

DIVISION 2 - SITEWORK
SECTION 02810
IRRIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Furnish all labor, materials, supplies, equipment, tools and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein. Items of work specifically included are:

- A. Procurement of all applicable licenses, permits, and fees including payment of all development, plant investment, or any other fees and permits associated with the purchase and installation of the tap.
- B. Coordination of Utility Locates (“Call Before You Dig”).
- C. Excavation, installation, and backfill of tap into municipal water line.
- D. Excavation, installation, and backfill of water meter and vault.
- E. Verification of existing static pressure.
- F. Maintenance period.
- G. Sleeving for irrigation pipe.

1.02 WORK NOT INCLUDED

Items of work specifically excluded or covered under other sections are:

- A. Provision and connection of electrical power supply to the irrigation control system.

1.03 RELATED WORK

- A. Division 2 - Site Work:
 - 1. Section 02920 - Fine Grading and Soil Preparation.
 - 2. Section 02931 - Seeding.
 - 3. Section 02950 - Trees, Plants and Ground Cover.

1.04 SUBMITTALS

- A. Deliver four (4) copies of all required submittals to the Owner’s Representative within 15 days from the date of Notice to Proceed.
- B. Materials List: Include pipe, fittings, mainline components, water emission components, control system components. Quantities of materials need not be included.
- C. Manufacturers' Data: Submit manufacturers' catalog cuts, specifications, and operating instructions for equipment shown on the materials list.

- D. Shop Drawings: Submit shop drawings called for in the installation details. Show products required for proper installation, their relative locations, and critical dimensions. Note modifications to the installation detail.
- E. Project Record Drawings: Submit project record (as-built) drawings to Owner prior to commencement of maintenance period (refer to specification section 3.11 for specific requirements).

1.05 RULES AND REGULATIONS

- A. Work and materials shall be in accordance with the latest edition of the *National Electric Code*, the *Uniform Plumbing Code* as published by the *Western Plumbing Officials Association*, and applicable laws and regulations of the governing authorities.
- B. When the contract documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.
- C. If quantities are provided either in these specifications or on the drawings, these quantities are provided for information only. It is the Contractor's responsibility to determine the actual quantities of all material, equipment, and supplies required by the project and to complete an independent estimate of quantities and wastage.

1.06 TESTING

- A. Notify the Owner's Representative three days in advance of testing.
- B. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least 24 hours before testing.
- C. Subsections of mainline pipe may be tested independently, subject to the review of the Owner's Representative.
- D. Furnish clean, clear water, pumps, labor, fittings, and equipment necessary to conduct tests or retests.
- E. Hydrostatic Pressure Test:
 - 1. Subject mainline pipe to a hydrostatic pressure of 150 PSI for two hours. Test with mainline components installed. A 2 PSI pressure variation is allowed. Backfill to prevent pipe from moving under pressure. Expose couplings and fittings.
 - 2. Leakage will be detected by visual inspection. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat the test until the pipe passes test.
 - 3. Cement or caulking to seal leaks is prohibited.
- F. Operational Test:
 - 1. Activate each remote control valve in sequence from controller. The Owner's Representative will visually observe operation, water application patterns, and leakage.
 - 2. Replace defective remote control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.
 - 3. Replace, adjust, or move water emission devices to correct operational or coverage deficiencies.
 - 4. Replace defective pipe, fitting, joint, valve, sprinkler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
 - 5. Repeat test(s) until each lateral passes all tests.

1.07 CONSTRUCTION REVIEW

The purpose of on-site reviews by the Owner's Representative is to periodically observe the work in progress and the Contractor's interpretation of the construction documents and to address questions with regards to the installation.

- A. Scheduled reviews such as those for irrigation system layout or testing should be scheduled with the Owner's Representative as required by these specifications.
- B. Impromptu reviews may occur at any time during the project.
- C. Final review will occur at the completion of the irrigation system installation and Record (As-Built) Drawing submittal.

1.08 GUARANTEE / WARRANTY AND REPLACEMENT

The purpose of this guarantee/warranty is to insure that the Owner receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.

- A. For a period of one year from commencement of the formal maintenance period, guarantee/warranty irrigation materials, equipment, and workmanship against defects. Fill and repair depressions. Restore landscape or structural features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by a defective item. Make repairs within seven days of notification from the Owner's Representative.
- B. Contract documents govern replacements identically as with new work. Make replacements at no additional cost to the contract price.
- C. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the guarantee/warranty period.

