

SECTION 02811

IRRIGATION SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

- A. Provide underground sprinkler system as shown and specified. Work includes:
1. All permits and related inspections
 2. Controllers, enclosures and control wire.
 3. Fall winterization and spring start-up service.
 4. Excavation and backfilling related to underground sprinkler system work.
 5. Install all plumbing and electrical work to comply with all local building code requirements
 6. Testing of all mains, laterals, fittings, sprinkler heads, quick coupler valves, control valves and controllers.
 7. Associated interior and exterior plumbing and electrical work, including controller connections and accessories to complete the system
 8. Include a minimum of two (1) full days to review the operation of the irrigation system with owners' representative once the system is 100% operational.
 9. The underground sprinkler system shall be constructed using the sprinkler heads, valves, piping, fittings, controllers, wiring and accessories of the sizes and types as shown on the drawings and per this specification.
 10. The underground sprinkler system shown on the drawings is essentially diagrammatic. Spacing of the sprinkler heads or quick coupler valves is shown on the drawings and shall be exceeded only with the permission of the irrigation consultant – here in, Century Equipment.

1.02 RELATED WORK

- A. Install irrigation mainline piping prior to installation of subgrade drainage system. (if applicable)

1.03 QUALITY ASSURANCE

- A. The contractor shall coordinate the work related to this contract with the work of other trades.
- B. Construct the system to grade and in conformance to areas and locations designated on the drawings
- C. Excavating, backfilling and compacting operations: Comply with earthwork requirements and as specified.
- D. Installer's qualifications: Minimum of five (5) years experience installing underground sprinkler systems of comparable size.
 - 1. Underground sprinkler system work shall be performed only by experienced workmen familiar with sprinkler system installation work under the supervision of a qualified experienced superintendent
- E. All materials shall be supplied from a single source distributor.

1.04 SUBMITTALS

- A. Submit five (5) copies of manufacturer's product data and installation instructions for approval for each of the system components including all sprinkler heads, automatic valves, controllers, and quick coupling valves.
- B. Submit shop drawings:
 - 1. Any deviation from the plans to layout and products shall be submitted by the contractor to the owner's representative at least thirty (30) days prior to installation.
 - 2. Include piping layout and details illustrating location and types of sprinkler heads, valves, and control systems. Show sprinkler head coverage.
- C. Provide sprinkler system record drawings upon irrigation system acceptance. All record documents shall be bound into notebooks and shall include the following:
 - 1. Include written instructions for future service and maintenance.
 - 2. Include instruction sheets and parts lists covering all operating equipment.
 - 3. Submit as-built drawings.

4. Maintain record drawings current with actual construction on a daily basis during system installation.
5. Provide a reproducible irrigation system record drawing showing sprinkler heads, valves, drains, piping layout, controllers, quick coupler and automatic valves. Final payment shall not be made for this work without the receipt of an accurate as-built drawing.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store and handle materials to prevent damage and deterioration.
- B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends, both threaded and plain.
- C. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
- D. Provide secure, locked storage for valves, sprinkler heads and similar components that cannot be immediately replaced, to prevent installation delays.

1.06 GUARANTEE

- A. Guarantee shall include responsibility for removal and replacement of work, which conceals underground sprinkler system work.
- B. Guarantee underground sprinkler system against defects in workmanship and materials for one (1) year from date of acceptance.
- C. Guarantee includes contractor returning to the site for fall winterization and spring start-up service.
- D. Guarantee that all trenches and other disturbed areas shall be free from heaving and/or settling by more than one-quarter (1/4") inch. If necessary adjust the grade, re-grade the trench and re-seed. This no settlement guarantee shall extend over the entire one (1) year guarantee from date of acceptance.

PART 2 – PRODUCTS

2.01 GENERAL MATERIALS

- A. the contractor shall use materials as specified. Material other than specified shall be permitted only after written application by the contractor and written approval by the owner's representative.
- B. All material to be incorporated in this system shall be new, without flaws or defect and of quality and performance as specified. All material overages at

the completion of the installation are the property of the contractor and are to be removed from site.

