

**SECTION 32 84 00  
PLANTING IRRIGATION**

SPEC WRITER NOTE: Delete text between  
// \_\_\_\_\_ // not applicable to project.  
Edit remaining text to suit project.

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Automatically-controlled // lawn // trees // shrub // irrigation system, controllers and all other appurtenances.

**1.2 RELATED REQUIREMENTS**

SPEC WRITER NOTE: Update and retain  
references only when specified elsewhere  
in this section.

- A. Concrete Work, Reinforcing, Placement and Finishing: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Metering: SECTION 25 10 10, ADVANCED UTILITY METERING SYSTEM.
- C. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.

**1.3 ABBREVIATIONS**

SPEC WRITER NOTE: Retain abbreviations  
that remain after this section has been  
edited.

- A. HDPE: High-density polyethylene plastic.
- B. NPT: National pipe thread.
- C. PTFE: Polytetrafluoroethylene.
- D. PVC: Polyvinyl chloride plastic.

**1.4 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.

## 1.5 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

SPEC WRITER NOTE: Based on project design  
for local conditions, delete references  
not applicable for project.

B. American Society Of Mechanical Engineers (ASME):

1. B16.18-2012 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. B16.22-2013 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
3. B16.24-2011 - Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500 and 2500.
4. B40.100-2013 - Pressure Gauges and Gauge Attachments.

C. American Society Of Sanitary Engineering (ASSE):

1. 1013-2011 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers.

D. ASTM International (ASTM):

1. B88-14/B88M-13 - Seamless Copper Water Tube.
2. B813-10 - Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.
3. D1785-15 - Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120.
4. D2239-12- Polyethylene (PE) Plastic Pipe (SIDR) Based on controlled Inside Diameter.
5. D2241-15 - Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series).
6. D2464-15 - Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
7. D2466-15 - Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
8. D2564-12 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
9. D2609-15 - Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
10. D2683-14 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
11. D2855-15 - Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.

12. F477-14 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

E. American Water Works Association (AWWA):

- 1. C504-15 - Rubber-Seated Butterfly Valves.
- 2. C906-15 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks.

F. American Welding Society (AWS):

- 1. A5.8/A5.8M-04 - Filler Metals for Brazing and Braze Welding.

G. National Fire Protection Association (NFPA):

- 1. 70 2011 Edition - National Electrical Code.

**1.6 PREINSTALLATION MEETINGS**

- A. Conduct preinstallation meeting // at project site // minimum 30 days before beginning Work of this section.

SPEC WRITER NOTE: Edit participant list to ensure entities influencing outcome attend.

1. Required Participants:

- a. Contracting Officer's Representative.
- b. // Architect/Engineer. //
- c. // Inspection and Testing Agency. //
- d. Contractor.
- e. Installer.
- f. // Manufacturer's field representative. //
- g. Other installers responsible for adjacent and intersecting work, including // \_\_\_\_\_ //.

SPEC WRITER NOTE: Edit meeting agenda to incorporate project specific topics.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.

- a. Installation schedule.
- b. Installation sequence.
- c. Preparatory work.
- d. Protection before, during, and after installation.
- e. Installation.
- f. Terminations.
- g. Transitions and connections to other work.
- h. Inspecting and testing.

- i. Other items affecting successful completion.
- 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

#### 1.7 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
  - 1. Show size, configuration, and installation details.
  - 2. Show complete detailed irrigation layout covering design of system showing pipe sizes and lengths; fittings; locations; types and sizes of sprinklers; controls; backflow preventers; valves; // drainage pits; // location and mounting details of electrical control equipment // complete wiring diagram showing routes and wire sizes for; power, signal and control wiring details // and connections to water supply main.
  - 3. Do not start work before final shop drawing approval.
- C. Manufacturer's Literature and Data:
  - 1. Description of each product.
    - a. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
    - b. Include zone chart and controller timing schedule showing each irrigation zone and its control valve; and show time settings for each automatic controller zone.
  - 2. Installation instructions.
  - 3. Warranty.
- D. Extra Materials: Show labels describing contents.
  - 1. // Rotary and Spray Head Sprinklers // Bubblers // Emitters //: // 5 // Insert number // percent of amount installed for each type and size indicated, but no fewer than 2 units.
  - 2. // Drip-Tube System Tubing // Soaker Tubes //: // Insert percent // of total length installed for each type and size indicated, but minimum // 50 feet (15 m) // 100 feet (30 m) // Insert value //.
- E. Certificates: Certify // each product complies // products comply // with specifications.
  - 1. Control systems.
  - 2. Show control system is UL Listed for specified application.
- F. Qualifications: Substantiate qualifications comply with specifications.
  - 1. Irrigation Installer // with project experience list //.

