

SECTION 328400 - PLANTING IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The work covered by this Section consists of furnishing all labor, equipment and materials and performing all operations necessary for installing an automatic irrigation system as shown on the Drawings and/or described by these Specifications. The work includes: excavation and preparation of trenches, installation of the irrigation system (including: plastic pipe – solvent weld and gasketed, plastic fittings – solvent weld and gasketed, ductile iron fittings - gasketed, thrust blocking directional fittings and isolation valves, sprinkler heads, gate valves, electric control valves, valve boxes, electrical control cable, automatic controller, grounding and surge protection, decoders, sensors, wiring to controller, discharge zee pipe for pump station, connection of zee pipe to PVC mainline), and all required submittals.

1.2 DEFINITIONS

- A. Supply Piping: Piping from water source to connection to irrigation system pressure piping. Mainline piping is under same static pressure as water supply.
- B. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are standard size in inches.
- C. Supply Piping: Piping from water source to connection to irrigation system pressure piping. Mainline piping is under same static pressure as water supply.
- D. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventers, when used.
- E. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure during flow.
- F. Control Valve: Automatic (electrically operated) valve for control water flow to irrigation system zone.
- G. Drain Piping: Downstream from circuit piping drain valves. Piping is not under pressure.
- H. Drain Valve: Manual or automatic (pressure operated) drain valve for draining of irrigation system circuit piping.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Location of Sprinklers and Devices: Design location is approximate. Minor field adjustments may be necessary to avoid plantings and obstructions such as signs and light standards. Sprinklers to be spaced no greater than 55% of diameter of throw at optimum performance pressure. This will achieve "Head to Head" coverage performance.
- B. Minimum Water Coverage: Not less than:

1. Turf Areas: 100 percent.
 2. Other Planting Areas: 100 percent.
- C. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise on drawings.
1. Pressure Piping: 160 psi
 2. Circuit and Drain Piping: 160 psi
- D. Electrical: Source Power for irrigation controller to be 120 Volts A.C., 60 Hertz, Single Phase, with a 10 amp circuit breaker.

1.4 SUBMITTALS

- A. Product data including pressure rating, rated capacity, settings, and
1. Backflow Preventers, and Pressure Regulators (When Required)
 2. Automatic Controller, Sensors, Decoders, Wires, and Connectors
 3. Valves, including general-duty, underground, manual and automatic, and quick-coupler types and Valve Boxes.
 4. Sprinklers, including swing joint risers and swing pipe.
 5. Drip Emitters, Tubing, Filters, and other devices.
- B. Shop drawings showing irrigation system, including plan layout and locations, types, sizes, capacities, and flow characteristics of irrigation system components. Include water meters, backflow preventers, valves, piping, sprinklers and devices, accessories, controls, and wiring. Show areas of sprinkler spray and overspray.
- C. Coordination drawings showing piping and major system components. Indicate interface and spatial relationship between piping, system components, adjacent utilities, and proximate structures.
- D. Maintenance data for inclusion in "Operating and Maintenance Manual" for all the following products, if applicable, on system.
1. Backflow preventer, including instructions for testing
 2. Master valve
 3. Isolation valve
 4. Pressure Regulator
 5. Automatic control valve
 6. Sprinkler
 7. Controller and Control System components
 8. Pump and Control System components
 9. Filter
- E. A list of three (3) past projects similar in scope to this project, including names and phone numbers of owners and date of installation shall be submitted with bid.

1.5 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.
- B. Comply with requirements of authority with jurisdiction for irrigation systems.