2.02 MATERIALS

A. Pipe and Fittings

1. Pipe sizes shall conform to those shown on the drawings
2. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.
3. Primer and solvent for use with PVC pipe to conform to ASTM D2564. Primer to be purple in color. Solvent to be appropriate for pipe and fitting type and weather conditions.
4. All PVC pipes two and one-half (2-1/2") inches diameter and smaller shall be SDR 21, Class 200 PVC solvent weld.
5. Mainline pipe size three (3") inch and larger shall be SDR 21 Class 200 PVC ring tite (gasket) pipe.
6. Fittings for PVC pipe sizes three (3") inch and larger shall be constructed of ductile iron with gasket joints with a minimum working pressure of 200 PSI, Harco or approved equal.
7. Fittings for PVC pipe sizes two and one-half (2-1/2") inches and smaller shall be ASTM D2466 Schedule 40 PVC molded fittings suitable for solvent weld.
8. All piping shall be ASTM D2241, rigid, unplasticized polyvinyl chloride, extruded from virgin parent material. Provide pipe homogeneous throughout and free from visible cracks, hole, foreign materials, blisters, wrinkles and dents.
9. Provide pipe continuously and permanently marked with manufacturer's name or trademark, size, schedule, and type of pipe, working pressure at seventy-three (73) degrees Fahrenheit and National Sanitation Foundation (NSF) approval. Cover pipe during storage.

B. Sprinkler Equipment

1. Accepted Manufacturers
 - a. Toro
 - b. Rain Bird
 - c. Hunter

C. Sprinkler Heads – Long Range

1. The full or part-circle sprinklers shall be a gear driven rotary type. The sprinkler shall be of a pop-up design with an overall height of 8-1/2", a body diameter of 2-1/2", a cap diameter of 3-3/8" and a pop-up stroke of 4". The sprinkler shall be mounted at finish grade and shall have a 1" NPT or BSP female threaded inlet. The sprinkler shall be capable of covering up to a 52' radius at 60 pounds per square inch pressure with a discharge rate of 10.2 gallons per minute. Water distribution shall be via two (2) nozzles that thread into a 2" diameter nozzle turret. The dual color-coded nozzles shall elevate 4" when in operation.
2. The body and cap of the sprinkler shall be injection molded from ABS, a non-corrosive, impact-resistant, UV-resistant, heavy-duty plastic material. The cover and nozzle top shall be injection molded from Alcryl, a synthetic rubber, and be capable of providing excellent impact resistance. The sprinkler shall be available with a plastic or stainless steel riser. The sprinkler shall have a plastic filter screen sized to prevent entry of foreign material into the nozzle. All components shall be removable from the top of the sprinkler case via a snap ring retention method.
3. The sprinkler shall have a single-piece riser/body seal that regulates flutings during pop-up and retraction to clear any debris from around the riser and a heavy-duty stainless-steel spring to ensure positive retraction. Rotation shall be accomplished by a water lubricated planetary gear-drive assembly driven by a variable reversing stator that maintains a constant speed of rotation with all nozzles. The variable reversing stator shall require no adjustments when changing nozzles.
4. The sprinkler shall incorporate an anti-vandal arc memory feature that allows the nozzle to be turned beyond its watering borders without incurring any internal damage. If turned beyond its watering borders, the sprinkler shall automatically return to the previously set arc. The sprinkler shall have a standard rubber cover available in black, or lavender for effluent water use applications.

D. Remote Control Valves

5. The remote control valve body and bonnet shall be constructed of 33% glass-filled nylon (GFN) and stainless steel and have a maximum pressure rating of 220 PSI. The diaphragm shall be made of double-beaded, fabric-reinforced rubber to retain flexibility and provide maximum sealing throughout its area. The diaphragm assembly shall be fully serviceable, held together with stainless-steel components and plastic components. All parts shall be serviceable from the top of the valve without removing the valve from the line. The valve may be installed at any angle without

affecting valve operation. All other internal parts shall be made of plastic, brass and stainless steel to ensure corrosion resistance.

