve servicing.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Select system components with pressure rating equal to or greater than system operating pressure.

H. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
      a. Steel Pipe Sleeves: For pipes smaller than 6".
      b. Steel Sheet Sleeves: For pipes 6" and larger, penetrating gypsum-board partitions.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

E. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

F. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
   1. Stenciled Markers: According to ASME A13.1.
   2. Locate pipe markers on exposed piping according to the following:
      a. Near each valve and control device.
      b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
      c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
      d. At manholes and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
   1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
   2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
   3. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.4 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Place grout, completely filling equipment bases. Avoid air entrapment during placement of grout.

E. Place grout on concrete bases and provide smooth bearing surface for equipment.

F. Place grout around anchors.

G. Cure placed grout.

END OF SECTION

SECTION 331100
WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Domestic water and fire suppression lines.
      a. Terminate within the building as indicated on the Drawings.

1.2 SUBMITTALS

A. Product Data: For each material specified.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Domestic Water Line: Provide piping manufactured from the following materials. Do not provide domestic water in materials outside of size limits specified:
   1. Cement Mortar Lined & Coated Steel Pipe (CML&C).
      a. Steel thickness shall be at least 12 ga. (0.1046").
      b. Steel thickness shall be determined from the pressures imposed (Class) and the design stress of the steel. Design stress is defined as one-half (1/2) of the allowable minimum yield stress of the steel.
      c. Cylinder shall conform to AWWA C-200.
      d. Cement mortar lining shall conform to AWWA C-205.
      e. Separate joint rings, if used, shall conform to Section 2.6, AWWA C-303.

B. Coatings
   1. Cement mortar lined steel pipe shall be cement mortar coated unless specified otherwise.
      a. Cement Mortar coating shall be a minimum of ¾" thick.
      b. Cement Mortar coating shall either be Type II or Type V cement, unless specifically stated on the plans.
      c. Cement Mortar coating shall be one type of cement; i.e., Type II & V shall not be mixed together.
      d. Cement Mortar coating shall meet or exceed AWWA C-205 requirements.
      e. Cement Mortar coating shall be of adequate thickness to provide required rigidity and corrosion protection.

C. Rubber Ring Gaskets
   1. Shore durometer hardness range shall be in the range of 50-55 in accordance with ASTM D-2240.
   2. Compound shall conform to the requirements of Section 2.8 AWWA C-303.

2.2 MATERIALS

A. Steel cylinder pipe shall be fabricated in accordance with AWWA C-200 for cement mortar lined steel pipe.

B. Cement mortar lining process shall be followed with sealing each pipe end with a waterproof cover prior to carefully moving the pipe section. The pipe sections shall be cured under sprinklers or by other processes approved by the Engineer.

C. Coatings shall be applied after the exterior of the pipe is thoroughly cleaned and free from all loose mill scale and rust.

1. Cement mortar coating shall be applied pneumatically or by impaction resulting in a dense uniform coating that adheres tightly to the pipe.

D. Joints

1. All pipes shall have rubber gasket joints unless otherwise shown.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before commencing pipe installation, field verify building tie-in locations/inverts, tap locations/inverts, and all utilities crossings. Notify owner's representative of any conflicts.

3.2 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions, local governing authorities/codes, and approved submittals and in proper relation with adjacent construction. Coordinate with work of other sections.

B. Excavate and backfill utility trenches as specified in Division 31 Section "Earth Moving" and the trench detail on the Drawings. Do not enclose, cover, or put into service any piping systems before inspection and approval is obtained. Verify minimum burial depths and separation requirements with the local frost depths, codes, and authorities. Minimum cover over top of pipes shall be 30-inches unless otherwise specified by authorities.

C. Internal bracing, in addition to the bracing used for handling and transportation of the pipe, shall be installed when required to ensure maximum permissible deflections are not exceeded during laying, backfill, and compaction.

D. Curing operations shall begin immediately after completion of joint mortaring.

E. Immediate backfill should follow the completion of the joint mortaring operation where possible. Care must be taken to immediately wet down and consolidate the backfill, to avoid draining the moisture from the mortar through porous diapers into dry backfill soil, or disturbing the mortar set by subsequent compaction of the backfill.

F. Completed-joint mortar to be exposed to the sunlight where backfill will not take place until after the mortar has hardened must be kept continually moist during the curing period to prevent cracking of the curing mortar.

G. Test for proper operation.

1. Test pipe work to pressure and leakage tests equal to the design working pressure of the pipe and maintain specified pressure for not less than two hours.
2. Leakage shall not exceed that permitted by AWWA Specification C600 for mechanical joint and push-on joint pipe.

