

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies materials and procedures to modify and retrofit an existing automatically-controlled landscape irrigation system, controllers and all other appurtenances necessary to serve specified landscape and plant bed areas.
- B. Work shall include preconstruction identification and abandonment of existing landscape irrigation components including properly and safely cutting and abandoning in place, existing irrigation mainline and digital irrigation communication cable passing through the designated project construction zone.
- C. All sprinklers, control valves, decoders, valve boxes, surge and grounding components abandoned shall be catalogued and neatly boxed and submitted to the Owner. Piping, fittings and wiring shall be abandoned in place or as convenient, shall be removed and responsibly disposed of.

1.2 RELATED WORK

- A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- B. Concrete Work, Reinforcing, Placement and Finishing: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- D. Plant materials: Section 32 90 00, PLANTING.

1.3 DEFINITIONS

- A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves.
- B. Drain Piping: Downstream from circuit-piping drain valves.
- C. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves.
- D. 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. PVC: Polyvinyl chloride plastic
- E. SDR: Standard Dimension Ratio
- F. SCH: Schedule Pipe
- G. AWG: American Wire Gauge

1.5 PERFORMANCE REQUIREMENTS

- A. Irrigation zone control shall be automatic operation with controller and digital two-wire decoder-operated automatic control valves.
- B. Location of sprinklers and specialties on drawing sheets is approximate. The selected installing contractor shall make minor adjustments necessary to avoid hard surfaces and obstructions such as signs, utilities and light standards. Provide 100 percent irrigation coverage of areas indicated.
- C. 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 Minimum Qualifications:

The selected installing contractor shall be an employer of workers that include not less than one Certified Irrigation Contractor in good standing as accredited by The Irrigation Association, Fairfax, VA (www.irrigation.org) and who shall be currently employed by the selected installing contractor and who shall personally conduct or oversee the conduct of all work upon this project. The selected installing contractor shall be registered in the State of Minnesota as a Technology

Systems Contractor in good standing employing not less than one Minnesota licensed Power Limited Technician in good standing who shall be currently employed by the selected installing contractor and who shall personally conduct or oversee the conduct of all low voltage irrigation electrical work. The selected installing contractor shall be prepared to furnish proof of not less than 5 successful installations of projects of similar scope and complexity within the past 3 calendar years including but, not limited to successful installation, programming and operation of digital two-wire decoder irrigation control systems.

C. System Requirements:

100 percent irrigation coverage of specified areas is required. The actual and spirit of intent of this project outcome is clearly indicated upon the drawing sheets and within the specification documents. The selected installing contractor shall, at no additional cost to the Government, make minor adjustments necessary to avoid plantings and obstructions such as hard surfaces 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.
- B. Submit written confirmation of intent to comply with the literal and spirit of intent of the drawing sheets and specification including workmanship procedures in compliance with industry Best Practices and consideration for regional conditions.
- C. Furnish qualification data for:
 - 1. A qualified irrigation Installer.
 - 2. A qualified service provider, maintained and/or trained by the manufacturer to render satisfactory service within 8 hours of service request notification.
- D. Include a professionally-prepared and presentable zone chart and controller timing schedule showing each irrigation zone and its control valve and corresponding decoder information; and show the time settings for each automatic controller zone.
- E. Furnish professionally-prepared and presentable operation and maintenance data for sprinklers, automatic control valves and quick-coupler equipment to include in operation and maintenance manuals.

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 and Spray Head Sprinklers including nozzles: 5 percent of the final number installed for each type and size indicated, but no fewer than 2 units.
2. Decoders and control valves for each type and size indicated; no fewer than two each.
3. Quick-coupler keys with swivel; no fewer than one each.

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 For Testing And Materials (ASTM):

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

- D3261-10a.....Butt Heat Fusion Polyethylene (PE) Plastic
Fittings for Polyethylene (PE) Plastic Pipe and
Tubing
- F477-10.....Elastomeric Seals (Gaskets) for Joining Plastic
Pipe
- F656-10.....Primers for Use in Solvent Cement Joints of
Poly(Vinyl Chloride) (PVC) Plastic Pipe and
Fittings
- F771-99(2005).....Polyethylene (PE) Thermoplastic High-Pressure
Irrigation Pipeline Systems
- C. American Water Works Association (AWWA):
- C504-06.....Rubber-Seated Butterfly Valves
- C906-07.....Polyethylene (PE) Pressure Pipe and Fittings, 4
in. (100 mm) Through 63 in. (1600 mm), for Water
Distribution and Transmission
- D. General Services Administration:
- A-A-60005.....Frames, Covers, Gratings, Steps, Sump and Catch
Basin, Manhole
- E. Manufacturers Standardization Society (MSS):
- SP-70-2006.....Gray Iron Gate Valves, Flanged and Thread Ends
- F. National Fire Protection Association (NFPA):
- 70 2011 Edition.....National Electrical Code

