SECTION 323119 - DECORATIVE METAL FENCES AND GATES

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.

B. Soil and Groundwater Management Plan

1. PRIOR TO ANY AND ALL CONSTRUCTION ACTIVITIES, THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IF LOCATION OF CONSTRUCTION ACTIVITIES ARE SUBJECT TO ENVIRONMENTAL LAND USE CONTROLS (LUC). ANY AND ALL ENCOUNTERED CONTAMINATED SOIL AND OR GROUNDWATER SHALL BE HANDLED PER THE “SOIL AND GROUND WATER MANAGEMENT PLAN”, DATED FEBRUARY 13, 2015 INCLUDED IN THE PROJECT MANUAL. CONTRACTOR SHALL VERIFY THAT LUC CONSTRUCTION PERMIT HAS BEEN FILED AND APPROVED FOR THIS WORK.”

1.2 SUMMARY

A. Section Includes:

1. Decorative aluminum fences.
2. Swing gates.

B. Related Requirements:

1. Section 321313 "Concrete Paving” for concrete post concrete fill.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each fence material and for each color specified.

1. Provide Samples 12 inches (300 mm) in length for linear materials.
2. Provide Samples 12 inches (300 mm) square for bar grating and sheet or plate materials.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Include 10-foot (3-m) length of fence complying with requirements.

PART 2 - PRODUCTS

2.1 DECORATIVE ALUMINUM FENCES

A. Decorative Aluminum Fences: Fences made from aluminum extrusions.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Alumi-Guard, Inc.
b. Ameristar Fence Products.
c. Carfaro, Inc.
d. Delair Group, L.L.C.
e. East & West Alum Craft Ltd.
f. Elegant Aluminum Products, Inc.
g. Elite Fence Products, Inc.
h. Ideal Aluminum Products.
i. Iron Eagle Industries, Inc.
j. Japra Group International.
k. Jerith Manufacturing Company, Inc.
l. Master Halco.
m. Merchants Metals.
n. Royal Aluminum and Steel, Inc.
o. Specrail.
p. Superior Aluminum Products, Inc.
q. Tek-Rail.
r. Ultra Aluminum Mfg., Inc.
s. Virginia Railing and Gates, LLC.

B. Posts: Square extruded tubes.

1. Line Posts: 4 by 4 inches (101.6 by 101.6 mm) with 0.125 inch (3.18-mm) wall thickness.
2. End and Corner Posts: 4 by 4 inches (101.6 by 101.6 mm) with 0.125 inch (3.18-mm) wall thickness.
3. Swing Gate Posts: 4 by 4 inches (101.6 by 101.6 mm) with 0.250 inch (6.35-mm) wall thickness.
4. Horizontal-Slide Gate Post, Openings up to 12 Feet (3.7 m): 4 by 4 inches (101.6 by 101.6 mm) with 0.250 inch (6.35-mm) wall thickness.
5. Horizontal-Slide Gate Post, Openings Wider Than 12 Feet (3.7 m): 12 by 12 inches (304.8 by 304.8 mm) with 0.250 inch (6.35-mm) wall thickness.
6. Guide Posts for Class 1 Horizontal-Slide Gates: 3 by 3 inches (76 by 76 mm) with 0.125-inch (3.18-mm) wall thickness; installed adjacent to gate post to permit gate to slide in space between.

C. Post Caps: Aluminum castings that cover entire top of posts.

D. Rails: Extruded-aluminum channels, 1-1/4 by 1-1/4 inches (32 by 32 mm), with 0.078-inch- (1.98-mm-) thick sidewalls and 0.062-inch- (1.57-mm-) thick top.

E. Pickets: Extruded-aluminum tubes, 1 inch (25 mm) square, with 0.062-inch (1.57-mm) wall thickness.

1. Terminate tops of pickets at top rail for flush top appearance.
2. Picket Spacing: 4 inches (101.6 mm), maximum. A 4 inch (101.6 mm) diameter ball shall not fit between pickets.

F. Fasteners: Manufacturer's standard tamperproof, corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers.

G. Fabrication: Assemble fences into sections by welding pickets to rails.

1. Fabricate sections with clips welded to rails for field fastening to posts.
2. Drill clips for fasteners before finishing.

H. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

I. Finish: Baked enamel or powder coating.

2.2 SWING GATES

A. Gate Configuration: As indicated.

B. Gate Frame Height: As indicated.

C. Gate Opening Width: As indicated.

D. Automated vehicular gates shall comply with ASTM F 2200, Class II.

E. Frame Corner Construction: Welded and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.

F. Additional Rails: Provide as indicated, complying with requirements for fence rails.

G. Infill: Comply with requirements for adjacent fence.

H. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.

1. Treillage: Provide iron castings of pattern indicated between each pair of pickets. Finish as specified for gates.

I. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet (1.52 m) wide. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

J. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.

1. Function: 39 - Full surface, triple weight, antifriction bearing.
2. Material: Wrought steel, forged steel, cast steel, or malleable iron; galvanized.

K. Rim Locks: BHMA A156.5, Grade 1, suitable for exterior use.

1. Function: 626 - Interlocking deadbolt operated by key from either side
2. Material: Cast, forged, or extruded brass or bronze.
3. Mounting Plate: Configuration necessary for mounting locks. Fabricate from 1/8-inch- (3.2-mm-) thick, aluminum plate.

L. Mortise Locks: BHMA A156.13, Grade 1, suitable for exterior use.

1. Function: F16 - Double-cylinder deadlock or F17 - Deadlock.
2. Material: Brass or bronze.
3. Levers: Cast, forged, or extruded brass or bronze.
4. Mounting Box: Configuration necessary to enclose locks. Fabricate from 1/8-inch- (3.2-mm-) thick, aluminum plate.

M. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 3/4-inch- (19-mm-) diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in closed position.

N. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

O. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.

P. Aluminum Finish: Baked enamel or powder coating.

2.3 HORIZONTAL-SLIDE GATES

A. Gate Configuration: Double leaf.

1. Type: Overhead slide.
2. Type: Cantilever slide, with internal roller assemblies.

B. Gate Frame Height: 72 inches (1830 mm).

C. Gate Opening Width: As indicated.

D. Automated vehicular gates shall comply with ASTM F 2200, Class II.

E. Aluminum Frames and Bracing: Fabricate members from square tubing.

1. Frame Members: Extruded-aluminum 2-1/2 by 2-1/2 inches (64 by 64 mm) with 0.154-inch (3.91-mm) wall thickness.
2. Bracing Members: Extruded-aluminum tubes 1-1/2 by 1-1/2 inches (38 by 38 mm) with 0.154-inch (3.91-mm) wall thickness.

F. Frame Corner Construction:

1. Welded frame with panels assembled with bolted or riveted corner fittings and 5/16-inch-(7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
2. Overhead Slide Gates: Welded or assembled with corner fittings including 5/16-inch-(7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.

G. Additional Rails: Provide as indicated, complying with requirements for fence rails.

H. Infill: Comply with requirements for adjacent fence.

I. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.

J. Hardware: Latches permitting operation from both sides of gate, locking devices and roller assemblies and stops fabricated from mill-finished, Grade 319 aluminum-alloy casting with stainless-steel fasteners. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

K. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.

L. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.

M. Aluminum Finish: Baked enamel or powder coating.

2.4 ALUMINUM

A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.

B. Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

C. Tubing: ASTM B 429/B 429M, Alloy 6063-T6.

D. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

E. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.

F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.

B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size.

C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.

2.6 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: Black to match existing fencing at rear of amphitheater

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

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

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

1. Construction layout and field engineering are specified in Section 017300 "Execution."

3.3 DECORATIVE FENCE INSTALLATION

A. Install fences by setting posts as indicated and fastening rails and infill panels to posts. Peen threads of bolts after assembly to prevent removal.

B. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches (600 mm) plus 3 inches (75 mm) for each foot (300 mm) or fraction of a foot (300 mm) that fence height exceeds 4 feet (1.2 m).

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Concealed Concrete: Top 12 inches (304.8 mm) below grade as indicated on Drawings to allow covering with surface material. Slope top surface of concrete to drain water away from post.

3. Posts Set in Concrete: Extend post to within 6 inches (150 mm) of specified excavation depth, but not closer than 3 inches (75 mm) to bottom of concrete.
4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch (20 mm) larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.

   a. Extend posts at least 5 inches (125 mm) into sleeve.
   b. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.

5. Posts Set into Voids in Concrete: Form or core drill holes not less than 3/4 inch (20 mm) larger than outside diagonal dimension of post.

   a. Extend posts at least 5 inches (125 mm) into concrete.
   b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.

6. Space posts uniformly at 8 feet (2.44 m) o.c.

3.4 GATE INSTALLATION

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

3.5 ADJUSTING

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

END OF SECTION 323119

SECTION 328400 - IRRIGATION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, and equipment necessary to perform the irrigation work, complete, as indicated on the Drawings and as specified.

B. The completed and proper construction of the landscape irrigation system including, but not limited to:

1. All piping, including: mains, laterals, fittings, connections, tees, risers, clamps, and swing joints.
2. All control, gate, globe, pressure reducing, quick coupling and other valves including: valve boxes, markers, connections, operators and other accessories.
3. Complete automatic control system as shown on plans: including controllers, control wiring connections and electrical supply.
4. All rotating and stationary sprinkler heads including: proper nozzles as called for herein and shown on the plans and all other appurtenances and accessories for proper operations.
5. Connections of piping to the supply sources as shown on the plans.
6. All excavation, site-work, relocation or replacement of utilities, backfill and restoration of all disturbed areas.
7. Provide complete and operable system for the irrigation of all areas to be landscaped on the project site. The plans and these specifications are intended to include all items obviously necessary and requisite for the proper irrigation of the project. This in no way relieves the Contractor of his responsibility to furnish any additional labor, materials and equipment required for a proper system.
8. Adjust head location, type and size, and any other system components to comply with the requirements of landscaping as actually installed.
9. Supply, deliver, store, and protect all equipment and materials including pipe and fittings, sprinkler heads, valves, controllers, wire, and all other component parts necessary for the installation of a fully automatic irrigation system as indicated in the plans and specifications.
10. Provide adequate security of materials on site.

1.02 QUALITY ASSURANCE

A. All applicable ANSI, AWWA, and ASTM Standards and Specifications, and all applicable building codes and other public agencies having jurisdiction upon the work.

B. The Contractor shall be responsible for constructing the system in complete accordance with all local codes, ordinances and laws. Any modification made to conform to said codes, laws, and ordinances shall be completed at the Contractor's expenses with no additional compensation allowed.

C. Protection of Existing Plants and Site Conditions: The Contractor shall take necessary precautions to protect site conditions to remain. Should damages be incurred, this Contractor shall repair the damage to its original condition at his own expense.

D. Permits and Fees: Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspection required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to Landscape Architect to show that all work has been installed in accordance with the ordinances and code requirements.

E. The Contractor shall provide full coverage in all irrigated areas and shall be responsible for additional heads and components as required, installed at his own cost.

F. Workmanship: All work shall be installed by skilled personnel, proficient in the trades required, in a neat, orderly, and responsible manner with recognized standards of workmanship. The Contractor shall have had considerable experience and demonstrated ability in the installation of sprinkler irrigation systems of this type.

G. Work shall be guaranteed for one year from date of acceptance against all defects in material, equipment and workmanship. Repairs if required shall be done promptly.

1.03 SUBMITTALS

A. Submit Shop Drawings of irrigation system equipment indicating details of construction including fitting and materials. Where appropriate, and when approved by the Landscape Architect, manufacturer's product data may be substituted for shop drawings.

B. Provide manufacturer's warranties as applicable.

C. After completion of installation, furnish complete as-built reproducibles showing locations of all sprinkler heads, valves, drains, and piping to scale, with dimensions where required or necessary, to show vertical and horizontal deviations from the bid documents made during construction affecting but not limited to the mainline pipe, controller locations, remote control valves, quick-coupling valves and all sprinkler heads. The Drawings shall also indicate and show approved substitutions of size, material and manufacturer's name and catalog number. All piping shall be dimensioned and drawn to scale. Remote control valves and isolation valves shall have two (2) measurements from fixed objects. Provide two copies of the drawings.

PART 2 - PRODUCTS

2.01 PVC PIPING

A. Polyvinyl Chloride (PVC) plastic pipe shall be virgin, high impact, and shall be continuously and permanently marked with the following information: Manufacturer's name, pipe size, schedule or type of pipe and material. Pipe shall conform to U.S. Department of Commerce Commercial Standard CS 207-60 or latest revision.

B. Main lines, sleeves, laterals, risers and suction line shall be SCH 40 PVC conforming to ASTM D, 1785.

2.02 GALVANIZED PIPE

A. Pipe installed above grade for the backflow shall be galvanized painted steel conforming to ASTM A.120 Schedule 40.

2.03 FITTINGS

A. PVC fittings shall be SCH 40, Type 1, and must be of domestic manufacture. Fittings shall be identified according to pressure rating or schedule.

B. Galvanized fittings shall be malleable iron screwed fittings conforming to ANSI B. 16.3.

2.04 SWING JOINTS AND RISERS

A. Shrub heads shall be installed on 1/2" SCH 40 PVC Risers which shall be painted black.

B. Pop-up spray heads and smaller rotor heads shall be installed on flexible swing joints consisting of Toro thick-walled poly pipe and appropriate insert elbows.

C. Pop-up rotor heads used in non-athletic fields shall be installed on flexible swing joints consisting of Toro thick-walled poly pipe and appropriate insert elbows.

2.05 SPRINKLER HEADS

A. All sprinkler heads shall be as manufactured by Rainbird, Inc. or approved equal. The manufacturer shall guarantee all sprinklers and components for not less than one (1) year from installation, warranted against all defects in normal material and workmanship.

B. Pop-up Spray Heads shall be of the fixed spray type designed for in ground installation. The sprinkler shall be capable of covering up to a fifteen-foot radius at 25 P.S.I.

1. The nozzle shall be comprised of one orifice at two radius ranges and shall be adjustable from full on to full off. The nozzle shall elevate four or twelve inches when in operation. Retraction shall be achieved by a heavy-duty stainless steel spring. The nozzle position shall have a smooth external surface operation in a smooth resilient guide. A riser wiper shall be included in the sprinkler for continuous operation under the pressure of sand and other foreign material. The nozzle shall have the pressure regulation and zero flow features.
2. Coverage shall be either full or part circle. The part circle coverage shall be available in areas of 90, 120, 180, 240, and 270 degrees. Also included shall be special configurations. Nozzle delivery shall be such as to allow part circle patterns to match full circle patterns in participation rates.
3. The body of the sprinkler shall be constructed of non-corrosive heavy duty Cycolac. A filter screen shall be in the nozzle piston. All sprinkler parts shall be removable through the top of the unit by removal of a threaded cap.

C. Shrub Spray Heads shall be of the fixed spray type designed for in ground installation. The sprinkler shall be capable of covering up to a fifteen-foot radius at 25 P.S.I.

1. The nozzles shall be of the spray type for use on slopes, adjustable by means of a stainless steel screw. Nozzle delivery at maximum flow shall be such as to allow part circle patterns to be compatible in precipitation rates with full circle nozzles. The nozzle shall have the pressure regulation and zero flow features.
2. The body of the sprinkler shall be constructed of non-corrosive heavy duty Cycolac. A 2" long cone strainer shall be a separate part from the nozzle assembly to allow for easy flushing of the sprinkler. Maximum working pressure at the base of the sprinkler shall be 50 P.S.I. The sprinkler base shall have 1/2" I.P.S. female threads and shall be approximately 1-1/4" high.

D. Pop-Up Rotary Heads

1. The full and/or part circle sprinklers shall be gear type rotary. Part circle shall be adjustable from a 45 degree to a 315 degree arc shape. The sprinklers shall be capable of covering 43 foot radius at 35 pounds per square inch pressure with a discharge rate of 3 gallons per minute. Radius reductions shall be adjustable by 25%, by means of a radius adjustment screw accessible from the top of the cap when the sprinkler is properly installed. Water distribution shall be via one (1) nozzle mounted in a 1 3/8" diameter nozzle turret. The nozzle shall elevate 2" when in operation.
2. Retraction shall be achieved by a heavy-duty stainless steel retraction spring. The sprinkler shall have a riser seal and a wiper which permits limited flushing on down stroke to clear away debris from the riser. Rotation shall be accomplished by a sealed, oil packed assembly isolated from the water supply.
3. The body of the sprinkler shall be constructed of non-corrosive heavy duty Cycolac. The sprinkler shall be equipped with a filter screen, and all parts shall be removable through the top of the sprinkler case.

2.06 PLASTIC ELECTRIC VALVES

A. Series and manufacturer

1. RainBird manufacturer
2. PGA Series Plastic Valve

B. Electrically activated remote control valve (size as required) shall be constructed with stainless steel trim, normally close with manual bled plug and manual control (cross handle on 1-1/2" and 2" models; screw driver adjustment on 1" model). Solenoid shall be 3.5 watt, 24 volt A.C. with waterproof molded coil and removable from valve without running coil and twisting wire. Diaphragm shall be of rubber material. Tir-Act solenoid porting shall prevent a continuous flow of water through the ports during operation. Inlet port to solenoid shall be filtered with self-flushing stainless steel screen, removable from outside of valve body for maintenance. All parts shall be serviceable without removing valve from the line. Valve shall have no external plumbing or tubing that can be installed at any angle without affecting valve operation. Some valves shall have pressure regulation feature.

2.07 VALVE BOXES

A. Valve boxes for electric and manual valves shall be Carson plastic boxes or approved equal. The valve box shall be large enough to provide at least 2" of clearance around all valve parts. The

word "irrigation" shall be imprinted in the valve box cover. Each valve box shall have a cover with an anti-theft mechanism.

B. Valve boxes shall be installed flush with the finished grade as detailed on the drawings. Contractor shall assure percolation beneath the valve box by appropriate means. At least one cubic foot of porous material shall be installed per valve box to promote drainage.

2.08 ELECTRIC CONTROLLER

A. A new Rainbird ESP-LXME 24 Station Modular Controller shall be installed.

2.09 IRRIGATION CONTROL WIRE

A. All electrical control and ground wire shall be irrigation control cable. All wiring to be used for connecting the automatic remote control valves to the automatic independent station controllers shall be Type "UF," 600_volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder cable.

B. Insulation shall be 4/64" thick minimum covering of an approved thermoplastic compound for positive waterproof protection of sizes AWG 18 through and including 10. AWG size 8 through 00 shall be insulated with 5/64" of the approved thermoplastic compound.

C. Verification of wire types and installation procedures shall be checked with and made to conform to local codes. Wires shall be color coded and have different color or stripes for each zone control wire between controller and valve.

2.10 GATE VALVES

A. Gate valves shall be 150 Lb. Brass with non-rising stem, and shall be manufactured by Crane or approved equal.

2.11 PAINT

A. Exterior alkyd enamel, flat black or approved equal shall be use on all above ground PVC risers and other designated irrigation equipment. Contractor shall provide paint sample to Landscape Architect for approval prior to execution of painting.

2.12 WATER CONSERVATION EQUIPMENT

A. Rain sensors. Rain sensors shall be UL listed, 125 VAC, 4AMP rated, which interrupts the common wire to the controller by sensing a preset amount of rainfall. Rain Check□ by Rainbird, or approved equal.

2.11 WATER SOURCE

A. The proposed irrigation zones shall be connected to a new meter from the municipal water supply. See plans and details for more information.

PART 3 - EXECUTION

3.01 PREPERATION

A. Layout of Mains and Laterals: Layout sprinkler main lines and perform line adjustments and site modification to lateral prior to excavation.

B. Layout of Sprinkler Heads: Stake sprinkler head locations and check for uniformity of coverage and correctness of pattern.

C. Valve Location: Locate valves to assure ease of access for maintenance and that no physical interference with other elements of the project exist. Align valves parallel to each other in manifold systems.

D. Furnish temporary support, adequate protection and maintenance of all underground and surface utilities, structures, drains, sewers, and other obstructions encountered in the progress of the work.

E. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduit, ducts, pipe branch connections to sewer mains, main drains, water services, etc., the obstruction shall be permanently supported, relocated, removed, or reconstructed by the Contractor in cooperation with the owner of such utility.

1. No deviation from the required line or grade shall be made without the written direction of the Owner.

3.02 PIPE INSTALLATION

A. The Contractor shall stake out the location of each run of pipe, sprinkler heads, and valves prior to trenching. Contractor shall refer and comply to the Trench Safety Act in General Conditions, prior to any excavation.

B. Excavation shall be unclassified and shall include all materials whatsoever encountered in the excavation of trenches for pipe installation. The trench shall be of sufficient width and depth for installation of the pipe as indicated herein. The Contractor shall cause minimum disturbance to all existing conditions wherever possible; the Contractor shall bore under existing pavement and sidewalks rather than cut and restore. No pavement shall be cut without the Landscape Architect’s permission.

C. Pipe shall be delivered and stored on the job site with suitable protection against any damage to pipe and fittings.

D. Trenches shall be made wide enough to allow a minimum of 6 inches between parallel pipe lines. Parallel lines shall not be installed directly over one another. No lateral line shall be installed directly over another. No lateral line shall be installed in the main line trench. Trenches for pipe lines shall be made of sufficient depths to provide the minimum cover from finish grade as follows:

1. 24 in. minimum cover over main lines and laterals routed under pavement.
2. 18 in. Minimum cover over main lines and 12" minimum cover over laterals

3. 15 in. minimum cover over control wires from controllers to valves
4. 24 in. minimum cover for pipe under vehicular use areas or roads
5. Allow for sufficient width of excavating and working in trenches made in soft soil.

E. The pipe and fittings shall be carefully inspected before installation of the trench. All rocks over 1 in. diameter and unsuitable bearing materials shall be removed from trench in strict accordance with the manufacturer's recommendations.

1. Solvent welded joints shall be made only on clean, dry, square cut, smooth pipe sections. Fittings shall be "dry" tested for proper size before solvent is applied. The assembly shall proceed in strict accordance with recommended procedures furnished by the manufacturer.
2. Solvent welded pipe sections shall be "snaked" from side to side in the trench to prevent joint rupture due to thermal contraction.
3. Pipe openings shall be plugged during construction to prevent entrance of foreign materials

F. Place pipe to be installed under roadways, sidewalks, walls, stairs or other hardscape areas, in SCH 40 PVC sleeve which had an inside diameter of not less than one inch larger than the outside of the pipe or the combined outside diameter of pipes installed. All sleeves shall be buried a minimum of 24" beneath all hard surfaces and extend a minimum of 24" beyond hard surface areas. Run irrigation piping and electrical conduit sleeves in same trench with a minimum of 6" separation. Irrigation Contractor shall coordinate with General Contractor so that installation of sleeves precedes hard surface installation.

G. Backfill shall be carefully placed to avoid pipe dislocation. Backfill material shall be free of rocks, stumps, roots and other unsuitable material. In planting areas, the top 6 in. shall be suitable planting soil. If existing fill is not suitable contractor shall use clean sand. Backfill shall be placed in 6 in. lifts and shall be thoroughly compacted, except in planting area where planting soil is used. Backfill under pavement or sidewalks shall be compacted to 98% of maximum AASHTO T 180 density. The surface of backfilled trenches shall be even with the surrounding ground surface.

3.03 SPRINKLER HEAD INSTALLATION

A. Contractor shall be responsible for the exact location of all sprinkler heads, acknowledging that the plans are schematic in nature. The Contractor shall accordingly place all sprinkler heads, adjust all nozzles, spray patterns, and make whatever other adjustments that may be required to give the landscaped areas full, complete, and proper coverage and distributions, and to meet all manufacturer's requirements. The Contractor shall make all such adjustments and additions solely at his/hers expense.

B. Shrub spray sprinklers shall be installed on SCH 40 PVC risers as shown in the detailed drawings. Each sprinkler shall be installed within plant masses to be concealed from view. Shrub sprinklers shall be installed 12" away from adjacent curbs, sidewalks, fences, buildings, or edge of paving for protection.

C. Pop-up sprinklers shall be installed on swing joints as shown in detailed drawings. Each sprinkler head shall be installed so that the top is slightly above the finish grade level. Backfill around swing joints and sprinklers shall be clean and free of large rocks, root or foreign debris. If

existing fill is not suitable contractor shall use clean sand. Sprinkler elevations shall be properly maintained to eliminate the chance of injury to the public.

D. Pop-up spray sprinklers located adjacent curbs sidewalks, fences, buildings or edges of paving shall be installed 6 in. from back of curb, sidewalk, buildings or paving. Pop-up rotary sprinklers shall be adjacent to curbs, sidewalks, or edge of parking shall be installed 12 in. from back of curb, sidewalk or pavement.

E. All sprinklers shall be adjusted to eliminate overthrow onto impervious surfaces

3.04 CONTROLLER

A. Contractor shall coordinate final location of controller with Landscape Architect and Maintenance staff. Install per manufacturer's instructions. Controller shall be able to be located outdoors in a lockable cabinet.

3.05 CONTROL WIRE INSTALLATION

A. Install control wires at least 15 in. below finish grade and lay to the side of the main line. Provide a minimum of 24 in. of looped wire slack at valves and snake wires in trench to allow for contraction of wires. Tie color-coded wires in bundles at 10 ft. intervals.

B. All underground splices shall be made at electric valves in valve boxes. Solder splices and coat with elastomeric waterproof cement. Wrap with electrical tape and coat again with elastomeric waterproof cement.

C. All wire passing under existing or future paving or construction shall be encased in SCH 40 PVC conduit extending at least 24 in. beyond the edges of paving and stabilized for construction. Any wire in plant beds shall be installed in 3/4" Class 160 PVC. 18" min. burial. Installation procedures must conform to local codes.

D. Wire shall be color coded to facilitate troubleshooting.

3.06 AUTOMATIC VALVES

A. All automatic valves shall be installed in a valve box and shall be arranged for easy adjustment and removal. A union shall be installed on the downstream side. Valve boxes shall be installed flush with grade and shall contain a minimum of ten inches of coarse gravel under the valve itself. Contractor shall insure percolation through the box. Valves with pressure regulating feature shall be set at pressured indicated on the drawing.

3.07 WATER METER

A. The location of the proposed water meter shall be verified on site.

3.08 GATE VALVES

A. Gate valves shall be installed in accordance with local codes and arranged in valve box for easy adjustment and removal.

3.09 VALVE BOXES

A. Valve boxes shall be installed so the top of the box is at finished grade and parallel to adjacent boxes, curbs and walks.

B. Proper drainage material shall be provided for each box.

3.10 TESTING AND INSPECTION

A. The Contractor shall notify Landscape Architect and Owner 72 hrs. in advance of testing.

B. Cleaning and pressure testing: Flush irrigation system with water to clear lines of foreign materials after system assembly is complete and prior to installation of sprinkler heads. Cap and plug outlets and fill lines with water. Pressurize assembly to 100 P.S.I. and shut off pump. System shall hold at 100 P.S.I. for one hour at no loss of pressure. Joints, tees, elbows, caps and connections shall be left uncovered during this test. Main line sections of solid unbroken pipe should be buried at intervals adequate to secure stabilization of pipe runs when pressurized. If necessary, repair leaks and retest assembly until satisfactory. Install sprinkler heads after approval of test results.

C. Final inspection shall be made when the complete system is in place, operable, and all repairs, additions, adjustments, and other work is complete. At such time, the Contractor shall adequately demonstrate the proper operation of the system, shall show the system's complete conformance with the plans and specifications, and demonstrate that the irrigation system gives proper and adequate coverage of all landscaped areas.

D. Acceptance by the Landscape Architect and/or Owner in no way removes the Contractor of his (her) responsibility to make further repairs, corrections and adjustments to eliminate any deficiencies which may later be discovered. Moreover, the Contractor shall fully honor the one year warranty outlined herein.

END OF SECTION 328400