6. The valve shall have an internal manual downstream bleed to prevent flooding of the valve box and be capable of operation by hand. The valve shall have an external bleed for system flushing. The valve shall have a self-cleaning, stainless steel metering (externally removable) system. The valve shall have a manual flow control with a hand-operated, rising-type flow-control stem with a control wheel/handle. The flow control shall be adjustable down to zero flow.
7. For 1" models, friction loss at 40 GPM shall not exceed 7.2 PSI on electric valves. For 1-1/2" models, friction loss at 100 GPM shall not exceed 14.4 PSI on electric valves. For 2" models, friction loss at 180 GPM shall not exceed 8.05 PSI on electric valves. For 3" models, friction loss at 300 GPM shall not exceed 10.1 PSI on electric valves. The burst pressure safety rating shall be 750 PSI. The valve must open or close in less than one minute at 220 PSI without water hammer.
8. The valve shall have a plastic solenoid, which is fully encapsulated and have a captured hex plunger and spring. The solenoid will have a removable retainer for servicing of the spring and plunger. The plunger shall be on a stainless-steel solenoid seat for longer life. The 24 V a.c. solenoid shall open with a 22.5 V a.c. minimum at 220 PSI. At 24 V a.c. average inrush, current shall not exceed 0.40 amps. Average holding current shall not exceed 0.20 amps.
9. The valve shall have a built-in, Schrader-type valve for attaching a pressure gauge to verify downstream pressure. The valve shall be able to field retrofit with an optional pressure-regulating module, EZReg™, which can be factory or field-installed or serviced under pressure. The valve shall have a forward-flow design to ensure more precise regulation when used with a pressure regulator.
10. Pressure Regulating Electric Models: The pressure regulator, EZReg™, shall be of dial design to permit visual setting of pressure with or without the valve being operated or the use of a pressure gauge. The regulator shall be of a screw-in type and shall regulate precisely over a 5-100 PSI range with maximum inlet pressure of 220 PSI. The regulator shall maintain the set pressure within +/- 3 PSI (with a 10-PSI differential between inlet and outlet). The valve shall be developed, manufactured, qualified and released in the USA. The valve shall come with a 5-year trade warranty.

E. Control Wire and Connections

1. Low voltage wire connectors to be made using wire nuts and 3M DBY/DBR connectors or approved equal.

2. One hundred and twenty (120) volt or heavier splices made underground to be made using wire nuts and 3M brand DBY.
3. Control wire shall be Type; UL approved for direct burial. Conductor to be single strand soft annealed copper, jacket to be PVC or polyethylene.
4. Twenty-four (24) volt control wire to be a different color for each control timer and shall be size fourteen (14) or larger. Common wire to be white in color and shall be size twelve (12) or larger. Run a minimum of one (1) common per control timer. Do not connect ground wires from different controllers.

F. Control System

1. The field satellite controller shall use modular solid-state control technology and be capable of automatic, semi-automatic and manual operations. It shall be housed in a locking, weatherproof, pedestal-type enclosure constructed of plastic or heavy-gauge painted, stainless steel with corrosion-resistant finish inside and out. Access to all wiring connections is through a locking door. Four bolts shall secure the pedestal to the concrete pad.
2. The controller shall be capable of operating with an input voltage of 115/230 V a.c. (+/- 10%), 50/60 Hz. Each station shall be capable of delivering 0.75 amperes (18 VA) at 24 V a.c. per station. Each station shall have built-in surge protection. The controller shall be capable of operating multiple stations for a total output current of 3.2 amperes (72 VA) at 24 V a.c.
3. The controller shall have three modes of operation: central, stand-alone and off. Time-of-day, day-of-week, programming and operational status shall be shown in two large LCD displays. While operating in stand-alone mode, the controller shall have a 12/24-hour real-time clock.
4. The controller shall have 16 independent irrigation programs. Each program shall have the ability to be scheduled independently in a 14-day calendar or one-to 29-day interval mode. Each program shall have 12 start times, up to three repeat cycles and a programmable soak time of zero to 59 minutes.
5. The controller shall have 16 stations minimum with the ability to run each station from one minute to eight hours and 59 minutes in one-minute increments. It shall be expandable to a maximum of 64 stations using eight-station modules. Each station may be assigned independently to any or all of the 16 irrigation programs. Station run time shall be independent for each irrigation program.

6. The controller shall have a program-adjust feature that allows the independent adjustment of each irrigation program from 10% to 250% in 1% increments. The adjustment by program may be set to OFF to prevent run time changes for programs intended for non-irrigation use. The controller shall have a global adjust feature that additionally adjusts all programs from 10% to 250% in 1% increments.
7. The controller shall have a manual start feature that allows a program to be run in normal or syringe mode. Syringe mode run time may be specified in minutes (1 to 30) or as a percentage (10% to 99%) of normal station run time. When a program is running (automatic or manually started), the controller will display the currently running program, the currently running station and time left for the running station. The controller shall have a multi-manual cycle that allows the simultaneous operation of one to six stations with independent station run times. The multi-manual run time may be set for one to 59 minutes.
8. The controller shall use a high-energy lithium battery (not included) for real-time clock retention in the event of a power failure. The controller shall maintain the real-time clock for 90 days when the lithium battery is installed or 30 minutes of no battery is used. Program data shall be stored in non-volatile memory that will be retained faithfully for a minimum of ten years without power.
9. All electronic componentry shall be conformal coated in order to support visual diagnostics for field repair. The controller shall have a front cover lock that locks only when engaged and shall not lock automatically with each closure.
10. The controller shall not require the use of armored cable or looping communication cable.
11. The controller shall offer optional enhanced surge protection for all outputs, input power, communications and the pump and common.
12. When operating in the central mode, the controller shall be capable of two-way communications with the SitePro, Network LTC (up to 32 stations) and TouchNet for Network LTC Plus central controllers. It shall receive, store and send all commands generated by the central, including current time and day. It shall upload to the central: 1) satellite status, 2) program content and 3) failure sensing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine final grades and installation conditions. Do not start underground sprinkler system work until finished grades are established and unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Layout and stake the location of each pipe runs and all sprinkler heads and sprinkler valves. Obtain owner's representative's acceptance of layout before excavating.

