
PART 1 GENERAL**1.1 SUMMARY**

A. Section Includes:

1. Pipe Sleeves and Conduit Sleeves for Landscape Irrigation Pipe and Control Wire.
2. Trenching and Backfill for Landscape Irrigation Pipe and Control Wire.
3. Landscape Irrigation System Equipment and Materials.

1.2 REFERENCES

1. NEC — National Electric Code, Current Edition.
2. UPC — Uniform Plumbing Code, Current Edition

B. ASTM — American Society for Testing and Materials:

1. B 3 — Specification for Soft or Annealed Copper Wire.
2. B16 — Specification for Wrought Copper and Cast Bronze Pipe and Fittings.
3. B 88 — Specification for Seamless Copper Water Tube.
4. D 1557 — Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
5. D 1784 — Specification for Rigid PVC Compounds and CPVC Compounds.
6. D 1785 — Specification for PVC Plastic Pipe, Schedules 40, 80, and 120.
7. D 2241 — Specification for PVC Pressure-Rated Pipe.
8. D 2287 — Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.
9. D 2464 — Specification for Threaded PVC Plastic Pipe Fittings, Schedule 80.
10. D 2466 — Standard Specification for PVC Plastic Pipe Fittings, Schedule 40.
11. D 2467 — Specification for Socket-Type PVC Plastic Pipe Fittings, Schedule 80.
12. D 2564 — Specification for Solvent Cements for PVC Plastic Piping Systems.
13. D 2672 — Specification for Joints for IPS Pipe Using Solvent Cement.
14. D 2855 — Practice for Making Solvent-Cemented Joints with PVC Pipe and Fittings.
15. F 402 — Practice for Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.
16. F 656 — Specification for Primers for Use in Solvent Cement Joints of PVC Plastic Pipe and Fittings.

C. ANSI — American National Standards Institute:

1. NSF 14 — Plastics Piping System Components and Related Materials.
2. B16.22 and B16.18 — Cast Copper Alloy Solder-Joint Pressure Fittings.

1.3 DEFINITIONS

- A. Acceptance, Acceptable, or Accepted: Acceptance by the Owner's Representative in writing.
- B. PVC: Polyvinyl Chloride.
- C. SDR: Standard Dimensional Ratio.
- D. AWG: American Wire Gauge.
- E. Excessive Compaction: Planting area soil compaction greater than 75 percent of maximum dry density as determined by ASTM D 1557.

1.4 ACTION SUBMITTALS

A. LEED Submittals:

1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.

- B. Environmental Submittals:
 - 1. Credit WE 1 Option 2: Path 1 Use captured rainwater for irrigation. Provide information indicating the requirements for Option 1 have been met.
- C. Product Data: Submit for complete list of products, materials, equipment and assemblies to be installed.

1.5 INFORMATIONAL SUBMITTALS

- A. Record Documents:
 - 1. Show actual locations of valves and irrigation piping.
 - 2. Show dimensions from easily-identifiable permanent structures such as walls, curbs, fences, buildings or walks.
 - 3. The Owner's Representative will not be responsible for Contractor's errors or omissions in preparing the Record Documents.

1.6 QUALITY ASSURANCE

- A. Contractor Qualifications: Workmen shall be thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Regulatory Requirements: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work, including the UPC and NEC.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Storage:
 - 1. Meet requirements of material and product manufacturer's current printed instructions.
 - 2. Store products with protection from weather or other conditions which would damage or impair the effectiveness of the product.
 - 3. Protect PVC pipes and fittings from direct sunlight.
 - 4. Store pipe on level beds equal to or greater than length of pipe.

1.8 SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not lay PVC pipe when there is water in trench.
 - 2. Backfill trenches when PVC pipe is not in an expanded condition due to heat or pressure.
 - 3. Cool pipe by operating the system a short time before backfill, or backfill in early morning.
 - 4. Avoid installation and trench backfill during heat of the day on straight runs of more than 500 feet.
- B. Existing Conditions:
 - 1. Prior to Work commencement, review locations of existing public underground utilities and structures with utility companies and clearly mark locations in field.
 - 2. Prior to Work commencement, review location of existing private underground utilities and structures with the Owner and clearly mark locations in field.
 - 3. Prior to Work commencement, obtain and review irrigation As-Built plans to ensure understanding of existing site conditions.