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. PE pipe with controlled ID shall be ASTM F771, PE 3408 compound;
- C. Insert fittings for PE pipe: ASTM D2609, nylon or propylene plastic with
barbed ends. Include stainless steel bands or other fasteners.
- D. PE pressure pipe: AWWA C906, with DR of 7.3, 9, or 9.3 and PE compound
number required to give pressure rating not less than 160 psi (1100 kPa)

- E. PE butt, heat-fusion fittings shall be ASTM D3261.
- F. PE socket-type fittings shall be ASTM D2683.
- G. PVC pipe: ASTM D1785, PVC 1120 compound, Schedule 40.
- H. PVC socket fittings shall be ASTM D2466, Schedule 40 PVC threaded fittings: ASTM D2464, Schedule 80.
- I. Swing joints: 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.
- J. PVC socket unions: Both headpiece and tailpiece shall be PVC with socket ends.
- K. PVC Pipe: ASTM D2241, PVC 1120 compound, SDR 26.
- L. PVC socket fittings: ASTM D2467, Schedule 80.
- M. PVC socket unions: Both headpiece and tailpiece shall be PVC with socket or threaded ends.

2.2 PIPE JOINING MATERIALS

- A. Solvent cements for joining PVC piping: ASTM D2564. Include primer according to ASTM F656.
- B. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.3 VALVES

- A. Underground Shut-Off Valves:
 - 1. Butterfly valves 2 inches (50 mm) and larger: AWWA C504, iron body, bronze mounted, double disc with parallel or inclined seats, non-rising stem turning clockwise to close, 150 psi (1025 kPa) minimum working pressure.
 - 2. 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 shall have NPT female end connections.
- B. Operations:
 - 1. Underground applications shall use valves with 2 inch (50 mm) nut for T-Handle socket wrench operation.
 - 2. Aboveground and valve pit applications shall use valves, with handwheels.
 - 3. Valve ends shall accommodate the type of main pipe adjacent to valve.
- C. Remote Control Valves:
 - 1. All remote control valves shall be of the manufacturer and models indicated on the drawing sheets and within this specification. No deviation from manufacturer or model call-outs shall be allowed.

- a. Hunter ICV-G-FS sizes and locations as indicated on the drawing sheets. Molded-plastic body, furnished as straight or angle pattern type, normally closed diaphragm type with manual shut off and flow control adjustment. The remote control valve shall be manufactured by Hunter Industries Incorporated, San Marcos, California.
 - b. Baseline BL-5201 single valve digital two-wire decoder installed concurrently with each remote control valve and within the same remote control valve box, one valve per decoder, one decoder per control valve, one valve box per valve and decoder combination. The decoder shall be manufactured by Baseline, Incorporated, Boise, Idaho.
1. Install valves with unions on each side to allow for easy removal.
 2. Valves shall have a minimum of 150 psi (1025 kPa) working pressure.
 3. Each sprinkler section shall be automatically operated by a remote control valve installed underground and operated by a single-station 30 volt AC RMS in-line digital decoder-governed solenoid. Each valve with single-station decoder shall be in a valve vault.
 4. Valve boxes located within the Entry Access shall be locking type.
 5. Valves shall be completely serviceable from the top without removing valve body from the system. Valves shall operate at no more than 7 psi (50 kPa) pressure loss at manufacturers maximum recommended flow rate.
 6. 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.

2.4 VALVE BOX

- A. Isolation valve boxes shall be precast concrete boxes with a compressive concrete strength in excess of 4000 psi (30 Mpa). Box dimension shall be adapted to depth of cover required over pipe at valve location. Mark box cover to say "Irrigation" and set flush with finished grade. Provide 2 (two) "T" handle socket wrenches of 5/8 inch (15 mm) round stock with sufficient length to extend 2 feet (600 mm) above top of deepest valve box cover.
- B. Irrigation control valve and decoder boxes and quick coupler boxes shall be HDPE green in color or black body with green cover. Boxes shall be lockable.

C. After installation of boxes:

1. Label boxes with two 3 inch (80 mm) size stencils designated controller 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.

2.5 BACKFLOW PREVENTER

- A. Use existing landscape irrigation system reduced pressure principle backflow prevention assembly.

2.6 WATER METER

- A. Use existing landscape irrigation system water meter.

