

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies materials and procedures for furnishing and installing modifications to an existing automatically-controlled irrigation system, and all other appurtenances necessary to irrigate landscape areas indicated on the drawings.

1.2 RELATED WORK

- A. Plant materials: Section 32 92 00, TURF AND GRASSES.

1.3 DEFINITIONS

- A. Lateral Line Piping: Downstream from control valves to sprinklers, drip tubing and specialties. Piping is under pressure during flow.
- B. Mainline Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under constant system pressure.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 volts or for remote-control, signaling power-limited circuits.

1.4 ABBREVIATIONS

- A. FPT: Female pipe thread
- B. HDPE: High-density polyethylene plastic
- C. NPT: National pipe thread
- D. PTFE: Polytetrafluoroethylene
- E. PVC: Polyvinyl chloride plastic
- F. WOG: Water, oil and gas

1.5 PERFORMANCE REQUIREMENTS

- A. Irrigation zone control shall be under automatic operation with controller and automatic control valves.
- B. Location of sprinklers and specialties on Drawings is approximate. Contractor to make minor adjustments necessary to avoid plantings and obstructions such as signs, utilities and light standards. Provide 100 percent irrigation coverage of areas indicated.
- C. Minimum Working Pressures: The following are maximum pressure requirements for piping, valves and specialties unless otherwise indicated.

1. Irrigation Main Piping: 100 psi (640 kPa).
2. Circuit Piping: 80 psi (520 kPa).

1.6 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 pipe to prevent sagging and bending.

1.7 QUALITY ASSURANCE:

A. Products Criteria:

1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

B. Installer Certification:

1. Installer should be an employer of workers that include a certified irrigation designer qualified by The Irrigation Association Professional Class member of the American Society of Irrigation Consultants; Professional Technical Class member of the American Society of Irrigation Consultants to perform specified work, and have provided irrigation installations for 5 years.
2. Service provider qualifications shall be maintained and/or trained by the manufacturer to render satisfactory service within 8 hours of service request notification.

C. System Requirements:

1. 100 percent irrigation coverage of specified areas is required. The Contractor shall, at no additional cost to the Government, make minor adjustments necessary to avoid plantings and obstructions such as signs, utilities and light standards and achieve full and complete coverage of irrigated areas without overspray on roadways, sidewalks, window wells, or buildings and to protect trees from close high spray velocity.

1.8 SUBMITTALS

- A. Submit product data as one package for each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Highlight items being supplied on the catalog cut sheets.
- B. Provide qualification data for:
 - 1. A qualified irrigation Installer.

1.9 EXTRA MATERIALS

- A. Furnish extra materials, as called out below, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rotary Head Sprinklers: 5 percent of amount installed for each type and size indicated, but no fewer than 2 units of each type.

1.10 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society Of Mechanical Engineers (ASME):
- C. American Society For Testing And Materials (ASTM):
 - B61-08.....Steam or Valve Bronze Castings
 - B62-09.....Composition Bronze or Ounce Metal Castings
 - D1785-06.....Poly Vinyl Chloride (PVC) Plastic Pipe,
Schedule 40, 80, and 120
 - D2241-09.....Poly Vinyl Chloride (PVC) Pressure Rated Pipe
(SDR Series)
 - D2464-06.....Threaded Poly Vinyl Chloride (PVC) Plastic Pipe
Fittings, Schedule 80
 - D2466-06.....Poly Vinyl Chloride (PVC) Plastic Pipe
Fittings, Schedule 40
 - D2467-06.....Poly Vinyl Chloride (PVC) Plastic Pipe
Fittings, Schedule 80
 - D2564-04(2009)e1.....Solvent Cements for Poly Vinyl Chloride (PVC)
Plastic Piping Systems
 - D2609-02(2008).....Plastic Insert Fittings for Polyethylene (PE)
Plastic Pipe

D2683-10.....Socket-Type Polyethylene Fittings for Outside
Diameter-Controlled Polyethylene Pipe and
Tubing

D2855-96(2010).....Making Solvent Cemented Joints with Poly Vinyl
Chloride (PVC) Pipe and Fittings