2. Service provider // with project experience list //.

G. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.

H. Operation and Maintenance Data:

1. Start-up, maintenance, troubleshooting, emergency, and shut-down instructions for each operational product.

### 1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Regularly installs specified products.

2. Installed specified products with satisfactory service on five similar installations for minimum five years.

a. // Project Experience List: Provide contact names and addresses for completed projects. //

### 1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

D. Store plastic piping protected from direct sunlight. Support pipe to prevent sagging and bending.

### 1.10 WARRANTY

SPEC WRITER NOTE: Always retain construction warranty. FAR includes Contractor's one year labor and material warranty.

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. Provide system that operates with minimum water pressure of // \_\_\_\_\_ // kPa (// \_\_\_\_\_ // psi) at connection to // main // meter // building // backflow prevention device // and // \_\_\_\_\_ // kPa (// \_\_\_\_\_ // psi) at last head in each zone.

B. Irrigation Zone Control: Automatic operation with controller and automatic control valves.

## 2.2 SYSTEM PERFORMANCE

- A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.
- B. Design piping, valves, and specialties complying with following maximum pressure performance requirements:
  - 1. Irrigation Main Piping: // 640 kPa (100 psi) // \_\_\_\_\_ //.
  - 2. Circuit Piping: // 520 kPa (80 psi) // \_\_\_\_\_ //.

## 2.3 MATERIALS

### SPEC WRITER NOTE:

- 1. Select piping material according to project requirements. Verify site conditions.
- 2. Use copper or plastic pipe where corrosion problem exists.

### A. Piping Materials:

- 1. Copper Tubes: ASTM B88, // Type L // Type M //.
  - a. Fittings: ASME B16.18 and ASME B16.22 solder-joint fittings.
  - b. Bronze Flange: ASME B16.24, class 150, ASTM B32 solder-joint end.
  - c. Union: Cast-copper alloy with ball-and-socket, solder joints or threaded ends.
  - d. Brazing Filler Metal: AWS A5.8.
  - e. Solder: ASTM B32, tin-antimony. Flux soldering, ASTM B813.
- 2. Polyethylene (PE) Plastic Pipe with Controlled ID: ASTM D2239, // SIDR 11.5 // or // SIDR 15 //.
  - a. Fittings: ASTM D2609.
  - b. Flange Gaskets, Bolts, and Nuts: Type as recommended by manufacturer.
- 3. Polyethylene (PE) Plastic Pipe: AWWC906 with dimension ratio of 7.3, 9, or 9.3 to provide // 1100 kPa (160 psi) // 1380 kPa (200 psi) minimum pressure rating.
  - a. Fittings: // ASTM D3261 // ASTM D2683 //.

## SPEC WRITER NOTE:

1. Schedule 40 is Type I, Grade 1 with 13.8 MPa (2,000 psi) hydrostatic design stress, and wall thickness of Schedule 40.

2. Schedule 80 is Type I, Grade 2 with 13.8 MPa (2,000 psi) hydrostatic design stress, and wall thickness of Schedule 80.

3. SDR 21 is Type I, Grade 1 with 13.8 MPa (2,000 psi) hydrostatic design stress, and standard dimension ratio of 21.

4. SDR 26 is Type I, Grade 1 with 13.8 MPa (2,000 psi) hydrostatic design stress, and standard dimension ratio of 26.

4. Polyvinyl Chloride (PVC) Pipe: ASTM D1785 PVC 1120, Schedule // 40 // 80 //; or ASTM D2241, PVC 1120 compound, // SDR 21 // or // SDR 26 //.