1.9 WARRANTY

- A. Additional Items Covered: Warranty shall also cover settlement of trench backfill and repair of damage to other materials and workmanship resulting from defects in materials, workmanship and settlement.

1.10 MAINTENANCE

- A. Extra Materials: At final review, furnish to the Owner the following items:
 - 1. Three of any special tool required for the maintenance of each type of component used in the system.

2. Two quick-coupling valve keys or 1 quick-coupling valve key per 5 quick-coupling valves, whichever quantity is greater.
3. Other items indicated on the Drawings.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Piping on Pressure Side of Control Valves 2 Inches Diameter and larger: ANSI NSF 14, ASTM D 1784, PVC 1120-1220, SDR 13.5, Class 315 solvent weld.
- B. Piping on Pressure Side of Control Valves 1-1/2 Inches Diameter and Smaller: ANSI NSF 14, ASTM D 1784 AND 1785, PVC 1120-1220, Schedule 40 solvent weld.
- C. Piping at Street Level Planters: ASTM B88, Seamless Copper Water Tube, Type K, Hard.
- D. Piping on Non-pressure Side of Control Valves: ANSI NSF 14, ASTM D 1784 AND 1785, PVC 1120-1220, Schedule 40 solvent weld.
- E. Fittings for Piping on Pressure Side of Control Valves: ANSI NSF 14, ASTM D 2467, Schedule 80, PVC standard weight, as manufactured by "Sloane" or "Lasco".
- F. Fittings for Piping at Street Level Planters: ANSI B16.22 and B16.18, Cast Copper Alloy Solder-Joint Pressure Fittings.
- G. Connections to Control Valves, Gate Valves, and Quick Coupling Valves: As detailed on Drawings.
- H. Fittings for PVC Piping on Non-pressure Side of Control Valves: ANSI NSF 14, ASTM D 2466, Schedule 40, PVC standard weight, as manufactured by "Sloane" or "Lasco".
- I. Nipples: Plastic — ASTM D 1784 and ASTM D 1785, schedule 80, Type I, Grade 1, PVC, threaded both ends, uniformly grey in color.
- J. All PVC piping and Sleeves shall be Purple Colored (Pantone 522c).
- K. Primer for Solvent Cement Joints: ASTM F 656.
- L. Solvent Cement for Joints: ASTM D 2564.
- M. Sleeves for Control Wire and Water Line: PVC 1120-1220, Schedule 40 pipe.
- N. Two Wire Irrigation Controller: Refer to Drawings.
 1. Decoders: Baseline BL series valve and sensor decoders.
 2. Moisture Sensors: Baseline biSensors.
- O. Master Control Valve: Refer to Drawings.
- P. Flow Sensor: Baseline PFS series.
- Q. Remote Control Valves: Refer to Drawings.
- R. Two Wire Control Cable: Baseline biLine II.
- S. Control Wire between Decoders and Valve Solenoids:
 1. ASTM B 3, AWG no. 14, solid copper wire approved and classified for direct burial in ground.
 2. Use red, white, orange and black insulation colors.
- T. Control Wire Splicing Materials: 3M DBR/Y-6.

- U. Valve Boxes for Remote Control Valves in Planting Areas: Rainbird VB-STD, black box and cover; or, Applied Engineering Products No. 1015, black box and cover.
- V. Valve Boxes for Quick Coupling Valves in Planting Areas: Rainbird VB-10RND, black box and cover; or, Applied Engineering Products No. 910L, black box and cover.
- W. Quick-Coupling Valves: Refer to Drawings.
- X. Quick-Coupling Valve Keys: Fitted with 3/4-inch hose ells.
- Y. Heads: Refer to Drawings.
- Z. Steel Stakes and Pipe Clamps: Refer to Drawings.
- AA. Trench Backfill Under Paving: Pit run sand or fine aggregate with at least 90 percent passing number 4 sieve and no more than 10 percent passing number 200 sieve.
- BB. Trench Backfill at Planting Areas: On-site soil, free of vegetative matter, debris, frozen materials, stones larger than 1-inch diameter and other material which could damage pipe and wires or cause settlement.
- CC. Trench Backfill Around Existing Pipes at Planting Areas: On-site soil free of vegetative matter, debris, stones, other material larger than 3/8-inch diameter and material which could damage pipes or cause settlement.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.
- B. Notification of Unsuitable conditions: Before proceeding with Work, notify the Owner in writing of unsuitable conditions.