F656-10.....Primers for Use in Solvent Cement Joints of
Poly Vinyl Chloride (PVC) Plastic Pipe and
Fittings

C906-07.....Polyethylene (PE) Pressure Pipe and Fittings, 4
in. (100 mm) Through 63 in. (1600 mm), for
Water Distribution and Transmission

D. National Fire Protection Association (NFPA):

70 2011 Edition.....National Electrical Code

1.11 WARRANTY

A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of one year from date of Final Acceptance. Further, the Contractor will provide all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

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. PVC Mainline Pipe: ASTM D1785, PVC 1120 compound, Schedules 40 and 80.
1. PVC socket fittings: ASTM D2467, Schedule 80.
 2. PVC threaded fittings: ASTM D2464, Schedule 80.
 3. PVC socket unions: Both headpiece and tailpiece shall be Schedule 80 PVC with threaded ends.
- C. PVC Lateral Pipe: ASTM D2241, PVC 1120 compound, SDR 21.
1. Solvent weld pipe Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784 for PVC pipe.
 2. PVC socket fittings shall be ASTM D2466, Schedule 40.

3. PVC socket unions: Both headpiece and tailpiece shall be Schedule 40 PVC with socket or threaded ends.

D. Threaded Pipe:

1. Polyvinyl Chloride, ASTM D1785, PVC 1120, Schedule 80, for threaded connections, risers and swing joints.

E. Swing joints:

1. Threaded fittings with elastomeric seals that allow 360 degree rotation, and designed for minimum 200 psi (1375 kPa) working pressure, may be used in lieu of standard threaded fittings.

F. Tapping Saddles:

1. Tapping saddles for installing remote control valves on 3-inch and larger pressure mainlines. Double stainless steel straps with painted steel saddle. Size as required for application.
2. Acceptable Manufacturer: Romac or equal.

2.2 PIPE JOINING MATERIALS

- A. Solvent cements for joining PVC piping: ASTM D2564. Include primer according to ASTM F656.

2.3 VALVES

A. Underground Shut-Off Valves:

1. Ball valves, isolation valves, 1-1/2 inch (38 mm) and smaller: Full-port ball valves with bronze body, PTFE seats, and 90 degree on/off handle. Ball valves to have NPT female end connections.
2. Valve ends shall accommodate the type of main pipe adjacent to valve.

B. Pressure Regulating Remote Control Valves:

1. Valves shall be globe type of heavy duty construction and shall have manual shut-off and flow control adjustment and provide for manual operation.
2. Molded-plastic body, furnished as straight or angle pattern type, normally closed diaphragm type with manual shut off and flow control adjustment.
 - a. Install valves with unions on each side to allow for easy removal.
 - b. Valves shall have a minimum of 150 psi (1025 kPa) working pressure.
 - c. Each sprinkler section shall be automatically operated by a remote control valve installed underground and operated by a 24 volt AC electric solenoid.
 - d. Each valve shall be in the specified valve box.

- C. Valves shall be completely serviceable from the top without removing valve body from the system. Valves to operate at no more than 7 psi (50 kPa) pressure loss at manufacturers maximum recommended flow rate.
- D. Valves shall be diaphragm type designed to operate in water containing sand and debris and shall have a self-cleaning type contamination filter to filter all water leading to the solenoid actuator and the diaphragm chamber. Valve shall incorporate a non-adjustable type opening and closing speed control for protection against surge pressures, or valves shall operate by means of a slow acting direct drive thermal hydraulic motor without ports, screens or diaphragms.
- E. Valves shall be equipped with manufacturer's pressure regulation module.
- F. Valves shall be identified by non-potable purple flow control handle.
- G. Available Manufacturer/Model: Rain Bird/PESB-PRS-D-NP-HAN. No substitutions.

2.4 PRESSURE REGULATING MODULE

- A. For Existing Remote Control Valves:
 - 1. Manufacturer's pressure regulating module used to adjust water pressure downstream of remote control valve. Device shall be capable of being retrofitted onto existing remote control valves of varying sizes.
 - 2. Available Manufacturer/Model: Rain Bird/PRS-D.

