

## SECTION 02810 - IRRIGATION SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Piping.
  - 2. Automatic control valves.
  - 3. Transition fittings.
  - 4. Miscellaneous piping specialties.
  - 5. Sprinklers.
  - 6. Controllers.
  - 7. Boxes for automatic control valves.

#### 1.3 DEFINITIONS

- A. Circuit Piping: 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. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Irrigation zone control shall be automatic operation with controller and automatic control valves.
- B. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:

- 1. Irrigation Main Piping: 200 psig .

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Operation and Maintenance Data: For sprinklers controllers and automatic control valves to include in operation and maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### 1.7 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 to prevent sagging and bending.

#### 1.8 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
  - 2. Do not proceed with interruption of water service without Owner's written permission.

#### 1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Impact Sprinklers: Equal to 10 percent of amount installed for each type and size indicated, but no fewer than 2 units.
  - 2. Spray Sprinklers: Equal to 10 percent of amount installed for each type and size

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

indicated, but no fewer than 2 units.

3. Bubblers: Equal to 10 percent of amount installed for each type indicated, but no fewer than 5 units.

## PART 2 - PRODUCTS

### 2.1 PIPES, TUBES, AND FITTINGS

- A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
- B. Galvanized-Steel Pipe: ASTM A 53/A 53M, Standard Weight, Type E, Grade B.
  1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless-steel pipe with threaded ends.
  2. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
  3. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.
  4. Cast-Iron Flanges: ASME B16.1, Class 125.
- C. Hard Copper Tube: **ASTM B 88, Type L**, water tube, drawn 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. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
  3. 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.
- D. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedule 40.
  1. PVC Socket Fittings: ASTM D 2466, Schedule 40.
  2. PVC Threaded Fittings: ASTM D 2464, Schedule 80.
  3. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket ends.
- E. PVC Pipe, Pressure Rated: ASTM D 2241, PVC 1120 compound, SDR 21 and SDR 26.
  1. PVC Socket Fittings: ASTM D 2467, Schedule 80.
  2. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

### 2.2 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, **1/8 inch** thick unless otherwise indicated; full-face or ring type unless otherwise indicated.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- F. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

## 2.3 MANUAL VALVES

- A. Curb Valves:
  - 1. Description:
    - a. Standard: AWWA C800.
    - b. NPS 1 and Smaller Pressure Rating: 150 psig .
    - c. NPS 1-1/4 to NPS 2 Pressure Rating: 150 psig .
    - d. Body Material: Brass or bronze with ball or ground-key plug.
    - e. End Connections: Matching piping.
    - f. Stem: With wide-tee head.
- B. Curb-Valve Casing:
  - 1. Standard: Similar to AWWA M44 for cast-iron valve casings.
  - 2. Top Section: Telescoping, of length required for depth of burial of curb valve.
  - 3. Barrel: Approximately 3-inch diameter.
  - 4. Plug: With lettering "WATER."
  - 5. Bottom Section: With base of size to fit over valve.
  - 6. Base Support: Concrete collar.
- C. Shutoff Rods for Curb-Valve Casings: Furnish one steel, tee-handle shutoff rod(s) with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve for Project.
- D. Brass Ball Valves:
  - 1. Description:
    - a. Standard: MSS SP-110.
    - b. SWP Rating: 150 psig.
    - c. CWP Rating: 600 psig.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- d. Body Design: Two piece.
- e. Body Material: Forged brass.
- f. Ends: Threaded or solder joint if indicated.
- g. Seats: PTFE or TFE.
- h. Stem: Brass.
- i. Ball: Chrome-plated brass.
- j. Port: Full or regular, but not reduced.

E. Bronze Ball Valves:

1. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig.
- c. CWP Rating: 600 psig.
- d. Body Design: Two piece.
- e. Body Material: Bronze.
- f. Ends: Threaded or solder joint if indicated.
- g. Seats: PTFE or TFE.
- h. Stem: Bronze.
- i. Ball: Chrome-plated brass.
- j. Port: Full or regular, but not reduced.

F. Iron Ball Valves:

1. Description:

- a. Standard: MSS SP-72.
- b. CWP Rating: 200 psig.
- c. Body Design: Split body.
- d. Body Material: ASTM A 126, gray iron.
- e. Ends: Flanged.
- f. Seats: PTFE or TFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel.
- i. Port: Full.

