

SECTION 02910 PLANTING IRRIGATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section includes specifications for automatic irrigation system.

1.02 REFERENCE STANDARDS

- A. ASTM International (ASTM International):
 - 1. D1784 Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds
 - 2. D1785 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - 3. D2241 Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
 - 4. D2464 Specification for Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
 - 5. D2466 Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
- B. National Sanitation Foundation (NSF)

1.03 SUBMITTALS

- A. Materials list: Submit materials list. Include manufacturer, model number and description of all materials and equipment. Include sealants, cements, lubricants and other proprietary items.
- B. Shop drawings: Submit shop drawings for assemblies not detailed on the Contract Drawings. Include mounting details for rain shutoff.
- C. As-Built Planting Irrigation Drawings: Submit as specified in Section 01720, Contract Record Documents. The following requirements are in addition to those specified in Section 01720, Contract Record Documents:
 - 1. Show every change from Contract Drawings and Specifications and exact as-built locations, sizes and kinds of equipment.
 - 2. Dimension from 2 permanent points of reference such as building corners, sidewalks, road intersections or monuments to the following items:
 - a. Connection to water source

- b. Valves (ball valves, remote control vales, quick coupling valves)
 - c. Routing of pressure lines
 - d. Controller
- D. Operation and Maintenance Manuals: Submit as specified in Section 01730, Operations and Maintenance Manuals. Include the following data:
- 1. Copy of Controller Charts: Include full size and reduced versions of each chart as mounted in Controllers. Reduced versions shall be either 8 1/2 inches by 11 inches or 11 inches by 17 inches sheets, folded. Fold full size version and enclose in clear plastic pocket in manual binder.

1.04 QUALITY ASSURANCE

- A. Installer of irrigation systems shall be a licensed Landscape Contractor.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic piping protected from direct sunlight. Support piping to prevent sagging and bending.

1.06 SEQUENCING AND SCHEDULING

- A. Coordinate sprinkler piping with planting work specified in Section 02900, Planting.
- B. Coordinate sprinkler piping with grading and utility work.

1.07 WARRANTY

- A. Refer to General Provisions GP4.3, Guaranty of Work. The Guaranty of Work shall include the following provisions in regard to planting irrigation system:
 - 1. Agree to repair or replace defective Work including adjacent work which is damaged by such defects, with the exception of ordinary wear and tear, abuse or neglect. This includes damage to site improvements caused by settlement of improperly compacted trench backfill.

1.08 MAINTENANCE MATERIALS

- A. Special tools: Deliver two sets of special tools as required to operate, adjust, dismantle or repair equipment. Include tools not normally found in possession of maintenance personnel. At minimum provide the following:

1. Two sets of special tools and valve keys required for operating, removing, disassembling and adjusting each type of valve supplied on the Project.
2. Two quick coupler keys and matching hose swivels.

1.09 MAINTENANCE SERVICE

- A. Maintain irrigation system in working order from beginning of work until the end of the Maintenance Period specified in Section 02900, Planting. Maintenance of system includes, for example, the following work: Flushing system and adjusting heads; providing optimum amounts of water to plants; replacing lost, stolen or damaged equipment; reprogramming controller.
 1. In addition to hand watering required in Section 02900, Planting, for plant establishment. During any times when irrigation is not available due to maintenance of irrigation system, hand water as required for maintaining plants.

PART 2 - PRODUCTS

2.01 PVC PIPE AND FITTINGS

- A. Polyvinyl Chloride (PVC) Pipe: NSF approved, Type 1, Grade 1 PVC compound; ASTM D1784, ASTM D1785 and ASTM D2241.
- B. Pipe shall bear the following markings:
 1. Manufacturer's name
 2. Nominal pipe size
 3. Schedule or class
 4. Pressure rating in PSI
 5. Date of extrusion
- C. Pressure Main Line Pipe: PVC 1120 plastic pipe: Class 315 for 1 1/2 inch and larger; schedule 40 for 1 1/4 inch and smaller.
- D. Lateral Line Pipe: PVC 1120 plastic pipe. Class 200 for 3/4 inch and larger.
- E. Sleeves (Twice the diameter of working pipe):
 1. Water lines: Schedule 40 PVC 1120
 2. Electrical lines: Gray, schedule 40 PVC conduit
 3. Caps: Schedule 40 PVC

- F. Fittings:
 - 1. Solvent weld socket fittings: Schedule 40, Type 1, Grade 1, NSF approved, ASTM D2466. Schedule 80, ASTM D2464. Fittings shall bear manufacturer's name or trademark, material designation, size, applicable IPS schedule and NSF seal of approval.
 - 2. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods recommended by pipe manufacturer.
- G. Risers: Schedule 80 PVC threaded nipples and elbows.