2.5 VALVE BOX

- A. Remote control valve boxes in landscape areas, shall be HDPE structural foam Type A, Class III, black in color. Box shall be minimum 19 inches (475 mm) long by 14 inches (350 mm) wide by 24" (305 mm) deep with key-lockable HDPE hinged cover.. Available Product: 'Carson' Specification Grade 1419 to match existing.
- B. After installation of boxes:
 - 1. Label boxes with two 3 inch (80 mm) size stencils designated controller, decoder letter, and circuit numbers with permanent white epoxy paint. Numbers shall be placed at center of valve cover and shall face nearest main road or service road.

2.6 AUTOMATIC CONTROL EQUIPMENT

- A. Existing to remain. Rain Bird ESP-LXD 2-Wire Decoder System.
- B. All components of the new work shall be compatible with the existing control system. No substitutions allowed.

2.7 SPRINKLER HEADS

- A. Sprinkler heads: Heads to be as indicated on Drawings. The entire internal assembly including filter screen, to be capable of removal from the top without removing the sprinkler case from the riser. Body shall have internal pressure regulation of 40 to 45 PSI.
- B. Sprinkler head body shall be pop-up spray type of standard, undersize or oversize configuration as noted on plans. The sprinkler body, stem, nozzle and screen shall be constructed of heavy-duty, ultraviolet resistant plastic. It shall have a heavy duty stainless steel retract spring and a ratcheting system for alignment of the pattern. The sprinkler shall have a soft elastomer pressure-activated co-molded wiper seal for cleaning debris from the pop-up stem. The sprinkler shall have a plastic multi-stream rotary nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing protective, non-clogging filter screens under the nozzle.

2.8 DECODERS FOR TWO-WIRE CONTROL SYSTEM

- A. The decoders shall be of solid-state design and housed in a watertight molded plastic housing. The decoder leads shall be 18-gauge, insulated, stranded copper conductors of colors as indicated below. Wire leads shall be not less than 12" long. All decoder wire connections shall be made using watertight electrical connections suitable for the wire type being connected, as recommended by the manufacturer.
- B. Decoders shall be mounted underground in separate 12" by 18" valve boxes, or with remote control valves. The decoders shall be fastened to the inside of remote control valve boxes using plumber's tape and stainless steel self-tapping screws. The valve boxes which house decoders shall have black lids branded with "SP" in 2" high stenciled letters and painted with permanent white epoxy paint; the boxes shall be placed on an 18" deep bed of pea gravel to provide adequate drainage.
- C. Decoders shall be for 26VAC input service provided by the two-wire communication path.
- D. Decoders shall have addresses pre-coded from the factory of manufacturer and available with 1, 2, or 4 addresses, with each address activating one remote valve solenoid.
- E. Decoders shall include as part of their assembly a line surge protection decoder.
- F. All decoders shall be as manufactured and furnished by Rain Bird, Corp.

G. Field Decoders: FD-101 (One station decoder); FD-102 (Two station decoder). No substitutions.

2.9 TWO-WIRE DECODER CABLE

- A. 2-conductor control cable design consisting of tin coated copper conductors, insulated with PVC and having a high density polyethylene direct burial jacket. Conductors are listed as Type UF by UL or ETL or CSA; 600 volt, rated for direct-burial.
- B. Conductor: Minimum conductor size 14 AWG; soft annealed tin coated solid copper core conforming to ASTM B-33.
- C. Insulation: Polyvinyl Chloride conforming to UL Standard 493 for TYPE UF rated 60°C.
- D. Cable Assembly: Insulated conductors are laid parallel.
- E. Outer Jacket: Pressure Extruded High Density PE conforming to ICEA S-61-402, and NEMA WC5 Jacket Thickness 3/64" minimum jacket material to completely fill interstices between the two insulated conductors.
- F. Color Coding: Black, Red.
- G. Jacket Color: Red.
- H. Manufacturer and Model: Rain Bird, Maxi-Wire. Size 600V, sunlight-resistant, direct-burial. No substitutions.