## a. Fittings:

- 1) Socket Type: // ASTM D2466, Schedule 40 // ASTM D, 2464 Schedule 80 //.
- 2) Threaded Type: ASTM D2464, Schedule 80.
- 3) Swing Joints: Threaded fittings with elastomeric seals and minimum 1380 kPa (200 psi) working pressure.

## b. Solvent Cement: ASTM D2564.

## c. Flange Gaskets, Bolts, and Nuts: Type as recommended by manufacturer.

## B. Valves:

## 1. Underground Shut-Off Valves:

SPEC WRITER NOTE: Select paragraphs as necessary below.

a. Butterfly Valves 50 mm (2 Inches) and Larger: AWWC504, 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.

b. Ball Valves, Isolation valves, 38 mm (1-1/2 Inch) 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.

## c. Operations:

- 1) Underground Applications: Use valves with 50 mm (2 inch) nut for T-Handle socket wrench operation.
  - 2) Aboveground and Valve Pit Applications: Use valves with handwheels.
  - 3) Provide enclosed gear drive operators for all butterfly valves 150 mm (6 inches) and larger.
  - 4) Valve ends: Accommodate type of main pipe adjacent to valve.
2. Swing Check Valves:
- a. Valves Smaller than 100 mm (4 inches): // ASTM B61 // or // ASTM B62 //, 850 kPa (125 psi) bronze body and bonnet.
  - b. Valves 100 mm (4 inches) and Larger: // ASTM B61 // or // ASTM B62 //, 1380 kPa (200 psi), iron body, bronze trim, vertical or horizontal installation, flange connection.
3. Pressure Reducing Valve: Cast steel body with renewable seats and stainless steel trim. Design flow passages and all parts to withstand high velocity applications, flange connected.

SPEC WRITER NOTE: An activated open and shut-off device for controlling water flow to sprinkler branch line.

4. Remote Control Valves: Solenoid actuated valves, 24 Volt AC, installed underground.

SPEC WRITER NOTE: Select paragraphs below as required. If both types are used, show locations on Drawings.

- a. Globe Valves: Heavy duty construction with manual shut-off and flow control adjustment manual operation.
  - b. Straight or Angle Valve:
    - 1) Cast iron valve body with brass bonnet, trim and renewable seat with two inlet taps.
    - 2) Molded-plastic body, normally closed diaphragm type with manual shut off and flow control adjustment.
  - c. Provide valves with unions and housing with minimum working pressure, 1025 kPa (150 psi).
5. Quick Couplers: Brass parts, two-piece unit consisting of coupler water seal valve assembly and removable upper body to allow spring and key track to be serviced without shut down of main.



- a. Lids: Lockable vinyl cover with springs for positive closure on key removal.
- b. Provide // Insert number // hose swivels and operating keys for each size coupler to Contracting Officer's Representative.
- 6. Reduced Pressure Principle Backflow Preventer: ASSE 1013. Provide for new connection to water distribution system.
- 7. Valves Serviceability: From top without removing valve body from system. Provide // Insert Number // 750 mm (30 inch) long adjustment keys. Valves to operate at no more than 50 kPa (7 psi) pressure loss at manufacturers maximum recommended flow rate.
- C. Sleeve Material: ASTM D2241, Schedule 40.

SPEC WRITER NOTE: For smaller projects with independent controllers, select Electric or Solar powered Controller options as conditions permit.

