

## SECTION 02812

# PRESSURIZED IRRIGATION SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Aboveground, underground, and drip irrigation systems complete with heads, valves, controls, and accessories.

#### 1.2 RELATED SECTIONS

- A. Section 02936: Vegetation Establishment Period.
- B. Section 03055: Portland Cement Concrete.

#### 1.3 REFERENCES

- A. ASTM A 53: Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. ASTM B 88: Copper Pipe.
- C. ASTM B 687: Brass, Copper, and Chromium-Plated Pipe Nipples.
- D. ASTM D 1784: Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated poly (Vinyl Chloride) (CPVC) Compounds.
- E. ASTM D 1785: Poly(Vinyl Chloride) PVC Plastic Pipe, Schedules 40, 80, and 120.
- F. ASTM D 2466 and D 2464: Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings; Schedules 40 and 80.
- G. ASTM D 2564: Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- H. ASTM D 2672: Joints for IPS PVC Pipe Using Solvent Cement.
- I. ASTM F 656: Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

- J. ASSE 1013, 1015: Backflow Preventers, Pressure Reducers.
- K. NEC: National Electric Code. (Latest edition)
- L. Utah Plumbing Code: Section 1003.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Location of sprinkler heads: Design location is approximate.
  - 1. Adjust as necessary to avoid existing plants and other obstructions.
  - 2. At no time should the number of heads or valves for example be less than that indicated on the plans.
- B. Water Coverage:
  - 1. Head to head coverage in turf and other planting areas (100 percent).
  - 2. Do not increase or decrease number of heads or size of pipe indicated unless approved by Engineer.
- C. PVC Pipe: Must be stamped with certified NFS.
- D. If work is to continue after November 1 or resume before April 15, drain the system at the end of each work day. Do not permit water to remain in pipe overnight.
- E. Verify and have marked the location of all utilities and underground obstructions.

#### **1.5 DEFINITIONS**

- A. Mainline: The system of pipes that carry water from the Point of Connection (POC) to the valves.
- B. Lateral Lines: The system of pipes that carry water from the valves to the sprinkler heads and/or emitters.

#### **1.6 SUBMITTALS**

- A. Product Data: Manufacturer's technical data and installation instructions.
- B. Certificates of compliance to Engineer prior to installation.
- C. As-Built Drawings: Red-lined plan layout and details illustrating mainline and lateral lines location, size, and assembly. Include type and coverage of heads, type of valves, controllers, fittings and accessories.

- D. Operating and Maintenance Data:
  - 1. Instructions covering full operation, care, and maintenance of system (and controls) and manufacturers parts catalog. Include drain procedures, blow out features for example.
  - 2. Instruct maintenance personnel in proper adjustment of sprinkler heads and use of special tools for adjustments.
- E. Keys:
  - 1. Gate Valve Key.
  - 2. Stop and Waste Valve Key: "T" handle, rigid steel, 5 ft long minimum, key end to fit the stop and waste valve nut.

## **PART 2 PRODUCTS**

### **2.1 PIPE AND FITTINGS**

- A. Mainline: Solvent welded schedule 40 PVC through 1-1/2 inch, then Class 200 PVC. ASTM D 1784 and ASTM D 1785.
- B. Lateral line: Solvent welded schedule 40 PVC through 1-1/2 inch, then Class 200 PVC. Meet ASTM 1784 and ASTM D 1785.
- C. Pipe Fittings: Solvent welded schedule 40 PVC. Meet ASTM D 2466.
- D. Valve Fittings: Solvent welded schedule 40 PVC. Meet ASTM D 2464.
- E. Risers: Threaded schedule 80 PVC. Meet ASTM D 2464.
- F. Copper Pipe: Type K as specified in ASTM B 88.
- G. Copper Fittings: Wrought or cast as specified in ASTM B 687.

### **2.2 VALVES**

- A. Automatic Control Valve:
  - 1. Body made of high-strength, non-corrosive PVC material.
  - 2. Pressure regulating (set at 50,750 psi).
  - 3. Slow and smooth opening and closing with a manual flow control and internal bleed screw.
  - 4. Highly efficient, totally encapsulated 24 VAC solenoid.
  - 5. High-strength rubber or synthetic rubber diaphragm.

- B. Gate Valve: Threaded brass construction, 200 psi rated (minimum) and sized according to main line.
- C. Manual Drain Valve: 3/4 inch bronze body, angle valve with replaceable seat disc and brass cross handle.