2.7 AUTOMATIC CONTROL EQUIPMENT - INDEPENDENT ELECTRIC CONTROLLER WITH NO FLOW SENSING (FOR SMALL INSTALLATIONS)

- A. The electric automatic control system shall consist of one digital two-wire decoder-based controller which operates individual remote control decoder-based valves and decoder-based soil moisture sensor(s) in accordance with timing schedules programmed into the independent unit.
 1. Use existing landscape irrigation digital two-wire decoder-based controller.
- B. The selected irrigation contractor shall connect, test electrically and program all retrofitted and new irrigation stations to the existing digital two-wire decoder-based control system per manufacturer recommendations and Best Practices and shall incorporate all stations into the control system as depicted upon drawing sheets.

2.8 SPRINKLER HEADS

- A. Sprinkler heads: Heads to be as indicated on the drawing sheets. The entire internal assembly including filter screen, to be capable of removal from the top without removing the sprinkler case from the riser.
- B. All sprinklers shall be of the manufacturer and models indicated on the drawing sheets and within this specification. No deviation from manufacturer or model call-outs shall be allowed.
- C. Rotary pop-up sprinklers: Gear-driven.
 1. Hunter I-20-XX-SS with nozzle installed as indicated on the drawing sheets. The sprinkler and nozzle shall be manufactured by Hunter Industries Incorporated, San Marcos, California. .
 2. Hunter MP1000, MP2000, MP3000, MPSTRIP rotary nozzles on Hunter PROS-06-CV as indicated on the drawing sheets. The sprinklers and nozzles shall be manufactured by Hunter Industries Incorporated, San Marcos, California. .
- D. Planting bed and shrub spray heads:

3. Hunter PROS-12 with nozzles installed as depicted on the drawing sheets. The sprinklers and nozzles shall be manufactured by Hunter Industries Incorporated, San Marcos, California.

2.9 QUICK COUPLERS

- A. Quick couplers shall have all parts contained in a two-piece unit and shall consist of a coupler water seal valve assembly and a removable upper body to allow the spring and key track to be serviced without shut down of the main.
- B. Metal parts shall be brass.
- C. Lids shall be lockable vinyl covered and have springs for positive closure on key removal.
- D. Each quick coupler shall be contained in valve boxes as indicated on the plan sheets. Quick couplers located within the courtyard of Ward 1K shall be contained in valve boxes with locking covers.
- E. Furnish 1 (one) hose swivel and operating key.

2.10 LOW VOLTAGE CONTROL VALVE WIRE

- A. Wire shall be solid copper wire, Underwriters Laboratories Inc. approved for direct burial in ground. Wire shall be digital decoder-based control wire of the same outer jacket color as that installed upon the existing landscape irrigation system. Size of wire shall be consistent with that already existing upon the installed landscape irrigation system or in accordance with manufacturer recommendations, never less than 14 AWG.

2.11 WIRE SPLICING MATERIALS: LOW VOLTAGE RATED UV RESISTANT MOISTURE-RESISTANT GREASE-FILLED POLYPROPYLENE TUBE

- A. 3M DBR/Y-6 Direct Bury Splice Kit UL486D-approved for direct burial in ground.

2.12 SLEEVE MATERIAL

- A. ASTM D2241, Schedule 40.

2.13 WARNING TAPE

- A. Provide standard, 4-Mil polyethylene 3 inch (76 mm) wide tape, non-detectable purple with black letters (depicting untreated well water) and imprinted with "CAUTION BURIED IRRIGATION WATER LINE BELOW".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine proposed irrigation areas for compliance with requirements and conditions affecting installation and performance.
- B. Commence with abandonment of existing components in the area of construction as required in Section 1.1.

- C. Set stakes to identify locations of proposed irrigation system. Obtain approval of the Contracting Officer's Representative prior to commencing excavation.
- D. Relocate and permanently install new irrigation mainline and new digital irrigation communication cable in new locations.

3.2 PIPE INSTALLATION - GENERAL

- A. Layout work as closely as possible to drawing sheets. Swing joints, offsets and all fittings are not shown. Lines are to be in a common trench wherever possible.
- B. Install sprinkler lines to avoid heating, ventilating, and air conditioning trenches; electric ducts; storm and sanitary sewer lines; and existing water and gas mains; 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 shall run through designated utility lanes or beside roadways where possible.
- K. Connect new system to existing mains. Concrete thrust blocks shall be installed upon piping 3-inch and larger where the irrigation main changes direction at "L" and "T" locations and where the irrigation main terminates. Pressure tests shall not be made for a period of 36 hours following the completion of pouring of the thrust blocks. Concrete

thrust blocks for supply mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.

L. Minimum cover over lines under constant pressure shall be 30 inches (750 mm) for pipe sizes of 3 inch and greater and 24 inches for pipe sizes of 2.5 inch and less. Cover laterals to minimum depth of 24 inches (600 mm).