**2.4 AUTOMATIC CONTROL EQUIPMENT - // ELECTRIC // INDEPENDENT // INDEPENDENT WITH NO FLOW SENSING // SOLAR //**

- A. Control Equipment: NEMA ICS 2 with // 20-volt single phase service // 24 Volt AC solar //, operating with indicated station, and ground chassis. Provide enclosure NEMA ICS 6 Type 3R, with locking hinge cover, // wall mounted // pedestal mounted //.
- 1. Electric Controller: Programmed for various schedules by operating individual remote control valves, with following manufacturer's standard recommended components:
  - a. Central computer.
  - b. Flow meter.
  - c. Moisture sensor.
  - d. ET (evapotranspiration).
  - e. Measurement device.
  - f. Rain measurement device.
  - g. Wind measurement device.
  - h. Central control software.
  - i. Field controller.
  - j. Accessories required to operate system.
- 2. Independent Electric Controllers: UL approved. Programmed for various schedules by one or more independent controllers to operate individual remote control valves, with following manufacturer's standard recommended components:

- a. Flow meter.
  - b. Rain sensor.
  - c. Accessories required to operate system.
3. Independent Electric Controller with No Flow Sensing (For Small Installations): Programmed for various schedules by one controller to operate individual remote control valve, with manufacturer's standard components.
  4. Solar-Powered: Programmed for various schedules by one or more independent controllers to operate individual remote control valves, with manufacturer's recommended components.

## **2.5 SPRINKLER HEADS**

- A. Sprinkler Heads: Manufacturer's standard unit designed to provide uniform coverage over entire area of spray as indicated on Drawings. Internal assembly includes filter screen, capable of removal from top without removing sprinkler case from riser.
  1. Rotary Pop-Up Sprinklers: Gear-driven, impact resistant heavy-duty ABS with gears and pinions assembled on stainless steel spindles.
    - a. Full circle sprinklers, dual or tri-nozzle combination type with positive water-driven gear assembly.
    - b. Part circle sprinklers, variable arc type.
  2. Shrub Spray: Pop-up or fixed spray type with heavy-duty, ultraviolet resistant plastic sprinkler body, stem, nozzle, and screen and stainless steel retract spring and ratcheting system for alignment of pattern.
  3. Drip Emitters: Pressure compensating, permanently assembled type with 13 mm (1/2 inch) FPT inlet, capable of providing 3.8 L/min. (1 gpm) at inlet pressures between 100 and 340 kPa (15 and 50 psi).
  4. Emitter Distribution Tubing: Constructed of UV resistant vinyl material, 5.5 mm (0.22 inch) O.D. and 4 mm (0.16 inch) I.D., manufactured by same manufacturer as drip emitters.

## **2.6 LOW VOLTAGE CONTROL VALVE WIRE**

- A. Wire: NFPA 70, solid copper wire, minimum 1.8 mm (14 gage), UL LLC approved for direct burial in ground.

## **2.7 LOW VOLTAGE CONTROLLER CABLE**

- A. Multi-strand cable, UL-approved for direct burial in ground, size and wire type according to manufacturer's recommendations.

**2.8 TRACER WIRES**

- A. Tracer Wires: Plastic-coated copper tracer wire, 1.8 mm (14 gage), green, Type TW, installed with non-metallic irrigation main lines.

**2.9 SPLICING MATERIALS**

- A. Epoxy waterproof sealing packet.

**2.10 ACCESSORIES**

- A. Valve Box: Precast concrete with compressive strength in excess of 30 MPa (4,000 psi). Provide valve boxes suitable and adjustable for valve used.
  1. Cast word "Irrigation" on cover.
  2. Provide "T" handle socket wrenches, 15 mm (5/8 inch) round stock with sufficient length to extend 600 mm (2 feet) above top of deepest valve box cover.
  3. Stencil controller and circuit numbers with permanent white epoxy paint. Letters minimum 75 mm (3 inches) height.
  4. Provide // Insert Number // 760 mm (30 inches) long valve adjustment keys.
  5. Valve Box in Plant Bed Areas: HDPE structural foam Type A, Class III.
    - a. Color: // Green // Tan //.
    - b. Size: Minimum 480 (19 inches) long by 355 mm (14 inches) deep with key-lockable hinged cast iron cover.
  6. // Drip Zone Lateral Flush Cap Assembly: HDPE round reinforced plastic valve box and lid with lift hole, minimum 145 mm (5-3/4 inches) diameter top opening and 230 mm (9-1/16 inches) minimum height. //
  7. // Emitter Access Boxes: UV resistant thermoplastic round plastic boxes with lid, tan in color. Top diameter 125 mm (5 inches) and 260 mm (10-1/4 inches) high, minimum. //
- B. Backflow Preventer: ASSE 1013. Provide reduced pressure principle backflow preventer at each new connection to water distribution system.