### **2.3 BACKFLOW PREVENTER**

- A. Body and caps constructed of bronze with wear and corrosion resistant internal parts complete with bronze quarter turn ball valves.
- B. Reduced Pressure Principle Device (RP) as specified in ASSE 1013.
- C. Double Check Valve (DCV) as specified in ASSE 1015.
- D. Capable of being tested and serviced without removal of device from the line.

### **2.4 AUTOMATIC CONTROLLER**

- A. General: A commercial grade controller manufactured expressly for control of automatic valves and underground irrigation systems and equipped with the following minimum features.
  - 1. 12-hour duration for any or all stations.
  - 2. Four programs, with eight start times each.
  - 3. Two master valve terminals, one programmable by station.
  - 4. 365-day calendar with leap year intelligence.
  - 5. Event day off option.
  - 6. Programmable rain delay.
  - 7. Water budget by program with adjustments from 0 to 300 percent in one percent increments.
  - 8. Capable of having total run time split into usable cycles.
  - 9. Manual or automatic operation.
  - 10. Non-volatile.
  - 11. Battery backup.
  - 12. Heavy-duty electrical surge protection.
  - 13. UL listed; CSA, CE approved
- B. Transformer: Capable of converting service voltage to control voltage in accordance with manufacturer's recommendations.

## 2.5 PEDESTAL

- A. Free-standing unit with a weather resistant coating typically specified for the controller. Hardware included.

## 2.6 SPRINKLER HEADS

- A. Fixed Riser
  - 1. 1/2 inch x 24 inch schedule 80 riser Male Pipe Threads (MPT).
  - 2. 1/2 inch shrub head adaptor Female Pipe Threads (FPT) x MPT.
  - 3. 1/2 inch FPT barbed swing pipe adapter.
- B. Pop-up Spray Head
  - 1. Made of plastic and stainless steel materials.
  - 2. Pop-up risers of 4 inch, 6 inch, and 12 inch.
  - 3. Stainless steel retraction spring.
  - 4. Ratcheting mechanism.
  - 5. Side and bottom inlets on 6 inch and 12 inch heads.
- C. Rotary Head
  - 1. High-impact plastic construction with stainless steel ratcheting riser.
  - 2. 4-inch minimum pop-up with water-lubricated gear driven design.
  - 3. Integral rubber cover.
  - 4. Heavy-duty, stainless steel retraction spring.
  - 5. Built-in check valve.
- D. Pop-up Impact Head
  - 1. High-impact plastic construction with plastic clapper.
  - 2. 4 inch pop-up design with internal wiper seals.
  - 3. Heavy-duty, stainless steel retraction spring.
  - 4. Built in check valve required when used with more than 3 feet of elevation change on the lateral line.
  - 5. Plastic Sprinkler Nozzles
    - a. Interchangeable.
    - b. Matched precipitation.
  - 6. 3/4 inch side or bottom inlet.
- E. Above-ground Impact
  - 1. Brass construction with stainless steel clapper.
  - 2. Mounted above ground with no pop-up features.
  - 3. 4 inch riser mounted impact.
  - 4. 3/4 inch MPT inlet.

5. Brass Sprinkler Nozzles.
  - a. Interchangeable.
  - b. Matched precipitation.

## **2.7 PLASTIC NOZZLES**

- A. Fixed Spray
  1. Radius patterns and gal/min as shown on plans.
  2. Matched precipitation rates.
  3. Stainless steel adjustment screw.
  4. FPT to match 1/2 inch shrub head adapter.
  5. Pressure regulating: (Required when the psi at the sprinkler does not fall within the range recommended for its use.) See manufacturer's specifications.
  6. Filter screen.
- B. Bubbler
  1. Made of high-impact plastic.
  2. Pressure compensating with adjustable flow and radius as shown on plans.
  3. 1/2 inch FPT.
  4. Attach to fixed riser or pop-up spray.
  5. Filter screen.

## **2.8 DRIP TUBING**

- A. Self cleaning, pressure compensating, polyethylene dripperline.
- B. Dripper discharge: 0.6 gal/hr to 0.9 gal/hr and choice of 12 inch, 18 inch, or 24 inch spacing.
- C. Pressure compensation range from 8 psi to 60 psi.
- D. 0.63 inch ( $\pm 0.01$  inch) outside diameter; 0.54 inch ( $\pm 0.01$  inch) inside diameter.