END OF SECTION

PART 2 - MATERIALS**2.01 QUALITY**

Use materials which are new and without flaws or defects of any type, and which are the best of their class and kind.

2.02 SUBSTITUTIONS

Pipe sizes referenced in the construction documents are minimum sizes, and may be increased at the option of the Contractor.

2.03 IRRIGATION TAP AND WATER METER

- A. Provide materials required by local codes for installation of the municipal water tap and associated piping.
- B. Provide materials required by local code for installation of the water meter and vault and associated piping.

2.04 SLEEVING

- A. Sleeving beneath drives and streets shall be PVC Class 200 pipe with solvent welded joints.
- B. Sleeving diameter: equal to twice that of the pipe or wiring bundle.

2.05 PIPE AND FITTINGS**A. Mainline Pipe and Fittings:**

1. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end.
2. Use Class 200, SDR-21, rated at 200 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241. Use PVC pipe rated at higher pressures than Class 200 in the case of small nominal diameters which are not manufactured in Class 200.
3. Use solvent weld pipe for mainline pipe with a nominal diameter less than 3-inches or where a pipe connection occurs in a sleeve. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.

B. Lateral Pipe and Fittings:

1. For drip irrigation laterals downstream of zone control valves, use UV radiation resistant polyethylene pipe manufactured from Prime Union Carbide G-resin 7510 Natural 7 manufactured by Union Carbide or a Union Carbide Licensee with a minimum of 2% carbon black, and minimum nominal pipe ID dimension of 0.810" for 3/4 inch pipe.

Use PVC/compression line fittings compatible with the drip lateral pipe. Use tubing stakes to hold above-ground pipe in place.

C. Specialized Pipe and Fittings:

1. Copper pipe: Use Type "K" rigid conforming to ASTM Standard B88. Use wrought copper or cast bronze fittings, soldered or threaded per the installation details. Use a 95% tin and 5% antimony solder.
2. Use a dielectric union wherever a copper-based metal (copper, brass, bronze) is joined to an iron-based metal (iron, galvanized steel, stainless steel).

3. Assemblies calling for pre-fabricated double swing joints shall utilize LASCO Unitized swing joints or approved equal. Swing joints shall be rated at 315 psi, and use O-ring and street elbow construction.
4. Assemblies calling for threaded pipe connections shall utilize PVC Schedule 80 nipples and PVC Schedule 80 threaded fittings.
5. Joint sealant:
Use only Teflon-type tape pipe joint sealant on plastic threads. Use nonhardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.

2.06 MAINLINE COMPONENTS

- A. Main System Shutoff Valve: As per local practice and in compliance with local code.
- B. Winterization Assembly: As per local practice and in compliance with local code.
- C. Backflow Prevention Assembly: As presented in the installation details.
- D. Quick Coupling Valve Assembly: Double swing joint arrangement as presented in the installation details.

2.07 DRIP IRRIGATION COMPONENTS

- A. Remote Control Valve (RCV) Assembly for Drip Laterals: As presented in the installation details. Use wire connectors and waterproofing sealant to join control wires to solenoid valves. Use standard Christy I.D. tags with hot-stamped black letters on a yellow background. Install a separate valve box over a 3-inch depth of 3/4-inch gravel for each assembly.
- B. Drip Emitter Assembly:
 1. Barb-mounted, pressure compensating emitter device as presented in the installation details. The device shall be Rain Bird XB-20.
 2. Install emitter types and quantities on the following schedule:
 - a. *Ground cover plant*: 1 single outlet emitter each or 1 single outlet emitter per square foot of planting area, whichever is less.
 - b. *Shrub*: 2 single outlet emitters each.
 - c. *Tree*: 8 single outlet emitters each.
 3. Use 1/4-inch diameter flexible plastic tubing to direct water from emitter outlet to emission point. Length of emitter outlet tubing shall not exceed five feet. Secure emitter outlet tubing with tubing stakes.
- C. Flush Cap Assembly: as presented in the installation details. Locate at the end of each drip irrigation lateral pipe. Install a separate valve box over a 3-inch depth of 3/4-inch gravel for each assembly.

2.08 CONTROL SYSTEM COMPONENTS

- A. Irrigation Controller Unit:
 1. Rain Bird UNIK Battery-operated controller with one (1) field transmitter for the project, and one (1) control module for each remote control valve on the project.