SPEC WRITER NOTE: Retain applicable following paragraph.

**C. Water Meters:**

1. Meters: Comply with Section 25 10 10, ADVANCED UTILITY METERING SYSTEM. Connect irrigation system as follows:
  - a. // Use existing building water meter. //

- b. // Meter furnished and set by Public Utility Company. //
  - c. // Meter furnished by Public Utility Company and installed by Contractor. //
  - d. // Provide and install meter approved by Public Utility Company. Submit approval before installation. //
- D. Pressure Gages: ASME B40.100, 113 mm (4-1/2 inches) diameter, all metal case, with bottom connection.
- 1. Dial: // Dead black // or // white lacquered // throughout with maximum graduations of 13.8 kPa (2 psi). Provide shut-off cocks.
- E. Concrete Pit: Reinforced poured in place concrete structure as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE or approved precast concrete unit.
- 1. Frames And Covers for Concrete Pit:
    - a. For roadway applications, traffic rated frame and cover, AASHTO H20-44 loading.
    - b. For non-roadway applications, provide:
      - 1) Cast-iron cover with cast-in identification symbol "IRR-WATER".
      - 2) Frame: Type I, Straight Traffic Frame, Style A, Size 30A.
      - 3) Cover: // Type // Type B //, Size 30A.
- F. Strainers:
- 1. Brass Strainer Basket:
    - a. Bodies smaller than 63 mm (2-1/2 inches), brass or bronze.
    - b. Bodies 63 mm (2-1/2 inches) and larger, cast iron or semi-steel.
    - c. Provide strainer cover with blow-off connection and shut-off valve to accommodate 18 mm (3/4 inch) diameter hose connection.
- SPEC WRITER NOTE: Use non-detectable type at cemeteries only.
- G. Warning Tape: Polyethylene film warning tape, 0.1 mm (4 mils) thick, 75 mm (3 inches) wide, // detectable // non-detectable //, imprinted with "CAUTION BURIED IRRIGATION WATER LINE BELOW", colored as follows:
- 1. Blue with Black Letters: Potable water.
  - 2. Purple with Black Letters: Reclaimed or untreated well water.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Examine and verify substrate suitability for product installation.

- B. Protect existing construction and completed work from damage.
- C. Examine proposed irrigation areas for compliance with requirements and conditions affecting installation and performance.
- D. Set stakes to identify locations of proposed irrigation system. Obtain Contracting Officer's Representative's approval before excavation.

### **3.2 INSTALLATION - GENERAL**

- A. Install products according to manufacturer's instructions // and approved submittal drawings //.
  - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Perform excavation, trenching, and backfilling for sprinkler system as specified in Section 31 20 00, EARTHWORK.

### **3.3 PIPE INSTALLATION - GENERAL**

- A. Layout work as indicated on drawings. Lines are to be in common trench wherever possible.
- B. Install sprinkler lines to avoid HVAC trenches, electric ducts, storm and sanitary sewer lines, and existing water and gas mains; all of which have right of way.
- C. Cut existing sidewalks and curbs 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 warranty period.
- D. Do not lay pipe on unstable material, in wet trenches or, in opinion of Contracting Officer's Representative, when trench or weather conditions are unsuitable for work.
- E. Allow minimum of 75 mm (3 inches) between parallel pipes in same trench.
- F. Clean 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. Install full length of each section of pipe resting upon 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 depth of 300 mm (12 inches) over pipe.

SPEC WRITER NOTE: Include below for cemetery projects.

- J. Install irrigation lines and control wire at boundaries of graves, through designated utility lanes or beside roadways without disruption of irrigation system.
- K. Install irrigation lines and control wire at designated utility lanes or beside roadways where possible.

SPEC WRITER NOTE: Select options appropriate to installation in either cemetery or hospital.