## **2.9 LINE FLUSHING VALVE**

- A. Made of high impact plastic.
- B. Maximum flow rate per flush valve: 15 gal/min.
- C. Automatic cleaning operation.
- D. Can be disassembled allowing for winterization blow-out.

- E. 1/2 inch MPT threads.

#### **2.10 AIR/VACUUM RELIEF VALVE**

- A. Brass body and cap and rated to 200 psi.
- B. Temperature resistant silicone disc seat.

#### **2.11 DISK FILTER**

- A. Corrosion resistant thermoplastic design.
- B. Multiple disk filter design: 120 mesh.
- C. 1 inch MPT threads.
- D. Shut-off valve.
- E. Constructed of durable, non-corrosive components and equipped with O-ring seals.

#### **2.12 “Y” FILTER**

- A. 1 inch threaded inlet and outlet.
- B. 100 mesh polyester filter screen.
- C. Constructed of durable, non-corrosive components and equipped with an O-ring seal.
- D. Operating flow range of 1 gal/min to 15 gal/min with a pressure range of 10 psi to 150 psi.
- E. Easy removable cap and screen.

#### **2.13 SWING PIPE**

- A. Flexible Polyethylene Pipe: Maximum flow 6.0 gal/min. Inside diameter of 1/2 inch ( $\pm 0.01$  inch) with a wall thickness of 3/32 inch ( $\pm 0.01$  inch) and 80 psi rated.

- B. Flexible Polyethylene Pipe: For flows exceeding 6 gal/min. Inside diameter of 15/16 inch ( $\pm 0.01$  inch) with a wall thickness of 3/32 inch ( $\pm 0.01$  inch) and 80 psi rated.
- C. 1/2 inch Barbed Male Elbow: Plastic
- D. 3/4 inch Barbed Male Elbow: Plastic
- E. 1 inch Barbed Male Elbow: Plastic

#### **2.14 VALVE BOX**

- A. Precast concrete or plastic with adequate hand room to operate small tools and provisions for locking cover to frame.

#### **2.15 WIRE**

- A. Provide wire for connecting remote control valves to the automatic controllers that is Type "UF", 600 V, stranded or solid copper, single conductor wire with PVC insulation and bearing UL approval for direct underground burial feeder cable.
  1. Make all connections with UL approved type seal to make a waterproof connection.
  2. Where possible, bury wires in the same trench as the pipe.
- B. Provide wire with 0.060 inches insulation, minimum covering of ICC-100 compound for positive weatherproofing protection.
  1. For wire sizes 14, 12, 10, and 8 use a single conductor solid copper wire, and for sizes 6 and 4 use stranded copper wire.
  2. Make control or "hot" wires red and all common or "ground" wires white.

#### **2.16 QUICK COUPLER**

- A. Constructed of heavy duty brass with a 3/4 inch one-piece body design.
- B. Operating flow range of 10 gal/min to 50 gal/min with a pressure range of 5,000 psi to 101,500 psi.
- C. 3/4 inch brass valve key.
- D. 3/4 inch brass swivel hose ell.
- E. Stainless steel spring.

## **2.17 WASHED AGGREGATE**

- A. 1-1/2 inch maximum with 100 percent retained on a No. 4 sieve.

## **2.18 JOINT PRIMER AND SOLVENT CEMENT**

- A. As specified in references. ASTM F 656, and ASTM D 2672.

## **2.19 ACCESS SLEEVE**

- A. 2 inch, Schedule 40 PVC with a yellow rubber cap.

## **2.20 TEFLON TAPE**

- A. For use on threaded joints. Quality grade, 0.004 inch ( $\pm 0.001$ ) and domestically made.

## **2.21 CLASS B CONCRETE**

- A. Refer to Section 03055.

# **PART 3 EXECUTION**

## **3.1 EXCAVATION**

- A. Stake pipe and sprinkler locations for approval.
- B. Excavate trenches for sprinkler system pipe to provide 18 inches of cover over main lines and 9 inches over lateral lines.
  - 1. Where trenching is required in proximity to trees that are to remain, do not damage roots.
- C. Barricade trenches within the clear zone and along pedestrian routes that are left open overnight.