3.2 PREPARATION

- A. Protection:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the Work.
 - 2. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
 - 3. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
 - 4. Do not store materials or equipment, permit burning, or operate or park equipment under the drip line of existing plants to remain or over existing irrigation heads to remain.
 - 5. Submit written notification of conditions damaged during construction to the Owner immediately.

3.3 LAYOUT

- A. General:
 - 1. During installation, conform as closely as possible to Drawings.
 - 2. Drawings are diagrammatic to the extent that swing joints, offsets and fittings are not shown, and piping is not shown in exact location.
 - 3. Determine accepted tree locations prior to pipe trenching.
 - 4. Do not install pipe under tree root balls.
- B. Point of Connections: Where connections to existing water supply lines are required, install up to 50 additional feet of pressurized mainline pipe, at no additional cost to the Owner, should point of connections have to be located differently from where shown on the Drawings.
- C. Piping:

1. Where piping is shown on Drawings in paved areas but running parallel and adjacent to planted areas, install piping in planted areas, unless specifically noted to be installed in paved areas.
2. Do not install pipe directly over another line in same trench.

3.4 TRENCHING

- A. Pipe on Pressure Side of Control Valves: Excavate trenches to provide 18-inch cover where soil depth will allow, 14-inch minimum depth of cover in shallow soil depth areas.
- B. Pipe on Non-Pressure Side of Control Valves:
 1. Excavate trenches to provide 12-inch cover.
 2. Slope laterals to or from control valves.

3.5 CONDUITS AND SLEEVE INSTALLATION

- A. Conduit:
 1. Furnish and install conduit where control wires pass under or through paving, curbs, walls and other structures.
 2. Extend conduit 12 inches beyond edges of paving, curbs, walls and other structures.

3.6 PIPE LINE ASSEMBLY

- A. Manufacturer's Requirements: Meet requirements of pipe, pipe fitting and solvent manufacturers' current printed instructions.
- B. Cleaning: Clean pipes and fitting of dirt, scales and moisture before assembly.
- C. Solvent-Cemented Joints for PVC Pipes:
 1. Meet requirements of ASTM F 402 and ASTM D 2855, except requirements in conflict with the manufacturer's current printed instructions.
 2. Meet requirements of ASTM D 2672 for IPS pipe, except requirements which conflict with the manufacturer's current printed instructions.
 3. Use solvents and methods recommended by pipe manufacturer.
 4. Let solvents cure a minimum of one hour before applying any external stress on the piping and at least 24 hours before placing the joint under water pressure.
- D. Threaded Joints for Plastic Pipes:
 1. Use Teflon tape on threaded PVC fittings.
 2. Use strap-type friction wrench only.
 3. Do not use metal-jawed wrench.
- E. Laying of Pipe:
 1. Remove from trench rocks or clods 1-inch diameter or larger.
 2. Bed pipes in at least 2 inches of soil excavated from trench.
 3. Snake pipe from side to side of trench bottom to allow for expansion and contraction, allowing at least one additional foot per 100 feet of pipe.
 4. Do not lay PVC pipe when there is water in the trench.
 5. Backfill on sides of piping to provide uniform bearing.

3.7 IRRIGATION CONTROL VALVE INSTALLATION

- A. Manufacturer's Requirements: Meet requirements of manufacturer's current printed instructions.
- B. Valve Locations: Install control valves where shown on Drawings and group together as shown on Drawings.
- C. Valve Boxes: Locate valve boxes over valves and related pipe fittings in a horizontal position which allows easy removal and servicing.

3.8 BUBBLER HEAD INSTALLATION

- A. Install on a swing joint assembly as detailed on the Drawings.

3.9 QUICK COUPLING VALVE INSTALLATION

- A. Installation: Install on a swing joint assembly as detailed on the Drawings.