3. Locate and repair leaks and repeat tests until test results are satisfactory and in compliance to this section.

H. Sterilizing: Clean and sterilize the system in accordance with local authority or to the requirements below.

1. After tests have been approved, and prior to placing the pipe lines in service, sterilize piping with a liquid chlorine or chlorine bearing compound similar to "HTH" which has a strength of not less than 50 ppm.
2. Inject chlorine or chlorine solution into the pipelines through corporation stops installed at proper locations in the pipe line, or by other approved means.
   a. Corporation stops will be left in place with the outlets plugged.
3. Do not, under any circumstances, open the sectionalizing valves between the existing mains and the new mains until the bacterial analysis of the mains involved has been approved by the applicable local and/or state authorities. Time of initial opening and final closing will be recorded and given daily to said authorities.

3.3 FIELD QUALITY CONTROL

A. Test new piping systems and parts of existing systems (that have been altered, extended, or repaired) for leaks and defects per pipe manufacturer's recommendations and requirements of local authorities having jurisdiction.

1. Do not enclose, cover, or put into service any piping systems before inspection and approval is obtained.
2. Replace any defective areas found during inspections and testing and repeat the process until results are acceptable.
3. Project Completion Reports: Provide copies of test reports to the Owner's Representative, for each system or line, witnessed by either local authorities having jurisdiction or the Owner's testing agency per the test requirements.

END OF SECTION

SECTION 333100
SANITARY SEWAGE SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary drainage piping, fittings and accessories.

B. Connection of building sanitary drainage system to site sewer systems.

C. Cleanout access.

1.2 REFERENCES

A. SSPWC - Standard Specifications for Public Works Construction, Current Edition.

B. ANSI / ASTM D3034 – Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

C. Eastern Municipal Water District Standard Specifications and Drawings.

1.3 REGULATORY REQUIREMENTS

A. Conform to Section 306, Standard Specifications for Public Works Construction, for materials and installation of Work of this Section.

1.4 SUBMITTALS

A. Shop drawings indicating dimensions, locations and elevations of manholes, cleanouts and sub-surface structures.

B. Product data for pipe and pipe accessories.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record location of pipe runs, connections, manholes, cleanouts and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.1 SEWER PIPE MATERIALS

A. PVC pipe ASTM D3034, SDR 35.

2.2 PIPE ACCESSORIES

A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.

1. Gaskets: ASTM F477, Elastomeric seals.

2.3 CLEANOUTS

A. Cleanouts: Cleanouts per Eastern Municipal Water District Standard Drawing SB-52 "Sewer Cleanouts Main Line & On-Site".

1. Valve Box:
   a. Valve box to be Brooks I-RT valve box marked "SEWER", or approved equal.
   b. Lid must be cast iron for locating purposes.
   c. Casting shall be Alhambra Foundry number A-1241 or approved equal.
2. Sewer Pipe Fitting and Riser to Cleanout:
   a. Cleanout pipe must be the same diameter and material as main line sewer.
   b. Plug shall be threaded cap with square nut.
   c. Plug shall be cemented in place with cement mortar or shall be neoprene plug or approved equal.

2.4 MANHOLES

A. Standard Precast Concrete Manholes per Eastern Municipal Water District Standard Drawing SB-53 "Precast Reinforced Concrete Standard 48" & 60" I.D. Manhole".

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints and designed for ASSHO H-20 loading.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 9-inch minimum thickness for floor slab and 4-1/8 inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 5-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: 3/8" thick cement mortar joint neatly struck & pointed, or preformed cold-applied ready-to-use plastic joint sealing compound and primer.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP; 13" minimum width (wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step). Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Manhole Frame and Covers: Manhole frame and cover per Eastern Municipal Water District Standard Drawing SB-8 "Locking Type Manhole Cover and Frame."
2. Description: Manhole cover shall be Alhambra Foundry Co. Type A-1175 for 22-3/4" dia. (Catalog 17-Mar. '65) or approved equal. Include indented top design with lettering cast into cover, using wording equivalent to "E.M.W.D. SEWER" in 1-1/2" letters in 6" x 9" box.
3. Material: Cast iron manhole cover shall be designed for AASHO H-20 loading and shall have minimum tensile strength of 30,000 lb. per sq. in.

PART 3 EXECUTION

3.1 EXAMINATION

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

B. Beginning of installation means acceptance of existing conditions.

C. Verify that existing invert elevations on site will allow proper tie in to new work with proper positive slope. Ascertain accuracy prior to trenching and installation of sanitary sewer system.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with approved fill material.

B. Remove large stones or other hard matter that could damage sewer pipe or impede consistent backfilling or compaction.

3.3 INSTALLATION - PIPE

A. Prior to commencing any Work, Contractor shall pothole existing utilities at points of connection. Notify Architect in event of discrepancies prior to installation of any pipe.

B. Install pipe, fittings and accessories in accordance with Section 306, SSPWC and manufacturer's instructions. Seal joints watertight.

C. Place pipe on bedding as specified in Section 312317.

D. Lay pipe to slope gradient noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.

E. Do not displace or damage pipe when compacting.

F. Connect to site sewer outlet system through installed sleeves.

G. Do not cover joints until lines have been tested and approved.

3.4 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Establish elevations and pipe inverts.