- C. Installer Qualifications: Irrigation Contractor shall be a firm engaged full time in the installation of this type of system with at least five (5) years experience and who has completed a minimum of three (3) irrigation systems similar in material (size and type), design, and extent as indicated for this project and that have resulted in a record of successful in-service performance. Previous irrigation projects must have included: a two-wire communication/control system, gasketed mainline pipe with gasketed fittings, concrete thrust blocking, and similar type pump station discharge pipe installation.
- D. Listing/Approval Stamp, Label, or Other Marking: Onequipment, specialties, and accessories made to specified standards.
- E. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated on drawings. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do no change design concept of intended performance as judged by the Architect. The burden of proof of product equality is on the Contractor. A sample of the product must be submitted with written request for substitution. Contractor must obtain written approval of product substitution from Landscape Architect prior to installation.
- F. All irrigation equipment used in this project shall be purchased through a distributor which is a local authorized manufacturer's representative and who is a factory authorized service center. The distributor should have a service department that can assist in trouble shooting and training of specified products. The name of the distributor company including contact name, phone number and address shall be submitted with bid.

1.6 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards. Protect all hardscape and planted areas from damage during system installation, Hand trenching only inside "tree save" areas.

1.7 PRE-INSTALLATION MEETING

- A. Meeting to convene one (1) week before starting work on project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product manufacturer name, specific product type, model number and size are indicated on drawings. Any product substitutions must be approved in writing by Landscape Architect prior to installation by contractor.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, one of the following:

1. Backflow Preventers:
 - a. Wilkins Regulator, Zurn Industries, Inc.
 - b. Or approved equal
2. Pressure Regulators:
 - a. Wilkins Regulator, Zurn Industries, Inc.
 - b. Rain Bird Corporation
 - c. Senninger
 - d. Or approved equal
3. Valves for Aboveground and Underground Pit Installation:
 - a. Nibco
 - b. Harvard
 - c. Clow
 - d. Or approved equal
4. Automatic Control Valves:
 - a. Rain Bird Corporation
 - b. Hunter Industries
 - c. Or approved equal
5. Control Valve Boxes:
 - a. NDS
 - b. Carson Industries
 - c. Or approved equal
6. Sprinklers:
 - a. Rain Bird Corporation
 - b. Hunter Industries
 - c. Or approved equal
7. Drip Emitters, Tubes, and Devices:
 - a. Rain Bird Corporation
 - b. Agrifim
 - c. Jain Irrigation
 - d. Antelco
 - e. Or approved equal
8. Controllers:
 - a. Rain Bird Corporation
 - b. Hunter Industries
 - c. Or approved equal
9. Automatic Rain Shutoff Device:
 - a. Rain Bird Corporation
 - b. Hunter Industries
 - c. Irritrol
 - d. Or approved equal
10. PVC Solvent Weld Pipe:
 - a. Jet Stream Plastics
 - b. Silver-Line Plastics
 - c. Or approved equal
11. Solvent Weld PVC Fittings:
 - a. Lasco Fittings, Inc.

- b. Or approved equal
- 12. Wire:
 - a. Regency Wire and Cable
 - b. Or approved equal
- 13. PVC Gasketed Pipe:
 - a. Jet Stream Plastics
 - b. Silver-Line Plastics
 - c. Sanderson Pipe
 - d. Or approved equal
- 14. Gasketed PVC and Ductile Fittings:
 - a. IPS Weld-on
 - b. Or approved equal

2.2 PIPE

- A. Copper Tube: ASTM B 88 Types L and M water tube, annealed and drawn tempers, with plain ends.
- B. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, PVC 1120, Schedule 40, 160 psi minimum pressure rating for 8-inch and smaller sizes, with Belled/Solvent Weld ends.
- C. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, PVC 1120, SDR 21, 200 psi minimum pressure rating, with Belled/Solvent Weld ends.
- D. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 2241; PVC 1120, SDR 26, 160 psi minimum pressure rating, with Belled/Solvent Weld ends.

2.3 PIPE FITTINGS

- A. Copper Tube Fittings: ASME B16. 22, wrought copper or cast-brass, solder-joint, pressure types.
- B. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D 2466, Schedule 40, socket- type.

2.4 JOINING MATERIALS

- A. Solvent Cement: ASTM F 656 purple color primer and ASTM D 2564 solvent cement.
- B. Solder: ASTM B 32, Alloys Sn95 and E.
- C. Gaskets for Plastic Flanged Joints: Materials recommended by plastic pipe and fittings manufacturer.

2.5 BACKFLOW PREVENTERS

- A. Description: Consult with local water authority and only use approved type device and installation method prior to installation. ASSE standard backflow preventer of size indicated for maximum flow rate and maximum pressure loss indicated.

1. Working Pressure: 150-psi minimum except where otherwise indicated.
2. 2 Inches and Smaller: Bronze body with threaded ends
3. 2.5 Inches and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.

B. Approved type of devices may include one of the following and as indicated on drawings.

1. Reduced Pressure Principle Backflow Preventer
2. Double Check Valve Backflow Preventer
3. Pressure Vacuum Breaker

2.6 PRESSURE REGULATORS

A. Description: ASSE 1003, single seated, direct operated type water pressure regulators, rated for initial working pressure of 150 psi minimum, with size, flow rate, and inlet and outlet pressures indicated. Include integral factory installed or separate field-installed wye-pattern strainer that is compatible with unit for size and capacity. Manufacturer model number and size are indicated on drawings.

1. 2 Inches and Smaller: Bronze body with threaded ends.
2. 2.5 Inches and Larger: Bronze or cast-iron body with flanged ends.
3. Interior components: Corrosion resistant materials.

2.7 VALVES

A. Description: Manufacturer's standard valves for isolation and drain application, of type, size and model number are indicated on drawings and as follows:

- B. Non-rising Stem Gate valves 3 Inches and Larger: AWWA C500, cast-iron double disc, bronze disc and seat rings or AWWA C509, resilient seated; bronze stem, cast-iron, or ductile-iron body and bonnet, stem nut, 200 psi working pressure; and ends that fit NPS dimension, PVC pipe. Include elastomeric gaskets.
- C. Brass, non-rising Stem Gate Valves, 3 inches and smaller: Type 1, solid wedge; non-rising, full port, class (200 WOG Rating) brass body and screw bonnet with threaded or solder-joint ends. Include polytetrafluoroethylene (PTFE) impregnated packing, brass packing gland, and malleable-iron handwheel.
- D. Bronze, non-rising-Stem Gate Valves, 3 inches and smaller: MSS SP-80, Type 1, solid wedge; rising, copper-silicon-alloy stem; 125 class (200 PSI WOG Rating) body and screw bonnet of ASTM B 62 cast bronze, with threaded or solder-joint ends. Include polytetrafluoroethylene (PTFE) impregnated packing, brass packing gland, and malleable-iron handwheel.
- E. Plastic Valves: Polyvinyl chloride (PVC) plastic with 150 psi minimum pressure rating FPT, ends compatible to piping where valve is to be installed, and tee handle.

2.8 CONTROL VALVES

A. Description: Manufacturer's standard control valves for circuits, of type, size and model number are indicated on drawings and as follows:

1. Manual Control Valves: Class 150 psi minimum rating, globe valves.
2. Key-Operated, Manual Control Valves: Class 150 PSI rating, Gate

Valves, fitted for key operation.

3. Automatic control valves: Diaphragm type, normally closed, with manual flow adjustment, and operated by 24-volt AC solenoid.
4. Automatic Drain Valves: Designed to open for drainage when line pressure drops below 3 psi (when required).
5. Quick-Couplers: Factory-fabricated, assembly. Include coupler water seal valve, single piece body with spring loaded or weighted, rubber covered cap: hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on Outlet; and operating key.

- B. Control Valve Boxes: Polyethylene (PE), acrylonitrile-butadiene-styrene (ABS), fiberglass, polymer concrete, or precast concrete box and cover. Large enough for easy service access. Plastic valve boxes to be the "Pro Series" or "Spec Series" grade only, size as indicated on drawings detail drawings.

1. Drainage Backfill: Cleaned gravel or crushed stone, graded from 2 inches maximum to 3/4 inch minimum.
2. Include valve key, 60 inches long with tee handle and key end to fit key operated valve.

2.9 AUTOMATIC CONTROL SYSTEM

- A. Description: Low-voltage controller system, made for control of irrigation system automatic control valves. Controller operates on 120 volts AC building power system, provides 24 volts AC power to control valves, and includes stations for at least the number of control valves indicated. Manufacturer model number and size are indicated on drawings.

- B. Exterior Control Enclosure: Weatherproof enclosure with locking cover and 2 matching keys. Enclosure construction complies with NFPA 70 and NEMA 250, Type 4, and includes provision for grounding.

1. Material: Molded plastic or painted steel.
2. Mounting: Surface-type for wall mounting.
3. Transformer: Internal-type, and suitable for converting 120 volts AC building power to 24 volts AC power.

- C. Interior Control Enclosure: Drip-proof enclosure with and locking cover and 2 matching keys.

1. Material: Molded plastic or painted steel.
2. Mounting: Surface-type for wall mounting.
3. Transformer: Plug-in style and suitable for converting 120 volts AC building power to 24 volts AC power.

- D. Controller Stations for Automatic Control Valves: Each station is variable from approximately 1 to 360 minutes. Include switch for manual or automatic operation.

- E. Timing Device: Adjustable, 24-hour, 14-day clock to operate any time of day. Include provision for the following settings:

1. Setting to skip operation any day in timer period.
2. Setting for operation every other day.
3. Settings for multiple programs, 3 programs minimum.
4. Settings for operation 4 or more times daily.
5. Include manual or semi-automatic operation without disturbing preset automatic operation. Provide battery (NiCad or Alkaline) to automatically power the timing device during power outages to maintain time and date while non-volatile memory maintains schedule.

- F. Contractor should incorporate an adjustable rain shut-off device or weather sensor as indicated

on drawings.

- G. Controller to be grounded as per code and manufacturer's recommendations.

2.10 SPRINKLERS

- A. Description: Manufacturer's standard sprinklers designed to provide uniform ("Head to Head" placement) coverage over entire area of spray shown on Drawings at available water pressure. Manufacturer type, size and model number are indicated on drawings and as follows:
1. Housings: Brass or plastic, except where material is specified.
 2. Flush, Surface: Fixed pattern with screw-type flow adjustment.
 3. Interior Parts: Brass or other corrosion-resistant materials.
 4. Bubbler: Fixed pattern, with screw-type flow adjustment and pressure compensating.
 5. Shrubbery: Fixed pattern, with screw-type flow adjustment.
 6. Plastic Pop-Up Spray: Fixed pattern with screw-type flow adjustment and stainless steel retraction spring.
 7. Pop-Up, Rotary Spray: Gear drive, full-circle and adjustable part-circle type.

2.11 DRIP EMITTERS, TUBES, AND DEVICES

- A. Description: Manufacturer's standard units as indicated on drawings and as follows:
1. Application Pressure Regulators: Brass or plastic housing, $\frac{3}{4}$ -1 inch size, with corrosion-resistant internal parts, and capable of controlling outlet pressure to approximately 40 psi.
 2. Strainer/Filter Units: Brass or plastic housing, with corrosion-resistant internal parts of size and capacity required for emitters, drip tubes, and devices downstream of unit.
 3. Emitters: Plastic body with single outlet to deliver the following flow over a range of 15-50 psi and be pressure compensating.
 - a. Flow: $\frac{1}{2}$ gallon per hour.
 - b. Flow: 1 gallon per hour.
 - c. Flow: 2 gallons per hour.
 4. Emitters: Plastic body with multiple outlets, to deliver the following flow over a range of 15-50 psi and be pressure compensating.
 - a. Flow Each Outlet: $\frac{1}{2}$ gallon per hour.
 - b. Flow Each Outlet: 1 gallon per hour.
 - c. Flow Each Outlet: 2 gallons per hour.
 - d. Emitter Tubing: 1/8-inch diameter polyethylene tubing.
 5. Inline pressure compensating emitter tubing, to deliver the following flow over a range of 15 – 50 psi. Emitter flow, inline spacing and spacing between the rows are as indicated on drawings.
 - a. Flow: $\frac{1}{2}$ gallon per hour
 - b. Flow: 1 gallon per hour
 6. Drip Tubes: Flexible polyvinyl chloride (PVC)/or Polyethylene (P.E.) plastic tube for emitters or other devices indicated and with flushable end plug/cap.
 - a. Size: $\frac{1}{2}$ -inch NPS.

2.12 WIRE

- A. Wiring: Solid copper conductor, insulated cable, suitable for direct burial.
 - 1. Feeder Circuit power cables: Type UF, No. 12 AWG minimum between building circuit breaker and controllers.
 - 2. Low-Voltage, Branch Circuit Cables: Type PE, No.14 AWG minimum, between controllers and automatic control valves. Conductor size and color should be as required by controller manufacturer.
 - 3. Splicing Materials: 3m DBR/Y or approved equal.

2.13 PRESSURE GAUGES

- A. Pressure Gauges: ASME B40.1, 2.5 inch diameter dial, liquid filled, stainless steel housing with minimum dial range of 1½ times system operating pressure and bottom outlet.

2.14 PUMP (PRIMARY OR BOOSTER)

- A. If a pump (primary or booster) is required, contractor must install the manufacturer type and size as indicated on drawings. See detail notes and drawings for specific model number and electrical requirements. Contractor must verify the water source meets the minimum requirements of the design.

2.15 SUPPLIER

- A. All irrigation equipment to for this project to be purchased from Simmons Irrigation Supply.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor to examine site for conditions under which the work is to be performed. Communicate existence of any unsatisfactory site conditions to Owners Representation prior to commencement of installation. Start of installation means acceptance of site conditions. Damage to existing landscaping, hardscape, structures, utilities, etc. on the site will be the responsibility of the Contractor. Investigate and determine available water supply water pressure and flow characteristics prior to installation. If water source does not meet the minimum requirements of the design, consult Landscape Architect for design modifications.

3.2 PREPARATION

- A. Set flags to identify proposed sprinkler and valve locations. Obtain Landscape Architect's approval before excavation.

3.3 SLEEVING AND CONDUIT

- A. Sleeves/Conduits are to be installed prior to paving asphalt or pouring of concrete.
- B. Sleeves are to be installed under all hardscape areas. Refer to installation section 3.7 (D).
- C. Install piping and wires in sleeves where crossing hardscape features such as sidewalks, roadways, parking lots, curbs, etc.
 - 1. Install piping sleeves by boring or jacking under existing paving where possible.
 - 2. Repair any existing hardscape features to their original condition at the Contractor's expense.
- D. Sleeves shall be two (2) pipe sizes larger than the pipe within sleeve. A separate sleeve is required for control wire.
- E. Minimum cover for sleeves (depth of bury) should be consistent with the depth of the pipe routed through it. Refer to section 3.7 D.

3.4 PIPING APPLICATIONS

- A. Refer to detailed specifications for pipe and fittings products listed below. Piping in pits and aboveground may be joined with flanges instead of joints indicated. All above ground piping to be galvanized steel.
- B. Use pipe, tube, fittings, and joining methods according to the following applications.
- C. Pressure and Circuit Piping: Use size and type as indicated on drawings and as follows:
 - 1. All Sizes: ASTM D 2241, SDR 26 or 21, (as indicated on drawings) polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, with Schedule 40, PVC plastic, socket-type fittings, and solvent-cemented joints.
- D. Sleeves: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cemented joints.

3.5 JOINT CONSTRUCTION

- A. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.
- B. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply teflon and apply wrench to valve ends into which pipes are being threaded.
- C. Copper Tube and Fittings, Soldered Joints: Construct joints according to CDA No. 404/0 Products Handbook "Copper Tube Handbook."
- D. Polyvinyl Chloride (PVC) Piping Solvent-Cemented Joints: Construct joints according to

ASTM D 2672 and ASTM D 2855.

1. Handling of Solvent Cements, Primers, and Cleaners comply with procedures in ASTM F 402 for safe handling when joining plastic pipe and fittings with solvent cements.
2. The use of cleaner, purple primer and solvent cements should be used on the pipe and fittings at each joint.

3.6 PIPING INSTALLATION

- A. Install copper tube and copper tube fittings, according to CDA No. 404/0 Products Handbook "Copper Tube Handbook."
- B. Install underground polyvinyl chloride (PVC) plastic pipe according to ASTM D 2774.
- C. Lay piping on solid subbase, uniformly sloped without humps or depressions.
 1. Slope circuit piping down toward drain valve minimum of ½ inch in 10 feet.
 2. Install polyvinyl chloride (PVC) plastic pipe in dry weather when hours at temperature above 40 deg. F before testing, unless otherwise recommended by manufacturer.
- D. Minimum cover: Provide following minimum cover over top of buried piping or 12" below the average local frost depth, whichever is the greater depth.
 1. Pressure Piping: 18" of cover for pipe 2 1/2" and smaller; 24" for pipe 3" and 4", and 30" for pipe 6" and larger.
 2. Circuit Piping: 18" of cover for circuit pipe.
 3. Drain Piping: 18" of cover for pipe 4" and smaller; 24" for pipe 6" and larger.
 4. Sleeves: 24" of cover for pipe 6" and smaller; 30" for pipe 8" and larger.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, boring, or jacking. Prior approval by Landscape Architect must be obtained for all tunneling and boring.
- F. Install all piping and wire under sidewalks and paving in sleeves.
- G. Prior approval by Landscape Architect must be obtained for all trenching around existing specimen/large trees. Only hand trenching or directional boring will be allowed within "tree save" areas.
- H. Backfilling: Excavate to depths required to provide 2 inch depth of sand bedding for pipe when rock or unsuitable bearing material is encountered. Fill to match adjacent grade elevations with approved earth fill material free from all rock, stone or sharp objects, as well as, roots and building material. Place and compact fill material in lifts (layers) not greater than 6 inches thick. Mechanical tamping shall be done after each lift to eliminate trench settling. Contractor shall be responsible for repair or restoration of trench settlement in excess of ½ inch.

3.8 VALVE INSTALLATION

- A. Valves: Install underground valves in valve boxes or pits, top of valve box to be level with surrounding finished grade. Bottom of valve box to contain 3 inch of gravel sump.
- B. Control Valves: Install in valve control valve boxes, arranged for easy adjustment and removal.

Top of valve box to be level with surrounding finished grade. Bottom of valve box to contain 3 inch of gravel sump.

3.9 WATER METER INSTALLATION

- A. Install meter per local codes and per local water authority. Contractor to pay all fees associated with meter and tap unless otherwise agreed upon by Owners representative.

3.10 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity as indicated on drawings. Include valves and test cocks. Consult with local water authority with jurisdiction and use only approved type device and installation method prior to installation.
- B. Do not install bypass around backflow preventer.
- C. Do not install backflow preventers with drains or vents in pits or areas subject to flooding.
- D. Support backflow preventers, valves, and piping on 3000 psi minimum, Portland-cement-mix concrete piers or approved equal method.
- E. All above ground backflow preventers should be installed with an approved insulated, fiberglass cover.

3.11 PRESSURE REGULATOR INSTALLATION

- A. Install pressure regulators with shutoff valve and strainer on inlet and pressure gauge on outlet. Install shutoff valve on bypass where indicated

3.12 PIT CONSTRUCTION AND INSTALLATION

- A. Construct pits of cast-in-place concrete or provide precast concrete pits of dimensions indicated, with manhole frame and cover, ladder, and drain. Include sleeves with waterproof mechanical sleeve seal for pipe entry and exit or as indicated.

3.13 FIELD QUALITY CONTROL

- A. Testing: Perform hydrostatic test of mainline piping and valves before backfilling trenches. Piping may be tested in sections to expedite work. Notify the hardscape Architect or Owners Representative 72 hours in advance of pressure testing and document testing to their satisfaction.
 - 1. Subject the piping system to static operating pressure without exceeding pressure rating of piping system materials. Isolate the test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.