2.09 OTHER COMPONENTS

- A. Tools and Spare Parts: Provide operating keys, servicing tools, test equipment, other items, and spare parts indicated in the General Notes of the drawings.

END OF SECTION

PART 3 - EXECUTION

3.01 INSPECTIONS AND REVIEWS

A. Site Inspections:

1. Verify site conditions and note irregularities affecting work of this section. Report irregularities to the Owner's Representative prior to beginning work.
2. Beginning work of this section implies acceptance of existing conditions.
3. Contractor will be held responsible for coordination between landscape and irrigation system installation.
4. Landscape material locations shown on the Landscape Plan shall take precedence over the irrigation system equipment locations. If irrigation equipment is installed in conflict with the landscape material locations shown on the Landscape Plan, the Contractor will be required to relocate the irrigation equipment, as necessary, at Contractor's expense.

B. Utility Locates ("Call Before You Dig"):

1. Arrange for and coordinate with local authorities the location of all underground utilities.
2. Repair any underground utilities damaged during construction. Make repairs at no additional cost to the contract price.

C. Irrigation System Layout Review: Irrigation system layout review will occur after the staking has been completed. Notify the Owner's Representative two days in advance of review. Modifications will be identified by the Owner's Representative at this review.

3.02 LAYOUT OF WORK

- A. Stake out the irrigation system. Items staked include: pipe, control valves, and isolation valves.
- B. Install all mainline pipe and mainline components inside of project property lines.

3.03 EXCAVATION, TRENCHING, AND BACKFILLING

- A. Excavate to permit the pipes to be laid at the intended elevations and to permit work space for installing connections and fittings.
- B. Minimum cover (distance from top of pipe or control wire to finish grade):
 1. 18-inch over mainline pipe.
 2. 3-inch minimum mulch cover over drip lateral pipe in planting beds downstream of drip system zone control valves.
 3. PVC UV radiation resistant lateral pipe shall be installed directly on the soil surface.
- C. Backfill only after lines have been reviewed and tested.
- D. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, frozen materials, and stones larger than 2-inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects which may damage the pipe. Stones larger than 1-inch maximum dimension are not permitted in first (deepest) 6-inches of backfill.
- E. Backfill unsleeved pipe in either of the following manners:
 1. Backfill and puddle the lower half of the trench. Allow to dry 24 hours. Backfill the remainder of the

- trench in 6-inch layers. Compact to density of surrounding soil.
2. Backfill the trench by depositing the backfill material equally on both sides of the pipe in 6-inch layers and compacting to the density of surrounding soil.
- F. Enclose pipe beneath roadways, walks, curbs, etc. in sleeves. Minimum compaction of backfill for sleeves shall be 95% Standard Proctor Density, ASTM D698-78. Conduct one compaction test for each sleeved crossing less than 50 feet long. Conduct two compaction tests for each sleeved crossing greater than 50 feet long. Costs for such testing and any necessary retesting shall be borne by the Contractor. Use of water for compaction around sleeves, "puddling", will not be permitted.
- G. Dress backfilled areas to original grade. Dispose of excess backfill off site.
- H. Where utilities conflict with irrigation trenching and pipe work, contact the Owner's Representative for trench depth adjustments.

3.04 IRRIGATION TAP AND WATER METER

- A. Install the municipal water tap and associated piping materials in conformance with local regulations.
- B. Install the water meter and vault and associated piping in conformance with local regulations.

3.05 SLEEVING AND BORING

- A. Install sleeving at a depth which permits the encased pipe to remain at the specified burial depth.
- B. Extend sleeve ends six inches beyond the edge of the paved surface. Cover pipe ends and mark with stakes. Mark concrete with a chiseled "x" at sleeve end locations.
- C. Bore for sleeves under obstructions which cannot be removed. Employ equipment and methods designed for horizontal boring.