G. Bronze Gate Valves:

1. Description:

- a. Standard: MSS SP-80, Type 2.
- b. Class: 125.
- c. CWP Rating: 200 psig.
- d. Body Material: ASTM B 62 bronze with integral seat and screw-in bonnet.
- e. Ends: Threaded or solder joint.
- f. Stem: Bronze, nonrising.
- g. Disc: Solid wedge; bronze.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- h. Packing: Asbestos free.
- i. Handwheel: Malleable iron, bronze, or aluminum.

## 2.4 AUTOMATIC CONTROL VALVES

### A. Plastic, Automatic Control Valves:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
  - a. Champion Irrigation Products.
  - b. Hunter Industries Incorporated.
  - c. Rain Bird Corporation.
  - d. Toro Company (The); Irrigation Division.
- 2. Description: Molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, and operated by 24-V ac solenoid.

## 2.5 AUTOMATIC DRAIN VALVES

- A. Description: Spring-loaded-ball type of corrosion-resistant construction and designed to open for drainage if line pressure drops below **2-1/2 to 3 psig**.

## 2.6 TRANSITION FITTINGS

- A. General Requirements: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings:
  - 1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.
- C. Plastic-to-Metal Transition Fittings:
  - 1. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-socket or threaded end.
- D. Plastic-to-Metal Transition Unions:
  - 1. Description: MSS SP-107, PVC four-part union. Include one brass or stainless-steel threaded end, one solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

## 2.7 SPRINKLERS

- A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.
- B. Plastic, Pop-up, Gear-Drive Rotary Sprinklers:
  - 1. Description:
    - a. Body Material: ABS.
    - b. Nozzle: ABS.
    - c. Retraction Spring: Stainless steel.
    - d. Internal Parts: Corrosion resistant.
- C. Plastic, Pop-up Spray Sprinklers:
  - 1. Description:
    - a. Body Material: ABS.
    - b. Nozzle: ABS.
    - c. Retraction Spring: Stainless steel.
    - d. Internal Parts: Corrosion resistant.
    - e. Pattern: Fixed, with flow adjustment.
- D. Plastic Shrub Sprinklers:
  - 1. Description:
    - a. Body Material: ABS or other plastic.
    - b. Pattern: Fixed, with flow adjustment.

## 2.8 CONTROLLERS

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
  - 1. Champion Irrigation Products.
  - 2. Hunter Industries Incorporated.
  - 3. Rain Bird Corporation.
- B. Description:
  - 1. Controller Stations for Automatic Control Valves: Each station is variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each station.
  - 2. Interior Control Enclosures: NEMA 250, Type 12, dripproof, with locking cover and

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

two matching keys.

- a. Body Material: Enameled-steel sheet metal.
  - b. Mounting: Surface type for wall.
3. Control Transformer: 24-V secondary, with primary fuse.
  4. Timing Device: Adjustable, 24-hour, 14-day clock, with automatic operations to skip operation any day in timer period, to operate every other day, or to operate two or more times daily.
    - a. Manual or Semiautomatic Operation: Allows this mode without disturbing preset automatic operation.
    - b. Nickel-Cadmium Battery and Trickle Charger: Automatically powers timing device during power outages.
    - c. Surge Protection: Metal-oxide-varistor type on each station and primary power.
  5. Moisture Sensor: Adjustable from one to seven days, to shut off water flow during rain.
  6. Wiring: UL 493, Type UF multiconductor, with solid-copper conductors; insulated cable; suitable for direct burial.
    - a. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.
    - b. 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. Splicing Materials: Manufacturer's packaged kit consisting of insulating, spring-type connector or crimped joint and epoxy resin moisture seal; suitable for direct burial.

## 2.9 BOXES FOR AUTOMATIC CONTROL VALVES

### A. Plastic Boxes:

1. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.
  - a. Size: As required for valves and service.
  - b. Shape: Round.
  - c. Sidewall Material: PE, ABS, or FRP.
  - d. Cover Material: PE, ABS, or FRP.
    - 1) Lettering: "IRRIGATION."

### B. Polymer-Concrete Boxes:

1. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- a. Cover Material: Polymer concrete Reinforced polymer concrete with cover design loading of 5000 lb minimum over 10 by 10 inches square.
  - 1) Lettering: "IRRIGATION."