C. Mount lid and frame level in grout secured to top cone section to elevation indicated.

3.5 PROTECTION

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

END OF SECTION

SECTION 334100
STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe and fittings.
   2. Manholes.
   3. Catch basins.
   4. Channel drainage systems.

1.2 SUBMITTALS

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

B. Shop Drawings:
   1. Manholes, Catch basins and Channel Drainage Systems. Include plans, elevations, sections, details, frames, covers, and grates.

C. Field quality-control reports.

1.3 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Riverside County Regional Medical Center or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Corrugated High-density Polyethylene (HDPE): AASHTO M 924, type S with smooth interior.
   1. Corrugated HDPE Pipe and Fittings 18" to 48": AASHTO M 294M, Type S, with smooth waterway for coupling joints.

2.2 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.3 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Diameter: 48 inches minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
   4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
   6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
   7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
   8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
   9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
   10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:
   1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM DRAIN."
   2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.4 CATCH BASINS

A. Catch Basins: Curb inlets per Riverside County Flood Control and Water Conservation District.
   1. Catch Basin No. 1 per Riverside County Flood Control and Water Conservation District Standard Drawing number CB100.
   2. Catch Basin No. 4 per Riverside County Flood Control and Water Conservation District Standard Drawing number CB101.
   3. Catch Basin No. 6 per Riverside County Flood Control and Water Conservation District Standard Drawing number CB102

B. Frames and Grates: traffic rated or better.

2.5 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

A. General Requirements for Polymer-Concrete, Channel Drainage Systems: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include quantity of units required to form total lengths indicated.

B. 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:

C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. ABT, Inc.
   2. ACO USA.
   3. Innovative Plastic, Inc.; a subsidiary of T-H Marine Supplies, Inc.

4. Mea-Josam Div.; Josam Company.
5. Poly-Cast.
6. Or approved equal.

D. Sloped-Invert, Polymer-Concrete Systems:
   1. Channel Sections:
      a. Interlocking-joint, precast, modular units with end caps.
      b. 4-inch inside width and deep, rounded bottom, with built-in invert slope of 0.6 percent and with outlets in quantities, sizes, and locations indicated.
      c. Extension sections necessary for required depth.
      d. Frame: Include gray-iron or steel frame for grate.
   2. Grates:
      a. Manufacturer's designation "Heavy Duty," with slots or perforations that fit recesses in channels.
      b. Material: Ductile or Gray iron.
   3. Covers: Solid gray iron if indicated.
   4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

E. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.

F. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

PART 3 EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 HDPE PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. Install gravity-flow, non-pressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install piping 6" and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
   3. Install piping with 36-inch minimum cover.
   4. Install HDPE corrugated sewer piping according to ASTM D 2321.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure drainage piping according to the following:
   1. Join corrugated HDPE piping according to ASTM D 3212 for push-on joints.

3.4 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.5 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.6 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

F. Embed channel sections in 4-inch minimum concrete around bottom and sides.

3.7 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.8 CONNECTIONS

B. Connect non-pressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

C. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3,000 psi.
2. Make branch connections from side into existing piping, 4" to 18". Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3,000 psi.
3. Make branch connections from side into existing piping, 21" or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

a. Use concrete that will attain a minimum 28-day compressive strength of 3,000 psi unless otherwise indicated.
b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.9 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
   b. Option: Test plastic piping according to ASTM F 1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 334600
SUBDRAINAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Perforated-wall pipe and fittings.
   2. Geotextile filter fabrics.

1.2 SUBMITTALS

A. Product Data: For geotextile filter fabrics.

PART 2 PRODUCTS

2.1 PERFORATED-WALL PIPES AND FITTINGS

A. Perforated Poly Vinyl Chloride (PVC) Pipe and Fittings: ASTM D1785 and D2665.

2.2 SOIL MATERIALS

A. Soil materials are specified in Division 31 Section "Earth Moving."

2.3 WATERPROOFING

A. Material: Dehydratine #4 bitumastic compound or approved equal.

2.4 GEOTEXTILE FILTER FABRIC

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.

B. Structure Type: Nonwoven, needle-punched continuous filament.
   1. Survivability: AASHTO M 288 Class 2.
   2. Styles: Flat and sock.

PART 3 EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 FOUNDATION DRAINAGE INSTALLATION

A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for foundation subdrainage.

F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.

H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

I. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

J. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.3 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.

1. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping level and with a minimum cover of 36 inches unless otherwise indicated.
2. Lay perforated pipe with perforations down.
3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

3.4 PIPE JOINT CONSTRUCTION

A. Join perforated PE pipe and fittings with couplings according to ASTM D 3212 with loose banded, coupled, or push-on joints.

B. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.5 CONNECTIONS

A. Comply with requirements for piping specified in Division 33 Section "Storm Utility Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where required, connect low elevations of foundation subdrainage to stormwater sump pumps. Comply with requirements for sump pumps specified in Division 22 Section "Sump Pumps."

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.7 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION