Section 02811

LANDSCAPE IRRIGATION

1.0 G E N E R A L

1.01 SECTION INCLUDES

A Pipe and fittings, valves, sprinkler heads, accessories.

B Control system and wiring for automatic control irrigation system.

C References to Technical Specifications:
1. Section 01200 – Measurement and Payment Procedures
2. Section 01350 – Submittals
3. Section 02931 – Landscape and Tree Planting
4. Section 01310 – Coordination and Meetings

D Referenced Standards:
1. American Society for Testing and Materials (ASTM)
   a. ASTM D 2564, "Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems

1.02 MEASUREMENT AND PAYMENT

A Unless indicated as a Bid Item, no separate payment will be made for landscape irrigation under this Section. Include cost in Bid Items for which this Work is a component.

B If landscape irrigation is included as a Bid Item, measurement will be based on the Units shown in Section 00300 – Bid Proposal and in accordance with Section 01200 – Measurement and Payment Procedures.

1.03 SUBMITTALS

A Make Submittals required by this Section under the provisions of Section 01350 – Submittals.

B Submit manufacturer's data and details for landscape irrigation system to include pressure ratings, rated capacities, and settings of selected models for the following:
1. General-duty valves.
2. Specialty valves.
3. Control-valve boxes.
4. Sprinklers.
5. Irrigation accessories.
6. Controllers.

C Evidence of State of Texas irrigation license and required experience.

D Shop Drawings: Show irrigation system piping, including plan layout, and locations, types, sizes, capacities, and flow characteristics of irrigation system piping components. Include water meters, backflow preventers, valves, piping, sprinklers and accessories, controls, and wiring. Show areas of sprinkler spray and overspray. Show wire size and number of conductors for each control cable.

1.04 DEFINITIONS

A Irrigation Lateral Lines: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.

C Irrigation Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D Architect: The word Architect as used herein shall refer to the Owner's authorized representative or the Landscape Architect or the design engineer.

1.05 RECORD AND AS-BUILT DRAWINGS

A The Contractor shall provide and keep up to date and complete “as-built" record set of drawings which shall be corrected daily and show every change from the original drawings and specifications and the exact "as-built" locations, sizes, and kinds of equipment. This set of drawings shall be kept on the site and shall be used only as a record set.

B These drawings shall also serve as work progress sheets and shall be available at all times for inspection and shall be kept in a location designated by the Architect. Should the record as-built progress sheets not be available for review or not up-to-date at the time of any inspection, it will be assumed no work has been completed and the Contractor will be assessed the cost of that site visit at the current billing rate of the Architect. No other observations shall take place prior to payment of that assessment.

C The Contractor shall make neat and legible notations on the as-built progress sheets daily as the work proceeds, showing the work as actually installed.

D Before the date of the final inspection, the Contractor shall transfer all information from the "as-built" prints to a mylar. Contractor shall use symbols and notation consistent with original drawings.

E The Contractor shall dimension from two (2) permanent points of reference, building comers, sidewalk, or road intersections, etc., the location of the following items:

1. Connection to existing water lines
2. Connection to existing electrical power
3. Gate valves
4. Routing of sprinkler pressure lines (dimensions max. 100’ along routing)

5. Sprinkler control valves
6. Routing of control wiring
7. Quick coupling valves
8. Other related equipment as directed by the Architect
9. Sleeve locations

1.06 EXPLANATION OF DRAWINGS

A Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.

B All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.

C The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Owner's authorized representative. In the event this notification is not performed, the irrigation contractor shall assume full responsibility for any revisions necessary.

D No irrigation shall be required for undisturbed natural areas or undisturbed existing trees.

1.07 CONTROLLER CHARTS

A As-built drawings shall be approved by the Architect before controller charts are prepared.
1. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative.
2. Catalog and parts sheets on every material and equipment installed under this contract.
3. Guarantee statement.
4. Complete operating and maintenance instruction on all major equipment.

1.08 UNIFIED DEVELOPMENT CODE (UDC) REFERENCES

A Except for single-family lots and developments, all required landscaping areas shall be 100% irrigated by one of, or a combination of, the following methods:
1. An automatic underground irrigation system:
2. A drip irrigation system;
3. A hose attachment within 100 feet of all plant material, provided, however , that a hose attachment within 200 feet of all plant material in non-street yards shall be sufficient

B Irrigation zone design - A site plan, at a readable and defined scale, shall be submitted illustrating zones, delineating micro-irrigation zones and areas utilizing irrigation techniques other than micro-irrigation. Fifty (50) percent of the on-site green space shall be allowed to utilize irrigation techniques other than micro-irrigation. Turf areas shall be on separate irrigation zones from other landscaping plant zones. The irrigation system should be prepared by a licensed irrigator and designed to accommodate separate landscape plant zones based on different watering requirements unless approved by the Parks Director as indicated in the UDC Section 4.2.2.5, Item 8.D.1.

C Overspray/ Runoff - All irrigation systems shall be designed to avoid overspray / runoff, low head drainage, or other similar conditions where water flows onto or over adjacent property, non-irrigated areas, roadways, walkways, structures, or water features. Narrow areas (four feet wide or less) shall not be irrigated unless micro-irrigation is utilized.

D Landscaping - a site plan shall be submitted identifying all existing vegetation to be preserved, proposed turf, and other landscape areas. Installed trees and plants should be grouped together into landscape plant zones according to water and cultural (soil, climate and light) requirements. Plant groupings based on water requirements are as follows: natural, drought tolerant, and oasis.

E Turf / Turfgrass - A maximum of fifty (50) percent of green space may be planted with turf grass configured with a permanent irrigation system. Turfgrass planted in excess of this limitation shall not have a permanent irrigation system. Micro-irrigation shall not be used on turfgrass unless approved by the Parks Director as indicated in the UDC Section 4.2.2.5, Item 8.D.1.

1.09 SYSTEM DESCRIPTION

A Electric solenoid controlled underground irrigation system.

B Source Power: 120 volt

1.10 QUALITY ASSURANCE

A Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B All irrigation systems shall be designed and sealed in accordance with the Texas Licensed Irrigations Act and shall be professionally installed.

C Installer - Installation of Irrigation System shall be performed under the direction of a State of Texas licensed irrigator with not less than 5 years' experience in this type of work.

D Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

E Ordinances, Codes and Regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations and requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, these specifications and drawings shall take precedence.

1.11 REGULATORY REQUIREMENTS

A Conform to applicable code for piping and component requirements.

1.12 PRE-INSTALLATION CONFERENCE

A Convene one week prior to commencing work of this Section.

1.13 COORDINATION

A Coordinate work under provisions of Section 01310 – Coordination and Meetings

B Coordinate work under provisions of Section 02931 – Landscape and Tree Planting.

C Coordinate the work with site landscape grading and delivery of plant life.

1.14 PRODUCT DELIVERY AND HANDLING

A Materials shall be delivered in manufacturer's unopened packaging labeled to indicate manufacturer's name and product identification. Ensure that packaging and labeling remain intact until installation. Materials shall be stored protected from the elements, including direct sunlight.

B Pipes shall be handled so as to prevent them from being damaged and to maintain their straightness. Pipe ends shall be wrapped; Pipes shall be stored on beds the full length of the pipes; Damaged or dented pipes or fittings shall not be used.

1.15 SUBSTITUTIONS

A If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Owner's authorized representative for approval:

1. Provide a statement indicating the reason for making the substitution. Use a separate sheet of paper for each item to be substituted.
2. Provide descriptive catalog literature, performance charts and flow charts for each item to be substituted.
3. Provide the amount of cost savings if the substituted item is approved.

B Owner's authorized representative shall have the sole responsibility in accepting or rejecting any substituted item as an approved equal to those equipment and materials listed on the irrigation drawings and specifications.

1.16 EXTRA MATERIALS

A Furnish extra components listed as Extra Items in Section 00300 – Bid Proposal.
1. Two sprinkler heads of each type and size.
2. Two valve box keys.
3. Two wrenches for each type head core and for removing and installing each type head.

2.0 P R O D U C T S

2.01 MANUFACTURERS

A In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 PIPES, TUBES, AND FITTINGS

A Soft Copper Tube: ASTM B 88, Type L water tube, annealed temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

B Hard Copper Tube: ASTM B 88, Type K, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B 16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought- copper fittings if indicated.
2. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

C Mainline PVC pipe:

1. Pressure Main Line:

a. All main line shall be schedule 40 with solvent welded joints.
b. Pipe shall be made from an NSF approved Type I, Grade I, PVC compound conforming to ASTM resin specification Dl785. All pipe must meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld pipe).

2. PVC Non-Pressure Lateral Line Piping:
   a. Non-pressure buried lateral line piping shall be PVC class 200 with solvent-weld joints.
   b. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D I 784. All pipes must meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
3. Fittings 4" and larger shall be push-on Ductile Iron designed and manufactured using ASTM A-536 Grade 70-50-05 ductile iron with tensile strength of 70,000 psi such as manufactured by Harco or approved equal.
4. Fittings 3" and smaller shall be Schedule 40, I-2, II-I NSF approved conforming to ASTM test procedure D2466 PVC solvent-weld fittings.
5. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of Christie's Red Hot Blue Glue and Primer.
6. All PVC pipe must bear the following markings:
   a. Manufacturer's name.
   b. Nominal pipe size.
   c. Schedule or class.
   d. Pressure rating in P.S.I.
   e. NSF (National Sanitation Foundation) approval.
   f. Date of expiration.
7. All fittings shall bear the manufacturer's name or trademark, material designation, applicable I.P.S., schedule number and NSF seal of approval

D Irrigation Lateral Line pipe
1. Pipes 1/2 inch diameter and larger ASTM D 2231, PVC, 1120 or 1220, SDR 21.0, 200 PSI
2. Pipes 1/4 inch diameter: ASTM D 2241, PVC, 1120 or 1220, SDR 13.5, 315 PSI

E Fittings for Threaded Joints
1. ASTM D 2466, PVC, Schedule 80

F Length of pipes used
1. Use of pipe less than five (5) feet in length is prohibited unless otherwise noted on the plans.

G No use of small scrap material to extend water lines

2.03 GENERAL DUTY VALVES

A Gate valves 4" and smaller shall be MSS SP-80, Class 125, Type 1, nonrising-stem, bronze body with solid wedge, threaded ends, and malleable-iron hand wheel.

B Gate valves 3" and smaller shall be similar to those manufactured by Nibco, Hammond or approved equal

C All gate valves shall be installed per installation detail.

D Install six (6) inches of pee gravel into bottom of all valve boxes.

E Gate valves 6 inch and larger shall be cast or ductile iron. They shall conform to AWWA C-509. Stem shall be fitted with a 2" x2" square wrench nut and shall be opened counter-clockwise. Stem extension shall be added to bring operating nut to within 2 (two) feet of finished grade.

2.04 REMOTE CONTROL VALVES

A Plastic Automatic Control Valves: Molded-plastic body, normally closed, diaphragm type with manual flow adjustment, and operated by 24-V ac solenoid.
1. All electric control valves shall be of the same manufacturer.
2. All electric control valves shall have a manual flow adjustment and pressure regulating module.
3. Provide and install one control valve box for each electric control valve.
4. Electric remote control valve shall be Hunter ICV Series.
5. Install six (6) inches of pea gravel into bottom of all valve boxes.

B Automatic Drain Valves
1. Spring-loaded-ball type of construction and designed to open for drainage if line pressure drops below 2½ to 3 psi.

C Quick-Couplers
1. Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B 1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.
    a. Manufacturers:
        i. Hunter
2. All quick couplers shall be installed using "O"-ring style swing joint and located in 10" round valve box with purple lids.

D Remote Control-Valve Boxes
1. Box and cover, with open bottom and openings for piping; designed for installing flush with, grade. Include size as required for valves and service.
2. Valve boxes shall be heavy duty plastic 17 inch by 11-3/4 inch by 12 inch depth, black with black cover.
3. Valve box shall be Series 1419, non-hinged, non-bolt cover, by Carson Industries, Inc., or approved equal.
    a. Manufacturers:
        i. Carson Industries, LLC.
        ii. Christy Concrete Products, Inc.

E Gate Valve and Control Wire Splice Boxes

1. Gate valves and control wire splice boxes shall be heavy duty plastic 10 inch diameter by 10¼ inch deep, black with black cover, No. 910-12B, by Carson Industries, Inc. or approved equal.

F Drainage Backfill

1. Cleaned gravel or crushed stone, graded from 3/8 inch minimum to 1 inch maximum.

2.05 SPRINKLERS

A Brass or plastic housing and corrosion-resistant interior parts designed for uniform coverage over entire spray area indicated, at available water pressure. Manufacturers: Hunter Industries.

B Flush, Surface Sprinklers or VANs (Variable Angle Nozzle): Fixed pattern, with screw-type flow adjustment.

C Bubblers: Fixed pattern, with screw-type flow adjustment.

D Shrubbery Sprinklers: Fixed pattern, with screw-type flow adjustment.

E Pop-up, Spray Sprinklers: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.

F Pop-up, Rotary, Spray Sprinklers: Gear drive, full-circle and adjustable part- circle types.

G Pop-up, Rotary, Impact Sprinklers: Impact drive, full-circle and part-circle types.

H Aboveground, Rotary, Impact Sprinklers: Impact drive, full-circle and part- circle types.

I Matched precipitation rates - Sprays and rotors shall have matching application rates within each irrigation zone.

J MP Rotators: wind resistant multi stream nozzle

2.06 CONTROLLERS

A The ACC controller shall be capable of two-wire decoder control of up to 99 stations via a plug-in decoder output module. The decoder output module shall be field-installable without tools. The decoder output module shall have an intrinsic capability of up to 99 stations, and shall occupy 3 modular expansion slots inside the ACC controller cabinet.

B The decoder output module shall have 6 two-wire output paths to the field. The decoders may be wired in sequence over any combination of the two-wire paths, including all 99 on a single two-wire path. Each path may extend up to 10,000 ft. to the end of the wire run over 14 AWG (l.5mm dia.) wire, or 15,000 ft. over 12 AWG (2mm dia.)

C The wire paths shall be twisted pair; solid-core, color-coded red/blue pairs with each conductor in a polyethylene jacket suitable for direct burial. The two-wire paths shall be Hunter Industries Model IDWIRE I for 14 AWG (1.5mm) conductors, or Model IDWIRE2 for 12 AWG (2mm) conductors for extended range (over 10,000 ft., up to 15,000 ft.).

D All connections in the two-wire paths (outside the controller enclosure) shall be made with 3M DBR-6 waterproof, strain relieving direct burial connectors, or exact equals. Decoder output to solenoid connections shall be made with 3M DBY waterproof, strain-relieving connectors or exact equals. No substitution of wire or wire connection specifications is permissible. All connections, tees, and splices shall be positioned in valve boxes in valve boxes for future location and service.

E One Decoder per valve, installed in the valve box is required unless otherwise approved.

F The installer shall provide adequate earth ground (not to exceed I 0 Ohms) and connect it to one of the decoder ground leads every 750 ft., or every 10th decoder module, whichever is shorter. Also install on each dead end of the wire path.

G The ICD decoders and Sensor Decoders shall be UL and c-UL listed, and shall be CE and C-tick approved.

H Final location of automatic controllers shall be approved by the Owner's authorized representative.

I Unless otherwise noted on the plans, the 120 volt electrical power to the automatic controller location to be furnished by others. The final electric hook-up shall be the responsibility of the Irrigation Contractor.

J If two wire systems are not fitting to the system needed, another Hunter Controller with conventional wiring will be used.

K Controllers will be capable of communicating with offsite Hunter software, unless otherwise approved by owner.

L Control Equipment - Irrigation control equipment shall include and automatic irrigation controller with the following features; program flexibility such as repeat cycles and multiple program capabilities; battery back-up to retain the irrigation programs; and a rain sensor device.

2.07 WIRING

A Wiring: AWG-ULUF 600 volt with solid-copper conductors and insulated cable; suitable for direct burial.

1. Manufacturers:

a. Paige Cable
b. Regency Wire and Cable
c. Approved equal

B Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers and runs over 1,000 LF. Low-Voltage, Branch-Circuit Cables: No. 14 AWG minimum, between controllers and automatic control valves; color coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.

C Install 3 spare wires from each controller to farthest valve in each direction.

D Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.

E An expansion curl shall be provided within three (3) feet of each wire connection. Expansion curl shall be of sufficient length at each splice connection at each electric control, so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires.

F Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.

G All splices shall be made with Scotch-Lok #3576 Connector Sealing Packs, DBY (Direct Bury) Splice by 3M or approved equal. Use one splice per connector sealing pack.

H Field splices between the automatic controller and electrical control valves, less than 500' apart, will not be allowed without prior approval of the Architect.

I All field splices shall be installed in a 10" round valve box as specified in section 2.04

2.08 BACKFLOW PREVENTERS

A Backflow Preventers shall be bronze and copper, pressure vacuum breaker assembly Febco No. 765 by Febco Sales, Inc. (CMB Industries), or approved equal. Size as per drawings.
1. Reduced Pressure Backflow: Febco No. 825Y
2. Double Check Assembly: Febco No. 850
3. Or approved equal.

2.09 REMOTE CONTROL VALVE TIES

A Remote control valve ties shall be Christy's Valve I.D. tag model ID-STD-Y with wire to attach numbered tag to valve.

2.10 SOLVENT CEMENT FOR SOLVENT WELDED JOINTS

A CHRISTY'S RED HOT BLUE GLUE T. Christy Enterprises, Inc., or approved equal. Use a compatible primer recommended by the solvent cement manufacturer.

2.11 SEALANT FOR THREADED JOINTS UNDER CONSTANT PRESSURE

A RECTOR SEAL LIQUID TEFLON by Rector Seal Corp., or approved equal.

2.12 SLEEVES UNDER PAVING FOR CONTROL WIRE AND IRRIGATION LINES

A ASTM D 2455, PVC, Schedule 40 sized as shown on drawings.

2.13 FITTINGS FOR THREADED JOINTS

A ASTM D 2466, PVC, Schedule 80

2.14 BACKFLOW ENCLOSURES

A The backflow enclosure shall be of a vandal and weather resistant nature manufactured entirely of formed tubing and rod, coated with a performance polymer alloy coating to prevent injury. The mounting base and locking mechanism shall be manufactured entirely of metal or fiber glass. The locking mechanism shall be of the full release type which allows for complete removal of the enclosure from its mounting base without the use of tools. The handle controlling the locking mechanism shall be concealed within the surface of the enclosure and provide for a padlock.

B The backflow enclosure shall be Strong Box Model manufactured by V.I.T. Products Inc., 800-729-1314. No. SBBC-30CR Or approved equal.

C Hot Box Enclosure – CDR Systems Corporation or approved equal.

2.15 RAINFALL MONITOR

A Provide a Mini-Clik by Hunter Industries or approved equal.

2.16 FLOW SENSOR

A Install Flow sensor- Hunter Flow Click

3.0 E X E C U T I O N

3.01 EXAMINATION

A Site Conditions:
1. Verify location of existing utilities.
2. Verify that required utilities are available, in proper location, and ready for use.
3. All scaled dimensions are approximate.
4. The Contractor shall check and verify all size dimensions and receive Architect's approval prior to proceeding with work under this section.
5. Exercise extreme care in excavating and working near existing utilities.

6. Contractor shall be responsible for damages to utilities which are caused by his operations or neglect. Check existing utilities drawings for existing utility locations.
7. Coordinate installation of sprinkler irrigation materials including pipe, so there shall be No interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
8. Coordinate work with other site contractors.
9. The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler irrigation system.
10. No machine trenching, unless approved by Architect, is to be done within drip line of trees. Trenching is done by hand, tunneling or boring or other methods shall be approved by Architect.
11. It is understood that the piping layout is diagrammatic and piping shall be routed around trees and shrubs in such manner to avoid damage to plants.

3.02 PREPARATION

A Physical Layout:

1. Piping and head layout is shown on plans in schematic form only.
2. All pipes to be installed directly behind curbs, walks, and walls wherever possible.
3. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
4. All layouts shall be approved by Architect prior to installation.
5. Route pipes to avoid plants, ground cover and structures.
6. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

B Water Supply:

1. Sprinkler Irrigation system shall be connected to water supply points-of-connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.
3. Reclaimed systems utilizing purple pipe may be requested by owner. In the event of the installation of a reclaimed system. All components will utilize the same previously described manufacturer to provide 'purple pipe' components.
4. All Reclaimed/Purple Pipe systems will conform to 30 TAC §344.1

3.03 TRENCHING

A Refer to Section 02318 – Excavation and Backfill for Utilities for excavating, trenching, and backfilling.

B Location of Heads - Design location is represented as accurately as possible. Make minor adjustments on site with approval of Landscape Architect as necessary to ensure consistent and even spacing where applicable. Set all heads minimum 6" from back of curb and 6" from edge of concrete walls.

C Install piping and wiring in sleeves under sidewalks, roadways, parking lots, and railroads.

D Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded from 3/4 to 3, to 12 inches below grade. Cover gravel or crushed stone with sheet of asphalt-saturated felt and backfill remainder with excavated material.

E Provide minimum cover over top of underground piping according to the following:
1. Irrigation Main Piping: Minimum depth of 18 inches below finished grade.
2. Circuit Piping: 12 inches.
3. Drain Piping: 12 inches.
4. Sleeves: 24 inches.

F Backfill
1. The trenches shall not be backfilled until all required tests are performed, or until cover up is approved by the owner.
2. Trenches shall be carefully back- filled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting area.
3. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
4. A sand material backfill will be initially placed on all lines (minimum 3" depth). No foreign matter larger than one-half (1/2) inch in size will be permitted in the initial backfill.
5. Where rock is encountered in trenching, 4" of sand above the pipe and 4" of sand below the pipe will be used as the initial backfill.
6. Flooding of trenches will be permitted only with approval of Architect.
7. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.
8. Trench shall be excavated to accommodate grade changes.
9. Trench shall not be left open overnight unless caution taped or fenced off.
10. Existing Lawns - Where trenching is required across existing lawns, (or in the event of changes or repairs after new lawn has been established), uniformly cut strips of sod 6 inches wider than trench. Remove sod in rolls of suitable size for handling and keep moistened until replanted.
11. Backfill trench to within 6 inches of finished grade and compact.
12. Continue fill with acceptable topsoil and compact to bring sod even with existing lawn.
13. Replant sod within 2 days after removal, roll and water generously; unless new sod or hydro mulch is to be installed.
14. All sod areas not in healthy condition equal to adjoining lawns 30 days after replanting shall be re-sodded and restored to original condition.

3.04 INSTALLATION

A Pipes

1. Piping Mains and Laterals - Lay out sprinkler mainlines and perform line adjustments and site modifications to laterals prior to excavation. Lay pipe on solid sub base, uniformly sloped without humps or depressions.
2. Coordinate pipe installation with conduit installation.
3. PVC pipe Assembly
   a. Cut PVC pipe square and de-burr.
   b. Clean pipe and fittings using primer as recommended by the PVC pipe manufacturer. Use tinted primer to aid in visual inspection and blue glue.
   c. Apply a thin even flow coat of PVC solvent cement to inside of the fitting and pipe mating surface.
   d. Cure joints as recommended by the manufacturer and keep pipe and fitting out of service during curing period.
   e. Construct watertight joints equal or greater in strength than the pipe. Do not tap pipe at fittings.
   f. Install plastic pipe in dry weather, when temperature is above 40 degrees F. and in accordance with manufacturer's written instructions.
   g. Allow joints to cure at least 24 hours at temperature above 40 degrees F before testing.
   h. Plastic pipe shall be snaked in the trenches in a manner to provide for expansion and contraction as recommended by pipe manufacturer.
   i. Extend primer 1/2" beyond glue joint for visual inspection.
   j. Ensure that the pipe is not laid on top of fittings and put under stress in any way prior to cover-up.

B Sleeves under Paving

1. The majority of sleeves under paving exist as shown on drawings. Where boring is required for new sleeves (refer to drawings), it shall be a "wet bore." Install sleeves 12" beyond edge of pavement. Perform trench and backfill in accordance with these specifications.
2. Sleeves shall be marked on the concrete with 1/4" deep "V" cut into curb.

C Concrete Thrust Blocks

1. Install where the rubber-gasketed irrigation main changes direction as at ells and tees and where the rubber-gasketed main terminates.
2. Pressure tests shall not be made for a period of 36 to 48 hours following the completion of pouring of the blocks.
3. Blocks for these mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.

D Irrigation Heads

1. Flush irrigation lines with full head of water and install heads after hydrostatic test is completed.
2. Install heads at manufacturer's recommended heights.

3. Locate part-circle heads to maintain a minimum distance of 4, 12, 24, 48 inches from walls and inches from other boundaries, unless otherwise indicated.
4. Check for uniformity of coverage and pattern correctness. Adjust for 100% coverage where required.
5. Install nozzles with water running at reduced pressure starting with the head closest to the valve.
6. Adjust arcs and radius at normal operating pressure.
7. Ensure heads do not spray into areas not intended to receive water. Example: streets and sidewalks.
8. Install heads at minimum of six (6) inches from back of curb.
9. Spacing - Sprinkler spacing shall not exceed 55 percent of the sprinkler diameter of coverage.
10. Separate spray and rotors - Sprays and rotors shall not be combined on the same control valve circuit

E Drip Tubing

1. Tubing installed in planting beds is to be placed at spacing indicated on drawings in shallow trench and covered with planting backfill mix l"-2" deep and then covered with mulch.
2. Tubing is to be placed after bed preparation is complete and plant material is planted and root ball anchor is installed.
3. Drip tubing is to be placed on top of root balls of trees in planting beds to allow for even watering of trees.
4. All tubing is to be reviewed by Owner's Representative prior to burying.

F Electric Remote Control Valves

1. Adjust automatic control valves to provide flow rate at rated operating pressure required for each irrigation section.
2. Install valves in valve boxes, arranged for easy adjustment and removal. Locate valves to ensure ease of access for maintenance such that no physical interference with other elements of the project exists.
3. Remote Control Valve Tags to be used in Section 2.09
4. One Remote Control Valve Tag shall be attached to stem of each electric remote control valve. Tags shall be numbered sequentially. Numbers shall correspond to station numbers in electric controller. Provide tags and corresponding numbers for wires pulled for future valves.
5. Valve Boxes - Install valve boxes to cover electric remote control valves. Install one valve per valve box. Top of valve box shall be flush with finished grade. Bury minimum 4 bricks under base of each box as support.
6. Control Wire Splice Boxes - Install control wire splice box to cover any splice in control wire. Top of valve box shall be flush with finished grade. Bury minimum 4 bricks under base of each box as support. Install control wire splice box to cover wires pulled for future valves.

G Gravel Backfill

1. Backfill valve boxes and control wire splice boxes with gravel, minimum 6 inch depth.

H Electric Controller

1. Controllers shall be fully grounded.
2. Connect remote control valves to controller in clockwise sequence to correspond with stations 1, 2, 3, successively.
3. Affix a non-fading copy of irrigation diagram to cabinet door below controller's name. Irrigation diagram shall be sealed between two plastic sheets, 20 mils. Minimum thickness. Irrigation diagram shall show clearly all valves operated by the controller, showing station number, valve size, and type of planting irrigated.
4. Provide lockable cabinet. Provide two keys to Owner. Keys to be matched with existing controller key locking mechanisms.
5. Power to Controller & Locations: Locations shown on plan for controllers is approximate. Final location shall be determined on site by Owner.
6. Contractor shall supply 120 VAC to controller from adjacent existing power sources. Follow local governing codes in electrical work.
7. Lightning Protection and Grounding: Provide full grounding and lightning protection per system manufacturer's recommendations.
8. Wall mounted controllers; electrical meters and breaker boxes shall be mounted on I-beam structures.