2.02 OTHER PIPING MATERIALS

- A. Pipe upstream of (backflow preventer/master valve): Schedule 40 galvanized steel.
- B. Pipe Wrapping Tape:
 - 1. Metal pipe: 2-inch wide, 20 mils thick, black PVC, all weather corrosion-resistant tape with high tack adhesive formulated to resist corrosion. Use same manufacturer's pipe primer to seal pipe and prepare for tape wrapping.
 - 2. PVC pipe: As above, except primer is not required.
- C. Pipe Joint Compound: Non-hardening, non-toxic, designed specifically for use on PVC and metal threaded connections in water carrying pipe and as recommended by pipe manufacturer.
- D. Flexible Riser/Connector: EPDM rubber hose, PVC ends, with stainless steel bands. Product specifically marketed for irrigation systems such as Flex-Riser, King Brothers Industries, or Engineer approved equal.
- E. Provide dielectric fittings where dissimilar metals come into contact.
- F. PVC Sleeves: Schedule 40 PVC.
- G. Galvanized Steel Sleeve: ASTM A53

2.03 VALVES

- A. Ball valve: Brass construction, stainless steel ball, two-piece body, threaded connections, with teflon seats and full port.
- B. Plastic electric remote control valve:
 - 1. Heavy-duty, stainless steel fasteners, nylon-reinforced rubber diaphragm
 - 2. Normally closed with manual internal bleed; self-flushing stainless steel screen and brass flow control stem

3. Rated to 150 psi
 4. 24 Vac solenoid actuated
- C. Quick coupling valves: Bronze construction, 1 inch connection, two-piece body, yellow vinyl locking top, single slot and lug. Size: As indicated on the Contract Drawings.
- D. Inline Wye Filter
1. Specifically for low flow applications
 2. Rated to 150 psi
 3. Standard 200 mesh screen
 4. Shall not exceed 5 inches high, 6 inches long, and 2 1/2 inches wide
- E. Inline Pressure Regulator: Rated not less than 80 psi.

2.04 VALVE BOXES

- A. High Density Polyethylene (HDPE), green, UV resistant, with stainless steel bolt-down mechanism and heat-branded letters, minimum 2 inch height.
1. Remote control valves and gate valves: 12 inches by 18 inches, series 1419 B. Letters: "ICV" and the valve number.
 2. Quick coupling valve (QCV): Round, 10 inch diameter, series 910. Letters: "QCV".

2.05 SPRINKLER HEADS

- A. Spray Sprinkler:
1. Matched precipitation rate, seamless molded plastic, with stainless steel adjustment screw and retraction spring.
 2. Pressure activated wiper seal and removable flushing plug.
 3. Pop-up body shall have pressure regulator for 30 psi pressure regulation to nozzle and integral check valve capable of preventing low-head drainage up to 8 feet of head.
 4. Pop-up height: 6 inches in shrub and groundcover areas.
 5. Nozzle: As shown on the Contract Drawings. Provide pressure compensating screen where required to reduce radius.

2.06 SUBSURFACE DRIP SYSTEM EQUIPMENT

- A. Provide all components required for complete system to suit field conditions. All components shall be of single manufacturer.

1. Pressure regulator: Plastic, in-line serviceable, with built-in gauge, rated for 2.0 to 20 gpm.
2. Filter: Plastic, Y body, 200 mesh, composed of stacked thermoplastic discs. Maximum pressure loss: 5.87 psi at 17 gpm.
3. Air relief valve: Plastic, 1/2 inch MPT
4. Tubing: Low density 5/8 inch polyethylene with Rootguard; 0.71 O.D.; 0.62 I.D. Shall have integral, pressure compensating, self-cleaning emitters, 12 inches on center. Emitter flow: 1.02 gph. Shall maintain constant flow at inlet pressure of 5 to 50 psi. Provide fittings, staples adapters and other components of same manufacturer.
5. Line flushing valve: Plastic, 1 gpm, 1/2 inch MPT inlet, shall flush automatically at start of each cycle.
6. Stainless steel clamp: Type 304 stainless steel, screwed hose clamps, as recommended by manufacturer of subsurface irrigation system.
7. Emitter – Multi-Outlet Device – 8 Port, with 1/2 inch inlet

2.07 BACKFLOW PREVENTION DEVICE

- A. Reduced pressure type, bronze with 304 stainless steel springs, with two (2) ball valves, pressure rated to 175 psi, 1-inch size.

2.08 CONTROLLER

- A. UL listing; pedestal mount, as shown on the Contract Drawings. Controllers shall be factory mounted in manufacturer's enclosure unless otherwise shown.
- B. Solid state, microprocessor-based, capable of fully-automatic, semi-automatic or manual operation.
- C. Programming: 24 Station. Station timing: 1 minute to 99 minutes in 1 minute increments. Non-volatile memory.
- D. Master valve/pump start circuit and valve test function
- E. Water budgeting: 0 - 200 percent
- F. 6 starts per program per day
- G. Standby watering schedule
- H. Rainbird, ESP-LX Series with locking steel cabinet, or Engineer approved equal
- I. Controller charts: Provide controller charts the maximum size that the controller door will allow, showing areas covered by each controller. Color code area of coverage of each valve and enlarge valve sequence to be readable when

drawing is reduced. Reduce approved As-Built drawings and seal between two 20-mil plastic sheets; install inside door.

2.09 FLOW SENSOR

- A. Schedule 80 PVC with removable, non-magnetic sensing mechanism. Rated to 100 psi at 140 degrees F.
- B. Sensing mechanism: Electronic detector, glass reinforced polyphenylene sulfide housing with glass reinforced nylon impeller, UHMWPE bearing, tungsten carbide shaft, and EPDM O-rings.

2.10 CONTROL WIRE

- A. Control wire: Soft-annealed, uncoated copper, single conductor, with PVC insulating jacket, UL approved for direct burial, size and color as follows:
 - 1. Common ground: White, size #12 AWG-UF
 - 2. Control wire: Color other than white, size #14-1 AWG-UF
- B. Provide separate common ground for each controller.
- C. Connections: Gel-sealed waterproof connector kit, UL listed for direct burial splices, with spring connector, vinyl insulator and moisture proof snap top packet. DBY/DBR connector sealing packs, as manufactured by 3M Company, Austin, TX, or equal.

2.11 RAIN SENSOR

- A. Rain Sensor: Hygroscopic disks housed in UV stabilized, thermoplastic housing with weatherproof switch mechanism and 6 inch aluminum mounting bracket, with automatic return to normal watering cycle, as manufactured by Glen Hilton, Products, Inc, Richmond, VA, or equal.
- B. Click stop settings shall measure rainfall in quantities of 1/8 to 1 inch and shut off watering cycle during rain. Set device to shut off system when rainfall reaches 1/2 inch.
- C. Shall be low voltage, UL listed, with 25 feet of No. 20 AWG 2 conductor wire and lead wire for normally open wiring. Provide additional mounting hardware and wiring to suit project conditions.

2.12 TRENCH BACKFILL

- A. Trench backfill in planting areas shall be planting mix specified in Section 02900, Planting.
- B. Trench backfill under paving shall meet requirements of Section 02300, Earthwork.

2.13 OTHER MATERIALS

- A. Concrete: As specified in Section 03300, Cast-in-Place Concrete. Minimum compressive strength: 3,000 psi.
- B. Drain rock: 3/4 inch washed drain rock.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Protect existing and new above and below ground features.
- B. Coordinate placement of items to be embedded into concrete work or installed under paving.
- C. Design pressure is as shown on Contract Drawings. Verify static pressure at point of connection (POC) before starting construction and notify the Engineer if it is different from the design pressure.
- D. Irrigation demand is shown on the Contract Drawings. Verify at POC before starting construction.

3.02 LAYOUT

- A. Drawings: For purposes of clarity and legibility, the Contract Drawings are diagrammatic to the extent that many offsets, bends, unions, special fittings, and exact locations of items are not indicated, unless specifically dimensioned. Exact routing of piping, conduits and wiring shall be governed by actual site conditions.
 - 1. Provide necessary fittings and offsets to adapt to existing conditions and prevent conflicts with other work and existing improvements.
- B. Before installation, stake layout of pressure supply lines and valves for review. Coordinate with staked layout of trees provided under Section 02900, Planting. Adjust as required in ensure coverage, to avoid interference with planting.

3.03 BACKFILLING

- A. Backfill with specified material after testing pipe. Compact backfill to a density equal to adjacent soil, or as specified in Section 02300, Earthwork.
- B. Correct subsequent settlement of trenches, and correct any damage caused by settlement.

3.04 SLEEVES AND CONDUITS

- A. Provide sleeves and conduit of sufficient size and quantity to accommodate all pipe and wiring. Install sleeves where control wires and pipe pass through or under walls and under paving. Provide galvanized steel pipe sleeves where sleeves are installed by jacking or boring.

- B. Install minimum 7 inches below bottom of pavement base, and at least as deep as required depth of pipe.
- C. Sleeves and caps: Extend minimum 12 inches beyond edge of pavement. In-line fittings are not permitted in sleeves less than 20 feet long. Cap ends of sleeves hand tight until pipe is installed.
 - 1. Install sleeves and conduit level and in a straight line.
- D. Backfill with 4 inches clean sand on all sides of sleeves, and compact by tamping.
- E. Mark locations of sleeve ends with 2 x 4 stake extending 6 inches above finish grade, for future location during construction. Label stake clearly with letter "I". Remove stake when assembly is completed.

3.05 POINT OF CONNECTION/WATER METER

- A. Make arrangements and pay costs for installation of water meters at locations indicated on Contract Documents. Coordinate with the jurisdictional authorities and the Engineer.

3.06 BACKFLOW PREVENTION DEVICE

- A. Connect backflow prevention device to water supply line in approximate location shown on Contract Drawings.
- B. Arrange and pay for tests and certificates required by jurisdictional authorities.

3.07 PIPE

- A. General:
 - 1. Install pipe under existing paving by jacking or boring.
 - 2. Do not use pipe joint compound on sprinkler bases or remote control valves.
 - 3. Cap open pipe ends as pipe line is assembled to keep out soil or debris. Remove caps only when necessary to continue assembly.
 - 4. Sleeve pipe under paving. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeves to keep soil out.
 - 5. Pipe wrapping: Wrap galvanized pipe and fittings in contact with soil and to 3 inches above soil line. Overlap tape 1/2 its width.
 - 6. Provide check valve where required to prevent erosion from low head drainage.

- B. Solvent-weld PVC:
1. Install plastic pipe as recommended by manufacturer, including accommodating expansion and contraction.
 2. Install PVC pipe in trench with manufacturer's markings facing up.
 3. Cut pipe ends square and remove burrs. Pipe and fitting shall be free of dirt, dust and moisture.
 4. Dry-insert pipe into fitting to check fit. Pipe should enter fitting 1/3 to 2/3 depth of socket.
 5. Apply primer to socket and pipe end. Apply heavy coat of cement to pipe end. Apply light coat of cement to inside of socket and second coat to pipe end.
 6. Insert pipe into fitting and turn 1/4 turn until pipe seats to the bottom of the socket. Check alignment of pipe and fitting.
 7. Hold joint still for 30 seconds and remove excess cement.
 8. Cure joint minimum 30 minutes before handling and 6 hours before filling with water.
- C. Threaded joints:
1. Field threading of plastic pipe or fittings is not permitted. Use factory-made threads only.
 2. Use factory-made metal nipples wherever possible. Field cut threads in metal pipe may be used only where approved by the Engineer. Cut threads accurately on axis with sharp dies.
 3. Apply pipe joint compound to male threads and first 3 female threads.
 4. On metal to metal joints, no more than 3 full threads shall show when joint is complete.
 5. When assembling threaded plastic fittings, tighten joint no more than one (1) full turn beyond hand tight. Use strap type friction wrench only; do not use metal-jawed wrench.

3.08 VALVES

- A. General:
1. After pipe and risers are in place and connected and before installation of valves, flush out system with a full head of water. Lines shall be free of soil or debris.
 2. Locate and install as shown. Obtain Engineer's approval of location of valves and alignment of boxes.

- B. Valve Box Installation, General:
 - 1. Install boxes 18 inches from walk or header and 12 inches apart. Short side of rectangular boxes shall be parallel to walk or header. Install boxes 2 inches above finish grade in groundcover areas; flush in lawn areas.
 - 2. Install common bricks as shown and as required to keep box stable. Place 3/4 inch drain rock inside box for drainage as shown.
 - 3. No soil or accumulated water is permitted in valve boxes. Install PVC tape over box side cutouts.
- C. Remote Control Valve:
 - 1. Install where shown on Contract Drawings; group boxes together and install in groundcover areas wherever possible.
 - 2. Install separate box for each valve.
 - 3. Provide a separate riser and connection to mainline for each remote control valve shall have. Do not manifold valves to a single riser from mainline unless shown on the Contract Drawings.
 - 4. Number valves in sequence shown on the Contract Drawings.
 - 5. Label each valve with controller and station number on 2-1/4 inches by 2-3/4 inches polyurethane tag attached to control wire.
- D. Quick coupling valve: Set valve perpendicular to finish grade, unless otherwise shown.

3.09 SPRINKLERS

- A. Thoroughly flush lines before installing sprinkler heads.
- B. Locate and install heads, risers and fittings as shown. Notify the Engineer and adjust layout and provide additional heads, as required, where field conditions or obstructions prevent adequate coverage.
- C. Set heads perpendicular to finish grade, unless otherwise shown.
- D. Adjust sprinkler heads for proper distribution and trim, providing complete coverage with minimal overspray.