2.10 LOW VOLTAGE CONTROL VALVE WIRE

- A. Wire shall be solid copper wire, Underwriters Laboratories Inc. approved for direct burial in ground. Size of wire shall be in accordance with manufacturer's recommendations, never less than No. 14 AWG.

2.11 SPLICING MATERIALS:

- A. Waterproof Wire Connectors. '3M' DBY or DBR

2.12 SLEEVE MATERIAL

- A. ASTM D2241, Schedule 40 PVC.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine proposed irrigation areas for compliance with requirements and conditions affecting installation and performance.
- B. Set stakes to identify locations of proposed irrigation system. Obtain Contracting Officer's Representative's approval before excavation.

3.2 PIPE INSTALLATION - GENERAL

- A. Layout work as closely as possible to drawings. Swing joints, offsets and all fittings are not shown. Lines are to be installed in a common trench wherever possible.

- B. Install sprinkler lines to avoid other utility lines; all of which have the right of way.
- C. Existing sidewalks and curbs shall not be cut during trenching and installation of pipe. Install pipe under sidewalks and curbs by jacking, auger boring, or by tunneling. Repair or replace any cracked concrete, due to settling, during the warranty period.
- D. Do not lay pipe on unstable material, in wet trenches or, in the opinion of Contracting Officer's Representative, when trench or weather conditions are unsuitable for work.
- E. Allow a minimum of 3 inches (80 mm) between parallel pipes in the same trench.
- F. Clean the interior portion of pipe and fittings of foreign matter before installation. Securely close open ends of pipe and fittings with caps or plugs to protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- G. The full length of each section of pipe shall rest upon the pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipe on wood blocking.
- H. Hold pipe securely in place while joint is being made.
- I. Do not work over, or walk on, pipe in trenches until covered by layers of earth, well tamped, in place to a depth of 12 inches (300 mm) over pipe.
- J. Irrigation lines and control wire in cemetery applications shall run at boundaries of graves, through designated utility lanes or beside roadways so that any gravesite may be opened in the future without disruption of the irrigation system.
- K. Irrigation lines and control wire shall run through designated utility lanes or beside roadways where possible.
- L. Connect new system to existing mains.
- M. Minimum cover over water mains shall be 24 inches (610 mm). Cover laterals to minimum depth of 18 inches (460 mm).
- N. Warning tape shall be continuously placed 12 inches (300 mm) above sprinkler system water mains and laterals.

3.3 PLASTIC PIPE INSTALLATION

- A. Plastic pipe shall be snaked in trench at least 1 foot per 100 feet (1 meter to 100 meters) to allow for thermal construction and expansion and to reduce strain on connections.

B. Joints

1. Solvent Welded Socket Type: ASTM D2855.
2. Threaded Type: Apply liquid Teflon thread lubricant of Teflon thread type. After joint is made hand tight (hard), a strap wrench should be used to make up to two additional full turns.

3.4 SLEEVE INSTALLATION

- A. Furnish and install where pipe and two-wire cable pass under walks, paving, walls, and other similar areas.
- B. Sleeves to be twice line size or greater to accommodate retrieval for repair of wiring or piping and shall extend 12 inches (300 mm) beyond edges of paving or construction.
- C. Bed sleeves with a minimum of 4 inches (100 mm) of sand backfill above top of pipe in areas where pipe is placed prior to hardscape is installed.

3.5 VALVE INSTALLATION

- A. Locations of remote control valves are schematic. Remote control valves shall be grouped wherever possible and aligned at a set dimension back of curb along roads.
- B. Clean interior of valves of foreign matter before installation.
- C. Set valve box cover flush with finished grade unless otherwise indicated.
- D. Control valves shall never be less than 3 inches (80 mm) below the bottom of the valve box cover.
- E. Install tapping saddle on existing mainline per manufacturer's printed instructions.
- F. Install remote control valve as indicated in the drawings.
- G. Mainline flushing:
 1. Thoroughly flush mainline before installation of Remote Control Valve Assemblies.
 2. Identify remote control valve service tee(s) to be used for mainline flushing. Plug service tees not being used for flushing.
 3. Connect 50 mm (2-inch) pipe to flushing service tee(s). Use pipe to direct water away from trench and into drainage swale, curb section or storm sewer, (i.e. to an area that will direct the water away from the work area.) Direct water so that it does not disrupt the cemetery operations.
 4. Use a volume of water such that the velocity in the largest pipe flushing to this point is 0.9 m/s (3 FPS).