- L. Connect new system to existing mains. // Disconnect and abandon existing irrigation system. //
- M. Install concrete thrust blocks where irrigation main changes direction at "L" and "T" locations and where irrigation main terminates. Delay pressure tests until minimum 36 hours after completing thrust blocks. Size and place concrete thrust blocks for supply mains according to pipe manufacturer's instructions.
- N. Minimum cover over water mains, 760 mm (30 inches). Cover laterals to minimum depth of 600 mm (24 inches).
- O. Place warning tape 300 mm (12 inches) above sprinkler system water mains and laterals.

#### **3.4 PLASTIC PIPE INSTALLATION**

- A. Install plastic pipe snaked in trench at least 1 m per 30 m (1 foot per 100 feet) 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 Polytetrafluoroethylene (PTFE) thread lubricant or PTFE thread tape. After joint is made hand tight (hard), strap wrench should be used to make up to two additional full turns.
  3. Elastomeric Gasket: ASTM F477.

**3.5 VALVE INSTALLATION**

- A. Group remote control valves wherever possible and aligned at set dimension back of curb along roads.
- B. Do not install valves under roads, pavement or walks.
- C. Clean interior of valves of foreign matter before installation.
- D. House pressure control valves installed adjacent to remote control valve in same valve box.
- E. Install valve box with cover flush with finished grade.
- F. Install control valves minimum 75 mm (3 inches) below finished grade.

**3.6 SLEEVE INSTALLATION**

- A. Install sleeves where pipe and control wires are installed under walks, paving, walls, and other similar areas.
- B. Install sleeves twice line size or greater extend 300 mm (12 inches) beyond edges of paving or construction.
- C. Bed sleeves with minimum 100 mm (4 inches) sand backfill above top of pipe in areas where pipe is placed before hardscape is installed.

**3.7 EMITTER HOSE INSTALLATION**

- A. Joint: Solvent weld connection.
- B. Install line size by 9 mm (3/8 inch) insert bushings adapters from PVC Schedule 40 fittings to flex vinyl hose.

**3.8 SPRINKLER AND QUICK COUPLER INSTALLATION**

- A. Install sprinkler heads and quick couplers on temporary nipples extending at least 75 mm (3 inches) above finished grade. After turf is established, remove temporary nipples, install sprinkler heads and quick couplers at ground surface.
- B. Locate part circle heads to maintain maximum distance of 150 mm (6 inches) from edges and other boundaries.
- C. Provide swing joint assembly in all sprinklers, shrub sprays and quick couplers.
- D. Set shrub spray heads 200 mm (8 inches) above grade and 300 mm (12 inches) from edge of curb or pavement. Place adjacent to walls. Stake heads before backfilling trenches. Support stakes parallel to riser.
- E. Install entire system for manual and automatic draining. Equip low point of each underground line with drain valve draining into an excavation containing gravel. Backfill with excavated material and cover with 50 mm (2 inches) precast concrete cover.

### 3.9 DRIP IRRIGATION SPECIALTY INSTALLATION

SPEC WRITER NOTE: Actual water emission points of drip irrigation system installed above soil accomplishes two objectives. It aids visual checking of system for proper operation and it reduces system clogging that can be caused by root intrusion.

- A. Install drip heads // in plastic drip box //. Connect drip head to // rigid PVC nipple // drip head stake // directly to tubing //. Attach tubing to barbed fitting and daylight distribution tubing at root ball secured with stake. Add bug cap at end of secured distribution tubing. After installing drip heads and before operating system, open end of drop lateral and flush lines clean. Limit number of drip heads on line according to manufacturer's recommendations for hose or distribution tubing size and length.

### 3.10 AUTOMATIC IRRIGATION - CONTROL SYSTEM INSTALLATION

- A. Determine exact location of controllers in field before installation. Coordinate electrical service to these locations. Install according to manufacturer's instructions and NFPA 70.

SPEC WRITER NOTE: Select paragraph for control system installation.