3.03 EXCAVATING AND BACKFILLING

- A. Excavating shall be considered unclassified and shall include all materials encountered, except materials that cannot be excavated by normal mechanical means. Excavate trenches of sufficient depth and width to permit proper handling and installation of pipe and fittings. Excavate to depths required to provide two (2") inch depth of earth fill or sand bedding for piping when rock or other unsuitable bearing material is encountered.
- B. All mainline and continuously pressurized pipe is to be installed using open trenches. Lateral pipe may be installed by "plowing" if soil conditions permit and soils do not contain gravel, rock, construction debris or other potentially damaging material.
- C. The top ten (10") inches of backfill shall be topsoil, free of rocks, subsoil or trash. Any special soil mixture shall be replaced to the original condition it was prior to irrigation installation.
- D. Fill to within six (6") inches of final grade with approved excavated or borrows fill materials free of lumps or rocks larger than two (2") inches in any dimension.
- E. Provide approved fine grained earth fill or sand to a point four (4") inches above the top of pipe, where soil conditions are rocky or otherwise objectionable.
- F. Fill to match adjacent grade elevation with approved earth fill material. Place and compact fill in layers not greater than eight (8") inches in depth.

3.04 UNDERGROUND PIPE

- A. All mainline and contiguously pressurized pipes are to be installed using open trenches.
- B. Allow glued joints to set at least twenty-four (24) hours before pressure is applied to the system.
- C. Store pipe such that it is protected from oil and grease and from prolonged exposure to sunlight and excessive heat.
- D. Minimum depth of cover over lateral pipe shall be ten (18") inches and over mainline pipe shall be twenty-four (24") inches.
- E. Install plastic pipe in accordance with manufacturer's installation instructions.
- F. Where mainline pipe crosses piping related to the subgrade system drainage, the mainline piping shall go over the subgrade drainage, provided the mainline pipe is not installed with less than eighteen (18") inches of cover. Otherwise install mainline pipe at twenty-four (24") inches buried depth, beneath drainage system.

3.05 SPRINKLER INSTALLATION

- A. Install fittings and sprinkler heads in accordance with manufacturer's instructions, except as otherwise indicated.
- B. Provide all quick coupling valves and one (1") inch IPS sprinklers with three (3) elbow swing joints. Use Lasco one (1") pre-fabricated 'O' Ring joints as detailed on the drawings.
- C. Set sprinkler heads perpendicular to finished grades, except as otherwise indicated and positioned to prevent contact with grounds maintenance equipment. Locate sprinkler heads to assure proper coverage of indicated areas. Do not exceed sprinkler head spacing distances indicated.
- D. Flush piping with full head of water and install heads after hydrostatic test is completed.

3.06 VALVE INSTALLATION

- A. Electric valve installation shall be as indicated on the drawings. All electrical and manual valves shall be enclosed in a minimum ten (10") inch width valve box. Add extensions as required to prevent soil settlement around the valve. Set box flush with finish grade and aligned with adjacent boxes and/or adjoining site work.
- B. Install valve access boxes on a suitable base of gravel to provide a level foundation at proper grade and to provide drainage of the access box. Support box with block or notch box to protect pipe under box.

3.07 FLUSHING AND TESTING

- A. The sprinkler main shall be tested under normal water pressure for a period of twelve (12) hours.
- B. If leaks occur, repair and repeat the test. Give the owner's representative twenty-four (24) hours notice prior to testing.
- C. Adjustment of the sprinkler heads and automatic equipment shall be done by the contractor upon completion of installation to provide optimum performance. The contractor shall make minor adjustment during the guarantee period.
- D. After all new sprinkler piping are in place and connected for a given section and all necessary division work has been completed, and prior to the installation of sprinkler heads, all control valves shall be opened and a full head of water used to flush out the system.
- E. Testing of the system shall be performed after completion of each section or completion of the entire installation. Any necessary repairs shall be made, at the contractor's expense, to put the system in good working order before the owner shall make final payment.