5. Multiple points may be flushed simultaneously.
6. Flush for a minimum of 20 minutes. Continue flushing until the water is clear of any and all debris.
7. The COR will review the flushing operation and clarity of water before stopping the flushing operation.
8. Disconnect pipe from service tee(s) and install remote control valve(s).

3.6 TWO-WIRE CABLE INSTALLATION

- A. Splice into existing two-wire cable per manufacturer's printed instructions, at the nearest existing remote control valve location. Locate cable splice inside of existing valve box. If the cable splice is located elsewhere it shall be located inside of an 8-inch round valve box with black cover branded with "WS" in 2-inch high by 3/16-inch deep letters and paint recess with permanent white epoxy paint.
- B. Provide 36 inch (300 mm) expansion coil in cable at each wire connection or change in cable direction and at remote control valves.
- C. Use water-proof wire connectors for cable wire connections.

3.7 DECODER INSTALLATION

- A. Install decoder inside valve box securing the decoder to the inside of the valve box with plumber's tape and self-tapping stainless steel screws.
- B. Program each decoder addresses into the irrigation controller representing the control valves for the irrigation zones.

3.8 SPRINKLER INSTALLATION

- A. Place part circle rotary sprinkler heads no more than 6 inches (150 mm) from edge, of and flush with top of adjacent walks, header boards, curbs, and mowing aprons, or paved areas at time of installation.
- B. Install all sprinklers on swing joints, as detailed on plans.

3.9 FIELD TEST AND QUALITY CONTROL

- A. Tests and Inspections:
 1. Pressure test lines before joint areas are backfilled. Backfill a minimum of 12 inches (300 mm) over the pipe to maintain pipe stability during test period. Test piping at hydraulic pressure of 150 psi (1025 kPa) for two hours. Maximum loss shall be 0.8 gallons/inch pipe diameter/1,000-feet (3 L/25 mm pipe diameter/300 m). Locate pump at low point in line and apply pressure gradually. Install pressure gage shut-off valve and safety blow-off valve

between pressure source and piping. Inspect each joint and repair leaks. Line shall be retested until satisfactory.

2. After testing, flush system with a minimum of 150 percent of operating flow passing through each pipe beginning with larger mains and continuing through smaller mains in sequence. Flush lines before installing sprinkler heads and quick couplers.
3. After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. After electrical circuitry has been energized and final adjustment of the sprinkler heads to permanent level at ground surface is complete, test each sprinkler section by the pan test and visual test to indicate a uniform distribution within any one sprinkler head area and over the entire area. Operate controllers and automatic control valves to demonstrate the complete and successful installation and operation of all equipment.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Any irrigation product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTMENTS

- 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, so they will be flush with, or not more than 1/2 inch (13 mm) above, finish grade.
- D. Adjust sprinkler radius and arcs to minimize overspray onto structures and pavement.

3.11 DEMONSTRATION AND DOCUMENTATION

A. Maintain and provide a complete set of as-built drawings which shall be corrected daily to show changes in locations of all pipe, valves, and related irrigation equipment. Valves shall be shown with dimensions to reference points.

B. Controller Drawings and Zone Chart(s):

1. Prepare in digital format a drawing mapping the location of all valves, lateral lines, and route of the control wires. Identify all valves as to size, station, number and type of irrigation. Digital formatted "as built" drawings must be approved before controller zone charts are prepared.

2. Provide one controller zone chart for each added valve showing the area covered by the controller. The chart shall be a reduced drawing of the actual "as built" system and fit the maximum size controller door will allow. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.
3. The final irrigation "as built" drawings shall be submitted in digital format with a different color code used to show area of coverage for each station. All drawings and zone charts must be completed and approved prior to final inspection of the irrigation system.

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