### 3.11 CONTROL WIRE INSTALLATION

- A. Install electric control cable in trenches with new mains or in separate trench at back of curb, unless cross-country route is indicated on Drawings. Locate in trench with mains when possible on cross-country routes.
- B. Install wiring bundles located with piping 50 mm (2 inches) below bottom of pipe. Color code each wire in bundle differently. Bundle multiple wires and tape together at 4570 mm (15 foot) intervals. Tag wires at controllers and control valve location with plastic tie wire tags. Provide same number and color of wire at each ends.
- C. Hold splicing to minimum. Provide pullbox at each splice. No splices will be allowed between field located controllers and remote control valves.
- D. Provide 300 mm (12 inch) expansion loops in wiring at each wire connection or change in wire direction. Provide 600 mm (24 inches) loop at remote control valves.



- E. Do not install power wires for operation of irrigation system in same conduit as irrigation control wires.

### **3.12 TRACER WIRE INSTALLATION**

- A. Install tracer wire on bottom of trench, adjacent to vertical pipe projections, and continuous throughout length of pipe, with spliced joints soldered and covered with insulation type tape.
- B. Install tracer wire following main line pipe and branch lines and terminate in yard box with gate valve controlling these main irrigation lines. Provide sufficient length of wire to reach finish grade, bend back end of wire to make loop and attach plastic label with designation "Tracer Wire."
- C. Record locations of tracer wires and their terminations on project record documents.

### **3.13 FRAMED INSTRUCTIONS**

- A. Post framed instructions, containing wiring and control diagrams under glass or in laminated plastic, where directed by Contracting Officer. Condensed operating instructions, prepared in typed form, framed and posted beside diagrams. Post framed instructions before acceptance testing of system. Submit labels, signs, and templates of operating instructions that are required to be mounted or installed on or near product for normal, safe operation. Prepare controller charts and programming schedule after as-built drawings are approved by Contracting Officer. Provide one black-line chart for each controller as reduced drawing of actual as-built system that will fit maximum dimensions inside controller housing. Indicate each station coverage area with different pastel or transparent color on chart. After chart is completed and approved for final acceptance, laminate chart, sealed between two 0.5 mm (20 mil) pieces of clear plastic.

### **3.14 FIELD TRAINING**

- A. Provide field training course for designated operating and maintenance staff members for total period of // \_\_\_\_\_ // hours of normal working time and starting after system is functionally complete but before final acceptance tests. Submit information describing training to be provided, training aids to be used, samples of training materials to be provided, and schedules and notification of training. Cover items contained in operating and maintenance manuals. Provide two additional years of software support for one hour each month.

**3.15 FIELD QUALITY CONTROL**

## A. Special Inspections and Tests:

SPEC WRITER NOTE: Section 01 45 29, TESTING LABORATORY SERVICES includes VA provided testing for large projects and contractor provided testing for small projects. Coordinate testing responsibility.

## B. Field Tests and Inspections: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

1. Pressure test lines before joint areas are backfilled. Backfill minimum of 300 mm (12 inches) over pipe to maintain pipe stability during test period. Test piping at hydraulic pressure of 1030 kPa (150 psi) for two hours.
    - a. Maximum Loss: 3 L/25 mm pipe diameter/300 m (0.8 gallons per inch pipe diameter per 1,000-feet). 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. Repeat test until satisfactory results are achieved and accepted by Contracting Officer's Representative.
  2. After testing, flush system with minimum 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. Charge system and test for leaks after installation. Repair leaks and retest until no leaks exist.
  4. After electrical circuitry has been energized and final adjustment of sprinkler heads is complete, test each sprinkler section by pan test and visual test to indicate uniform distribution within any one sprinkler head area and over entire area. Operate controllers and automatic control valves to demonstrate complete and successful installation and operation of all equipment.
- C. 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.
- D. Prepare test and inspection reports.

SPEC WRITER NOTE: Adjust verbal instructional hours in following paragraph to suit installation. Hospital equals 8 hours, cemetery equals 16 hours, minimum.

**3.16 PROTECTION**

- A. Protect irrigation system from // traffic and // construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

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