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."
- B. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.
- C. Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded from 3/4 to 3 inches , to 12 inches below grade. Cover gravel or crushed stone with sheet of asphalt-saturated felt and backfill remainder with excavated material.
- D. Provide minimum cover over top of underground piping according to the following:
  1. Irrigation Main Piping: Minimum depth of 36 inches below finished grade, or not less than 18 inches below average local frost depth, whichever is deeper.
  2. Circuit Piping: 12 inches .
  3. Drain Piping: 12 inches .
  4. Sleeves: 24 inches .

#### 3.2 PREPARATION

- A. Set stakes to identify locations of proposed irrigation system. Obtain Architect's approval before excavation.

#### 3.3 PIPING INSTALLATION

- A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.
- B. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.
- C. Install piping free of sags and bends.
- D. Install groups of pipes parallel to each other, spaced to permit valve servicing.
- E. Install fittings for changes in direction and branch connections.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- F. Install unions adjacent to valves and to final connections to other components with **NPS 2** or smaller pipe connection.
- G. Install flanges adjacent to valves and to final connections to other components with **NPS 2-1/2** or larger pipe connection.
- H. Install expansion loops in control-valve boxes for plastic piping.
- I. Lay piping on solid subbase, uniformly sloped without humps or depressions.
- J. Install PVC piping in dry weather when temperature is above **40 deg F**. Allow joints to cure at least 24 hours at temperatures above **40 deg F** before testing.
- K. Install water regulators with shutoff valve and strainer on inlet and pressure gage on outlet. Install shutoff valve on outlet. Install aboveground or in control-valve boxes.
- L. Install piping in sleeves under parking lots, roadways, and sidewalks.
- M. Install sleeves made of Schedule 40 PVC pipe and socket fittings, and solvent-cemented joints.
- N. Install transition fittings for plastic-to-metal pipe connections according to the following:
  - 1. Underground Piping:
    - a. **NPS 1-1/2** and Smaller: Plastic-to-metal transition fittings.
    - b. **NPS 2** and Larger: AWWA transition couplings.
  - 2. Aboveground Piping:
    - a. **NPS 2** and Smaller: Plastic-to-metal transition fittings/unions.
    - b. **NPS 2** and Larger: Use dielectric flange kits with one plastic flange.

### 3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

- D. Flanged Joints: Select rubber gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- E. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 3. PVC Nonpressure Piping: Join according to ASTM D 2855.

### 3.5 VALVE INSTALLATION

- A. Underground Curb Valves: Install in curb-valve casings with tops flush with grade.
- B. Underground Iron Gate Valves, Resilient Seat: Comply with AWWA C600 and AWWA M44. Install in valve casing with top flush with grade.
- C. Aboveground Valves: Install as components of connected piping system.
- D. Drain Valves: Install in underground piping in boxes for automatic control valves.

### 3.6 SPRINKLER INSTALLATION

- A. Install sprinklers after hydrostatic test is completed.
- B. Install sprinklers at manufacturer's recommended heights.
- C. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries unless otherwise indicated.

### 3.7 AUTOMATIC IRRIGATION-CONTROL SYSTEM INSTALLATION

- A. Equipment Mounting: Install interior controllers on wall.
  - 1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Install control cable in same trench as irrigation piping and at least 2 inches below or beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

3.8 CONNECTIONS

- A. Comply with requirements for piping specified in Division 02 Section "Water Distribution" for water supply from exterior water service piping, water meters, protective enclosures, and backflow preventers. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.
- C. Connect wiring between controllers and automatic control valves.

3.9 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Division 15 Section "Identification for Plumbing Piping and Equipment."
- B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each automatic controller.
  - 1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tapes over underground piping during backfilling of trenches. See Division 2 Section "Earthwork" for warning tapes.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Photovoltaic Panel Structure  
and Parking Lot Addition  
Shasta Community Health Center  
Redding, CA

3.11 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Verify that controllers are installed and connected according to the Contract Documents.
  - 3. Verify that electrical wiring installation complies with manufacturer's submittal.

3.12 ADJUSTING

- A. Adjust settings of controllers.
- B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than **1/2 inch** above, finish grade.

3.13 CLEANING

- A. Flush dirt and debris from piping before installing sprinklers and other devices.

3.14 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain automatic control valves and controllers.

END OF SECTION 02810