3.10 AUTOMATIC CONTROLLER INSTALLATION

- A. Manufacturer's Requirements: Meet requirements of manufacturer's current printed instructions.
- B. Code Requirements: Meet requirements of the NEC and other applicable codes.
- C. Connection to Valves: Connect remote valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.
- D. Labeling: Affix controller name (i.e., "Controller A") on inside of controller cabinet door with minimum of 1-inch high waterproof, vandal-resistant letters.
- E. Irrigation Diagram:
 - 1. Affix a non-fading copy of irrigation diagram to cabinet door below controller name.
 - 2. Seal irrigation diagram between two plastic sheets 20 mil. minimum thickness.
 - 3. Irrigation diagram shall be a reduced copy of the record document plan, clearly showing valves operated by the controller, station number, valve size, and type of planting irrigated.

3.11 CONTROL WIRING INSTALLATION

- A. Placement:
 - 1. Install control wires in common trenches with sprinkler mains and laterals wherever possible.
 - 2. Lay wire to the bottom side of pipe line.
 - 3. Provide a minimum of 3 feet of looped slack at valves.
 - 4. Snake wires in trench to allow for contraction of wires.
 - 5. Tie wires in bundles at 10 foot intervals, except within conduits.
- B. Detection Wire: Install a 12 AWG or greater size wire on top of the PVC main line with electrical tape every 10 feet to allow future metal detection search for purpose of main line location, wherever control wires are not installed with mainline.
- C. Splicing:
 - 1. Crimp control wire splices at remote control valves.
 - 2. Seal splices with specified splicing materials.
 - 3. Line splices will be allowed only on runs of more than 2,500 feet
- D. Settlement: If settlement occurs, fill depressions with amended topsoil, raise plants and mulch or resod as required to repair settled planting areas to the original accepted condition.

3.12 CLOSING OF PIPE AND FLUSHING OF LINES

- A. Capping:
 - 1. Cap or plug openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe.
 - 2. Leave caps or plugs in place until removal is necessary for completion of installation.
- B. Flushing: Thoroughly flush out water lines before installing heads, valves and other hydrants.
- C. Hydrostatic Testing:
 - 1. Test as specified below.
 - 2. Upon completion of testing, complete assembly and adjust sprinkler heads for proper water distribution.

3.13 ON-GRADE BACKFILLING AND COMPACTING

- A. Planting Areas: After system is operating and required tests and reviews have been made, backfill excavations and trenches with soil as specified above.

- B. Un-Sleeved Pipe Under Paving: Provide PVC pipe under paving with minimum of 4 inches of sand backfill around pipe and 24-inch cover to bottom of paving.
- C. Existing Underground Pipes at Planting Areas: Backfill with soil as specified above..
- D. Existing Underground Pipes at Paving Areas: Backfill with sand.
- E. Backfill Compaction:
 - 1. Compact backfill to minimum 95-percent density under paved areas in accordance with ASTM D 1557.
 - 2. Compact trenches under paved areas in 6-inch lifts.
 - 3. Compact backfill in planting areas to same relative compaction of adjacent soil in planting area.
- F. Finish Grading: Bring areas disturbed by irrigation Work back to grades encountered when irrigation Work commenced.

3.14 FIELD QUALITY CONTROL

- A. Hydrostatic Testing of Piping:
 - 1. The Owner will review the installed piping during hydrostatic testing prior to backfilling of trenches.
 - 2. Notify the Owner at least 72 hours prior to the anticipated review.
 - 3. Using a hydraulic pump, make hydrostatic tests with risers capped after welded PVC joints have cured at least 24 hours.
 - 4. Do not use air compressor.
 - 5. Center load piping with backfill to prevent pipe from moving under pressure.
 - 6. Leave couplings and fittings exposed.
 - 7. Apply continuous static water pressure of 120 pounds per square inch to piping on the pressure side of control valves for a 4-hour test period.
 - 8. Apply line pressure to piping on the non-pressure side of control valves for a 2-hour test period.
 - 9. Piping which loses pressure during specified test period shall fail pressure test.
 - 10. Locate and repair leaks when piping fails pressure test.
 - 11. Do not backfill trenches until respective piping passes pressure test.

3.15 ADJUSTING

- A. Coverage:
 - 1. Make other adjustments as directed by the Owner's Representative during reviews in field with the Owner's Representative.
 - 2. Install additional heads and lateral lines if required by the Owner's Representative.
- B. Tree Irrigation: Adjust tree irrigation for deep root watering.

END OF SECTION