1. In the area of underground structures where cover is 24 inches or less above an underground tunnel rooftop, mechanical equipment, etc. , depth of cover shall be as deep as conditions allow without damage to tunnel material during excavation or laying of pipe directly upon tunnel material.

M. Warning tape shall be continuously placed 12 inches (300 mm) above sprinkler system 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. Elastomeric Gasket: ASTM F477.

3.4 SLEEVE INSTALLATION

A. Furnish and install where pipe and control wires 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 diagrammatic. Remote control valves shall be grouped (manifolded) wherever possible and aligned at a set dimension back of curb along roads.

B. No valves shall be set under roads, pavement or walks.

C. Clean interior of valves of foreign matter before installation.

- D. Pressure control valves installed adjacent to remote control valve shall be housed in the same valve box.
- E. Set valve box cover flush with finished grade.
- F. Control valves shall never be less than 3 inches (80 mm) below finished grade.

3.6 SPRINKLER AND QUICK COUPLER INSTALLATION

- A. Place part circle rotary sprinklers 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 and shrub sprays swing joints or flexible hose-and-fitting joints as detailed on drawing sheets.
- C. Install all quick couplers on swing joints as detailed on drawing sheets.
- D. Set shrub sprinklers 4 inches (100 mm) above grade or even with bedding mulch depth and 4 inches (100 mm) from edge of curb or pavement. Place 4 inches (100 mm) from walls. Stake sprinklers prior to backfilling trenches. Support stakes shall be parallel to riser.

3.7 IRRIGATION SPECIALTY INSTALLATION

- A. Within the Entry Access, care shall be taken to install sprinklers to maximize concealment. See drawing sheets.
- B. Electric control valves and quick couplers installed within Entry Access shall be placed in planting beds and shall have locking covers.
- C. See also Section 1.1.B and 1.1.C.
- D. See also Section 2.13A.

3.8 AUTOMATIC IRRIGATION - CONTROL SYSTEM INSTALLATION

- A. Attach new or reconfigured stations of irrigation to the existing digital two-wire decoder system and program and test each control valve for proper operation from the existing irrigation controller.
- B. Maintain control valve numbering sequence or as directed by the contracting officers representative.
- C. Adjust master controller programming to incorporate new stations of irrigation within programs for similar plant-types or hydrozones.

3.9 CONTROL WIRE INSTALLATION

- A. Wiring shall be located in trench with new pressure main pipe. Splicing shall be held to a minimum. In the event a wire splice is required outside of a remote control valve location, the splice shall be contained in a valve box not smaller than 10" round with not less than 24 inches of leader or expansion looping on each end of the splice.

- B. Provide 12 inch (300 mm) expansion loops in wiring at each wire connection or change in wire direction. Provide not less than 24 inch (600 mm) loop at remote control valves.

3.10 FIELD TEST AND QUALITY CONTROL

A. Tests and Inspections:

1. Pressure test pressure main line(s) 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 100 psi (689 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.
2. Install pressure gage shut-off valve and safety blow-off valve between pressure source and piping being tested.
3. Inspect each joint and repair leaks. Line shall be retested until satisfactory.
4. Flush lines before installing sprinkler heads and quick couplers.
5. After installation, charge system and test visually for leaks. Repair leaks and retest until no leaks exist.
6. After electrical circuitry has been energized and final adjustment of the sprinklers to permanent level at ground surface is complete, test each broadcast turf sprinkler section by the pan test and visual test to indicate a uniform distribution within any one sprinkler area and over the entire area.
7. Operate controller and automatic control valves to demonstrate the complete and successful installation and operation of all equipment.
8. 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.
9. Prepare test and inspection reports.

3.11 ADJUSTMENTS

- A. Adjust settings of controller.
- 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 finish grade.

3.12 DEMONSTRATION AND DOCUMENTATION

- A. Prior to final acceptance, verbal instructions, for a period of not less than 2 hours, shall be provided to the operating personnel.

- B. Program controller according to approved irrigation schedule. The selected installing contractor is responsible for scheduling and programming the existing controller, valves and soil moisture sensor(s) to accommodate new and amended stations of irrigation to appropriate landscape water requirements.
- C. Follow manufacturer's instructions for installation.
- D. Maintain and provide a complete set of as built drawings in a professional and workmanlike presentation form which shall be corrected daily to show changes in locations of all pipe, valves, pumps and related irrigation equipment. Valves shall be shown with dimensions to reference points.
- E. 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 shall be approved before controller zone charts are prepared.
 - 2. Provide one controller zone chart for each automatic controller 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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