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. This Section includes piping, valves, sprinklers, specialties, controls, and wiring for automatic-control irrigation system.

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

1.4 SUBMITTALS

A. Product Data: Include pressure ratings, rated capacities, and settings of selected models for the following:

1. General-duty valves.
2. Specialty valves.
3. Control-valve boxes.
4. Sprinklers.
5. Irrigation specialties.
6. Controllers.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

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

2.2 PIPES, TUBES, AND FITTINGS

A. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedule 40.

1. PVC Socket Fittings, Schedule 40: ASTM D 2466.

B. PE, Controlled OD Pipe: ASTM F 771 and ASTM D 3035, PE 3408 compound, [**DR 9**] [**DR 9 and DR 11**] [**DR 11**].

1. PE Socket Fittings: ASTM D 2683.
2. PE Butt-Fusion Fittings: ASTM D 3261.

C. PE, Controlled ID Pipe: ASTM F 771 and ASTM D 2239; PE 3408 compound; [**SIDR 7**] [**SIDR 9**] [**SIDRs 9, 11.5, and 15**].

1. Insert Fittings for PE Pipe: ASTM D 2609, PA or PP. Include bands or other fasteners.

2.3 GENERAL-DUTY VALVES

A. PVC Ball Valves: MSS SP-122, [**union**] [**nonunion**] type, with full-port ball, [**socket**] [**threaded**] [**socket or threaded**] detachable end connectors, and pressure rating not less than [**125 psig**] [**150 psig**] <**Insert other**>.

1. Material Option: MSS SP-122, of plastic other than PVC and suitable for potable water. Include threaded ends and pressure rating not less than 150 psig, unless otherwise indicated.
2. Manufacturers:

a. American Valve, Inc.
b. Sloane, George Fischer.

2.4 SPECIALTY VALVES

A. Plastic Automatic Control Valves: Molded-plastic body, normally closed, diaphragm type with manual flow adjustment, and operated by 24-V ac solenoid.

1. Manufacturers:

a. Nelson, L. R. Corporation.
b. Rain Bird Sprinkler Mfg. Corp.
c. Toro Company (The); Irrigation Div.

B. Automatic Drain Valves: 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.

C. Quick-Couplers: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

D. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3/4 inch minimum to 3 inches maximum.

2.5 SPRINKLERS

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

1. Manufacturers:

a. Hunter Industries Incorporated.
b. Nelson, L. R. Corporation.
c. Rain Bird Sprinkler Mfg. Corp.
d. Toro Company (The); Irrigation Div.

2. Flush, Surface Sprinklers: Fixed pattern, with screw-type flow adjustment.
3. Bubblers: Fixed pattern, with screw-type flow adjustment.
4. Shrubbery Sprinklers: Fixed pattern, with screw-type flow adjustment.
5. Pop-up, Spray Sprinklers: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.
6. Pop-up, Rotary, Spray Sprinklers: Gear drive, full-circle and adjustable part-circle types.
7. Pop-up, Rotary, Impact Sprinklers: Impact drive, full-circle and part-circle types.
8. Aboveground, Rotary, Impact Sprinklers: Impact drive, full-circle and part-circle types.

2.6 SPRINKLER SPECIALTIES

A. Strainer/Filter Units: Brass or plastic housing, with corrosion-resistant internal parts; of size and capacity required for devices downstream from unit.

B. Emitters: PE or vinyl body.

1. Manufacturers:

a. Agrifim.
b. Amiad Filtration Systems.
c. Netafim USA.
d. NIBCO INC.
e. Rain Bird Sprinkler Mfg. Corp.
f. Toro Company (The); Irrigation Div.

2. Single-Outlet Emitters: To deliver the following flow at approximately 20 psig:

a. Flow: 1/2 gph.
b. Tubing Size: 1/8-inch minimum ID and 10 feet long.

3. Outlet Caps: Plastic, for outlets without tubing.

C. Drip Tubes: NPS 1/2, flexible PE or PVC tubing for emitters and other devices, of length indicated and with plugged end.

1. Manufacturers:

a. Netafim USA.
b. NIBCO INC.
c. Rain Bird Sprinkler Mfg. Corp.