3.06 ASSEMBLING PIPE AND FITTINGS

- A. General:
 1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
 2. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.
- B. Mainline Pipe and Fittings:
 1. Use only strap-type friction wrenches for threaded plastic pipe.
 2. PVC Solvent Weld Pipe:
 - a. Use primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.
 - b. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
 - c. Snake pipe from side to side within the trench.
 3. Fittings: The use of cross type fittings is not permitted.
 4. UV Radiation Resistant Polyethylene Pipe:
 - a. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
 - b. Snake pipe from side to side within the trench, on the soil surface, and hold in place with tubing stakes spaced every five feet.
 5. Fittings: The use of cross type fittings is not permitted.
- C. Specialized Pipe and Fittings:

1. Copper Pipe:
 - a. Buff surfaces to be joined to a bright finish. Coat with solder flux.
 - b. Solder so that a continuous bead shows around the joint circumference.
2. Insert a dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, stainless steel) are joined.
3. Pre-fabricated double swing joints: Install per manufacturer's recommendations.
4. Low Density Polyethylene Hose: Install per manufacturer's recommendations.
5. PVC Threaded Connections:
 - a. Use only factory-formed threads. Field-cut threads are not permitted.
 - b. Use only Teflon-type tape.
 - c. When connection is plastic-to-metal, the plastic component shall have male threads and the metal component shall have female threads.
6. Make metal-to-metal, threaded connections with Teflon-type tape or pipe joint compound applied to the male threads only.

3.07 INSTALLATION OF MAINLINE COMPONENTS

- A. Main System Shut Off Valve: Install where indicated on the drawings.
- B. Winterization Assembly: Install where indicated on the drawings.
- C. Backflow Prevention Assembly: Install where indicated on the drawings. Install assembly so that its elevation, orientation, access, and drainage conform to the manufacturer's recommendations and applicable health codes.
- D. Quick Coupling Valve Assembly: Install where indicated on the drawings.

3.08 INSTALLATION OF DRIP IRRIGATION COMPONENTS

- A. Remote Control Valve (RCV) Assembly for Drip Laterals:
 1. Flush mainline pipe before installing RCV assembly.
 2. Locate as shown on the drawings. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wires. Connectors and sealant shall be installed as per the manufacturer's recommendations.
 3. Install only one RCV to valve box. Locate at least 12-inches from and align with nearby walls or edges of paved areas.
- B. Drip Emitter Assembly:
 1. Locate as shown on the drawings and installation details.
 2. Flush lateral pipe before installing emitter assembly.
 3. Cut emitter outlet distribution tubing square.
 4. Use tools and techniques recommended by the manufacturer.
- C. Flush Cap Assembly: Install at the end of each drip irrigation lateral pipe as shown on the installation details.

3.09 INSTALLATION OF CONTROL SYSTEM COMPONENTS

- A. Irrigation Controller Unit:
 1. Install battery-operated controller on underside of each remote control valve box cover with velcro strapping.

2. Make wiring connection per manufacturer's recommendation.

3.10 INSTALLATION OF OTHER COMPONENTS

A. Tools and Spare Parts:

1. Prior to the Pre-Maintenance Review, supply to the Owner operating keys, servicing tools, test equipment, and any other items indicated on the drawings.
2. Prior to Final Review, supply to the Owner the spare parts indicated in the General Notes on the drawings.

- #### **B. Other Materials:** Install other materials or equipment shown on the drawings or installation details to be part of the irrigation system, even though such items may not have been referenced in these specifications.

3.11 PROJECT RECORD (AS-BUILT) DRAWINGS

- #### **A.** Maintain on-site and separate from documents used for construction, one complete set of contract documents as Project Documents. Keep documents current. Do not permanently cover work until as-built information is recorded.
- #### **B.** Record pipe and wiring network alterations. Record work which is installed differently than shown on the construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each sleeve end, and other irrigation components enclosed within a valve box.
- #### **C.** Prior to Final Review, purchase from the Owner's Representative a reproducible mylar copy of the drawings. Using technical drafting pen, duplicate information contained on the project drawings maintained on site. Label each sheet "Record Drawing". Completion of the Record Drawings will be a prerequisite for the Final Review.

3.12 MAINTENANCE

- #### **A.** Upon completion of Final Review, maintain irrigation system for a duration of 2 years. Make periodic examinations and adjustments to irrigation system components so as to achieve the most desirable application of water.
- #### **B.** Following completion of the Contractor's maintenance period, the Owner will be responsible for maintaining the system in working order during the remainder of the guarantee/warranty period, for performing necessary minor maintenance, for trimming around sprinklers, for protecting against vandalism, and for preventing damage during the landscape maintenance operation.

3.13 CLEAN-UP

- #### **A.** Upon completion of work, remove from the site all machinery, tools, excess materials, and rubbish.

END OF SECTION