3.10 CONTROLLER

- A. Refer to the Sections of Division 16, Electrical, for specifications for power to the controller.

- B. Install in approximate location shown on the Contract Drawings. Obtain Engineer's acceptance of exact location. Connect to disconnect switch.
- C. Mount enclosure as shown.
- D. Connect control wires to controller according to valve numbers shown, in sequence shown on the Contract Drawings. Label each control wire with permanent label showing station number of valve controlled.
- E. Rain sensor: Mount in location accepted by the Engineer, as shown on approved shop drawings. Connect according to manufacturer's instructions and wiring diagrams.
- F. Control wire:
 - 1. Run lines along mains wherever possible. Provide separate conduit for wires under paving. Tie wires in bundles with 1-inch wide electrical tape at 10-foot intervals and allow slack for contraction between strapping. Tape is not required in sleeves.
 - 2. Loop three (3) feet of extra control and ground wires in 1-inch diameter coil, at each valve, at 100 foot intervals along wire runs, and at changes of direction.
 - 3. Splicing is not permitted.
 - 4. Install spare control wire of different color for each controller along entire main line.
- G. Programming: Perform programming throughout construction and maintenance period. Provide optimum amounts of water for each plant type to maintain plants in vigorous healthy condition. Reprogram as required at end of maintenance period.

3.11 TESTING PIPE

- A. Center-load pipe with approved backfill to anchor pipe before testing. Do not cover fittings.
- B. Before testing, bleed air out of lines at line pressure. Provide vertical pipe at high points during installation.
- C. Do not cover or enclose work until tests are approved by the Engineer.
- D. Solvent weld pipe: Test hydrostatically after joints have cured at least 24 hours. Provide caps, pumps, pressure gauges and other equipment required to perform test.
 - 1. Test pressure mainline at 150 psi for 4 hours and prove watertight.
 - 2. Cap sprinkler risers and test lateral lines at line pressure. Review system for leaks.

- E. Repair leaks and repeat tests until system is proven watertight.
- F. Remake faulty joints with new materials. Do not use cement or caulking to seal leaks. Perform repairs in conformance with the Contract Documents.

3.12 DRIP SYSTEM POST-INSTALLATION CHECK

- A. Immediately after installation, flush lateral line piping by removing the last emitter from each line.
- B. Clean filter screens. Open filter flush valve for at least 10 seconds. Clean or replace clogged elements.
- C. Operation check: While system is operating, check pressure gauge downstream from filter. Pressure shall be minimum 80 percent of supply pressure and minimum 10 percent above the setting of the pressure regulator.
- D. Clean or replace filter element as required to obtain specified pressure
- E. Adjust pressure regulator to system design pressure.
- F. Verify that emitters are producing specified water output. If not, replace emitters, check filter element, check pressure at emitters, and review system for clogs and leaks. Correct deficiencies.

3.13 FIELD QUALITY CONTROL

- A. Progress observations: In addition to the observations specified below, the Engineer will make periodic progress observations.
- B. Notify the Engineer in advance of the following observation meetings, as indicated:
 - 1. Field layout: 3 days
 - 2. Pressure supply line installation and testing: 48 hours
 - 3. Controller installation: 48 hours
 - 4. Coverage test: 48 hours
 - 5. Maintenance period observations: 7 days
 - 6. Final observation: 7 days

3.14 SYSTEM ADJUSTMENT

- A. Flush and adjust sprinkler heads for optimum performance. Prevent overspray onto walks, roadways, paving and buildings. Adjust nozzle sizes and degree of arc, and install pressure compensating screens, as required to cover planting areas without overspray. Adjust valve flow controls.

- B. Test and adjust entire system at completion of each phase or section of work.
- C. Perform coverage test in the presence of the Engineer to establish that coverage of all planting areas is complete and adequate. Correct deficiencies and repeat test until approved by the Engineer.

3.15 ACCEPTANCE

- A. Obtain Engineer's acceptance of irrigation system after irrigation work is complete and after acceptance of planting work as specified in Section 02900, Planting.
- B. Operate system during observation by the Engineer.

3.16 OPERATION INSTRUCTION

- A. Refer to Section 01730, Operations and Maintenance Manuals. Provide six (6) hours instruction in operation and maintenance of system to Owner's maintenance personnel, after completion and acceptance of irrigation system by the Engineer. Provide instruction by manufacturer's representative where Contractor is not expert in operation of equipment.

END OF SECTION