2.7 AUTOMATIC-CONTROL SYSTEM

A. Manufacturers:

1. Nelson, L. R. Corporation.
2. Rain Bird Sprinkler Mfg. Corp.
3. Toro Company (The); Irrigation Div.

B. Exterior Control Enclosures: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.

1. Material: Enameled-steel, sheet metal.
2. Mounting: As indicated..

C. Interior Control Enclosures: NEMA 250, Type 12, dripproof, with locking cover and two matching keys.

1. Material: Enameled-steel, sheet metal.
2. Mounting: As indicated.

D. Control Transformer: 24-V secondary, with primary fuse.

E. Controller Stations for Automatic Control Valves: Each station is variable from approximately 5 to 120 minutes. Include switch for manual or automatic operation of each station.

F. 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 2 or more times daily.

1. Manual or Semiautomatic Operation: Allows this mode without disturbing preset automatic operation.
2. Nickel-Cadmium Battery and Trickle Charger: Automatically powers timing device during power outages.

G. Wiring: UL 493, Type UF-B multiconductor, with solid-copper conductors and insulated cable; suitable for direct burial.

1. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.
2. 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.
3. Splicing Materials: Manufacturer's packaged kit consisting of insulating, spring-type connector or crimped joint and epoxy resin moisture seal; suitable for direct burial.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

B. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

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

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

E. Provide minimum cover over top of underground piping according to the following:

1. Irrigation Main Piping: Minimum depth of [**36 inches**] <**Insert other**> below finished grade, or not less than [**18 inches**] <**Insert other**> below average local frost depth, whichever is deeper.
2. Circuit Piping: [**12 inches**] <**Insert other**>.
3. Drain Piping: [**12 inches**] <**Insert other**>.

4. Sleeves: [**24 inches**] <**Insert other**>.

3.2 PIPING APPLICATIONS

A. Piping in control-valve boxes and aboveground may be joined with flanges instead of joints indicated.

B. Underground Irrigation Main Piping: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.

C. Circuit Piping: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.

D. Drain Piping: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.

E. Sleeves: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.

F. Transition Fittings: Use transition fittings for plastic-to-metal pipe connections according to the following:

1. Couplings:

a. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
b. Underground Piping NPS 2 and Larger: AWWA transition coupling.

2. Fittings:

a. Underground Piping: Union with plastic end of same material as plastic piping.

3. Transition fittings are specified in Division 2 Section "Piped Utilities -- Basic Materials and Methods".

3.3 VALVE APPLICATIONS

A. Underground, Shutoff-Duty Valves: Use the following:

1. NPS 2 and Smaller: Curb stop with tee head, curb-stop service box, and shutoff rod.
2. NPS 3 and Larger: Gate valve with elastomeric gaskets and stem nut, valve box, and shutoff rod.

B. Underground, Manual Control Valves: Bronze globe valve with control-valve box and valve key.

C. Control Valves: Plastic ball valve.

D. Drain Valves: Plastic ball valve.

3.4 INSTALLATION

A. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.

B. Install piping free of sags and bends.

C. Install groups of pipes parallel to each other, spaced to permit valve servicing.

D. Install fittings for changes in direction and branch connections.

E. Install unions adjacent to valves and to final connections to other components.

F. Lay piping on solid subbase, uniformly sloped without humps or depressions.

G. Underground Gate Valves: Install in valve box with top flush with grade.

1. Install valves and PVC pipe with restrained, gasketed joints.

H. Underground Curb Stops: Install in service box with top flush with grade.

I. Underground, Manual Control Valves: Install in manual control-valve box.

J. Control Valves: Install in control-valve box.

K. Drain Valves: Install in control-valve box.

L. Flush circuit piping with full head of water and install sprinklers after hydrostatic test is completed.

M. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries, unless otherwise indicated.

N. Install freestanding controllers on precast concrete bases not less than 36 by 24 by 4 inches thick, and not less than 6 inches greater in each direction than overall dimensions of controller.

O. 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 if irrigation piping is installed in sleeve.

3.5 CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding".

B. Connect wiring according to Division 16 Section "Conductors and Cables".

3.6 LABELING AND IDENTIFYING

A. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape over underground piping, during backfilling of trenches.

B. Refer to Division 2 Section "Earthwork" for warning tapes.

3.7 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

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.

B. Remove and replace units and retest as specified above.

3.8 ADJUSTING

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

C. Adjust sprinklers so they will be flush with, or not more than 1/2 inch above, finish grade.

END OF SECTION 02810
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