3.14 SPRINKLER INSTALLATION

- A. Sprinklers: Flush circuit piping with full head of water and instal sprinklers after hydrostatic test is completed.
 - 1. Install lawn sprinklers at manufacturer's recommended heights.
 - 2. Install shrubbery sprinklers at heights indicated.
 - 3. Locate part-circle sprinklers to maintain a minimum distance of 6" from walls and 2" from other boundaries (sidewalks, curbs) unless otherwise indicated.
 - 4. Install nozzles as indicated on drawings and adjust to avoid spray onto adjacent hardscape.

3.15 AUTOMATIC CONTROL SYSTEM INSTALLATION

- A. Install controllers according to manufacturer's written instructions and as indicated.
- B. Install control wiring in same trench with piping where possible. All wire crossing under a street or sidewalk shall be in a conduit.
- C. All splices to be made/located inside a valve box with a minimum of 60 inch of slack, excess wire coiled on each side of the splice.

3.16 CONNECTIONS

- A. Connect piping to sprinklers, devices, valves, control valves, specialties, and accessories.
- B. Connect water supplies to irrigation systems. Include backflow preventers on potable water supplies.
- C. Electrical Connections: Connect to power source, controllers, and automatic control valves.

3.17 CLEANING AND ADJUSTING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.
- B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.
- C. Carefully adjust lawn sprinklers so they will be flush with, or not more than ½ inch above, finish grade after completion of landscape work.
- D. Adjust settings of controllers and automatic control valves, and provide written irrigation schedule

3.18 COMMISSIONING

- A. Starting Procedures : Follow manufacturer's written procedures. If no procedures are pre-scribed by manufacturers, proceed as follows:

1. Verify that specialty valves and their accessories have been installed correctly and operate correctly.
2. Verify that specified tests of piping are complete.
3. Check that sprinklers and devices are correct type.
4. Check that damaged sprinklers and devices have been replaced with new materials.
5. Check that potable water supplies have correct type backflow preventers.
6. Energize circuits to electrical equipment and devices.
7. Adjust operating controls.

- B. Operational Testing: Perform operational testing after hydrostatic testing is completed, backfill is in place, and sprinklers are adjusted to final position.

3.19 AS-BUILT DRAWINGS

- A. Record Drawings: At conclusion of work, and as a condition for request for final payment, submit Record Drawings at a scale matching that of the construction drawings.

3.20 CLEAN-UP

- A. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall make any necessary repairs, adjustments and corrections to the work as required by the Drawings and Specifications. The Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures and all other items not incorporated into the work. The site shall be left in a neat and presentable condition.

3.21 GUARANTEE

- A. For a period of one year from date of final acceptance of the work performed under this Contract, the Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material, workmanship, or proper functioning of system.

3.22 REPLACEMENTS

- A. Landscape Irrigation System- During the last month of the guarantee period, the Landscape Architect and Contractor shall inspect the installation to determine the condition of the complete system. A list of defective materials or installations to be replaced shall be made and the Contractor will make repairs within thirty days of receiving written notification. Replaced materials and installation shall be in accord with these Specifications, Drawings and/or schedules. Damages to products and installation made by others are not subject to this replacement guarantee, this is only for defective material and workmanship.

3.23 DEMONSTRATION

- A. Demonstrate to Landscape Architect that system meets coverage requirements and that automatic controls function properly.

Mulberry Street Historic Cemetery
Visit LaGrange
LaGrange, Georgia

- B. Demonstrate to Owner's maintenance personnel operation of equipment, sprinklers, specialties, and accessories. Review operating and maintenance information.
- C. Provide 7 days written notice in advance of demonstration to the Landscape Architect and Owner's Representative.
- D. Provide a written schedule indicating days of operation, start time, and length of time each valve (zone) is required to open and provide 1.0 inch of water per week to the planted area.

END OF SECTION