I Irrigation Control Wires

1. Provide 24 volt system for control of automatic circuit-section valves of underground irrigation system. Provide unit capacity to suit number of circuits indicated.
2. Install control wires with irrigation mains and laterals in common trench where possible. Lay control wires neatly together to side of pipe. Provide looped slack at valves, comers, bores and snake wire in trench to allow for contraction. Tie wires in bundles at 10 foot intervals. Line splices will be allowed on runs of 500 Ft. or more. Splices shall be made and placed in control wire splice boxes.
3. Provide 12 inch long expansion loop within 3 feet of each wire connection and splice on runs of wire 100 feet or longer.

J Backflow Preventers

1. Make required connection to water supply according to local codes and manufacturer's written instructions.
2. Install pressure type backflow devices at required grade in accordance with the local Plumbing Code.
3. Insulate all above ground piping.

3.05 FIELD QUALITY CONTROL AND TESTING

A General - Notify Landscape Architect 48 hours in advance when testing will be conducted. Conduct tests in presence of Landscape Architect and owner.

B The Parks and Recreation Department will conduct open trench inspections daily, prior to cover-up.

C Hydrostatic Test - Test irrigation main line, before backfilling trenches, to a hydrostatic pressure of not less than 100 psi for 1 hour. Piping may be tested in sections to expedite work. Remove and repair or replace piping and connections which do not pass hydrostatic testing.

D Shut off mainline at backflow preventer during non-working hours until Contractor has demonstrated the mainline is stable.

E Operational Testing - Perform operational testing after hydrostatic testing is completed, backfill is in place and irrigation heads are adjusted to final position.

F Demonstrate to Landscape Architect that system meets coverage requirements, is as specified and indicated, and that automatic controls function properly.

G Coverage requirements are based on operation of one circuit at a time.

H After completion of grading, sodding and rolling of grass areas, carefully adjust lawn sprinkler heads so they will be flush with finish grade. Set shrub sprinkler heads not more than 1/2 inch above top of mulch.

I Ensure watering does not extend into unintended areas, such as roadways and sidewalks.

J Field inspection and testing will be performed.

K Prior to filling, test system for leakage for whole system to maintain 100 psi pressure for one hour.

3.06 FILLING

A Provide 3 inch sand cover over piping. Fill trench and compact to subgrade elevation. Protect piping from displacement.

3.07 ADJUSTING

A Adjust control system to achieve time cycles required.

B Change and adjust head types for full water coverage as directed.

3.08 MAINTENANCE

A Contractor shall correctly maintain the irrigation system during the installation process and throughout the landscaping maintenance service period.

B Contractor shall provide "As Built" Drawings for new work, showing dimensioned location of valves, meters, backflow preventers, controllers, and mainline. Contractor shall request reproducible mylar from the Landscape Architect in preparation of "As Built" Drawings. Contractor shall also provide a small laminated set of plans in each irrigation controller, which is color coded for each set of heads each valve operates.

C Maintenance and management - The landscape and irrigation system shall be maintained and managed to ensure water efficiency, and prevent wasteful practices. This should include, but not limited to: resetting the automatic controller according to the season; flushing the filters; testing the rain sensor device; monitoring, adjusting, and repairing irrigation equipment such that the efficiency of the system is maintained and utilizing turf and landscape best management practices during the maintenance period.

3.09 DEMONSTRATION

A Provide system demonstration.

B Instruct Owner's personnel in operation and maintenance of system, including adjustment of sprinkler heads. Use operation and maintenance material as basis for demonstration.

END OF SECTION