## **3.2 INSTALLATION**

- A. General: Plans are diagrammatic. Proceed with installation in accordance with the following:
  - 1. Install stop and waste valves, backflow preventors and other equipment required by local authorities according to Utah Laws and Regulations to make system complete.

2. Install main line, automatic control valves, lateral lines, fittings, and heads/drip line as specified.
  3. Thoroughly flush main lines before installing automatic control valves, and laterals before installing sprinklers. Flush supply lines thoroughly before installing backflow preventers or other regulating devices.
  4. After completion of grading, seeding or sodding, and rolling of grass areas, adjust heads to be plumb and flush with finished grades (flush is even with top of soil level or top of material level).
- B. Piping: Assemble all mainline and lateral lines in accordance with manufacturer's recommendations with no cul-de-sacs.
1. At wall penetrations, pack the opening around the pipe with non-shrink grout. At exterior face, fill perimeter slot with backer rod and sealant. Repair below grade waterproofing and make penetration watertight.
  2. Install PVC pipe in dry weather above 40 degrees F as specified by manufacturer's recommendations. Allow joints to cure a minimum of 8 hours before testing.
- C. Sleeving: Coordinate sleeving installation before placing pavement.
- D. Control Valves:
1. Install at plan locations and according to detail. Use Schedule 80 PVC pipe for nipples on valve header, length as necessary. Install valves two maximum per each standard, plastic valve box and provide 12 inches of expansion loop slack wire at all connections inside valve box.
- E. Manual Drains: Install at locations indicated on plans and according to detail.
- F. Quick-Coupling Valves: Install using 3/4 inch Schedule 80 PVC nipples for risers and elbows. Locations as indicated on plans.
- G. Backflow Preventers:
1. Install assembly using the detail.
  2. In below grade installations, provide washed aggregate drain sump.
- H. Valve Access Boxes:
1. Install over all automatic control valves, manual control valves, or zone shutoff valves and sized to provide adequate room for maintenance..
  2. Install valve boxes flush with finish grade and place parallel or perpendicular to adjacent curbs, sidewalks, or driveways.
  3. Imprint a valve control number on each valve box cover that corresponds to the valve controller (clock). Print the valve box number one inch high (minimum) in a permanent and legible manner.

4. Place washed aggregate in sump as shown on plans.
- I. Automatic Controller:
1. Stake or mark controller location for approval.
  2. Mount the panel enclosure so adjustments can be conveniently made by the operator.
  3. Properly ground controller in accordance with Utah Laws and Regulations. Make all control wire connections to automatic controllers. Coordinate controller installation with electrical work.
  4. If pedestal controller is used, pour the concrete pedestal base with inserted conduits and bolts.
  5. Provide a laminated copy of the irrigation plan indicating valve station numbers and field locations and attach it inside the controller.
  6. Program the controller to provide the appropriate amount of water for each station.
  7. Supply the Engineer with manufacturer's warranties and operating instructions for the controller.
- J. Wire and Electrical Work:
1. Use electrical control and ground wire suitable for sprinkler control cable of size indicated on plans.
  2. Tape control wires to underside of pipe at 15 ft intervals.
- K. Spray Heads, Fixed Risers and Bubblers:
1. Install as per plans.
  2. Adjust sprinkler nozzles to allow for adequate coverage and minimize overspray onto walks, roads, driveways, and buildings.

### **3.3 TESTING**

- A. Notify the Engineer 24 hours in advance of pressure testing the main line.
- B. Before backfilling and after air pockets have been vented from the lines, subject all supply and pressure irrigation lines to a hydrostatic pressure test by maintaining full supply line water pressure for 3 consecutive hours.
- C. Test connections for leaks prior to backfilling and repair all leaks. Lateral lines may be tested in sections to expedite backfilling work.

### **3.4 BACKFILLING OPERATION**

- A. Bed all pipe 2 inch (minimum) surrounding the pipe with native material excavated from the trench and passing through a 1/2 inch sieve.

- B. Prevent soil, rocks, or debris from entering pipes or sleeves.
- C. Compact backfilled trenches thoroughly to prevent settling damage to grades or plant materials. Repair irrigation system and plants at no additional cost to Department.

### **3.5 IRRIGATION INSTALLATION INSPECTION**

- A. Notify the Engineer to schedule the inspection with the Region Landscape Architect after the irrigation system is completely installed and fully functional.
- B. Make the required field adjustments and changes after the inspection.

END OF SECTION