

SECTION 32 80 00**IRRIGATION****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. CONTRACTOR shall furnish all labor, materials, supplies, equipment, tools and transportation, and shall perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, the guarantee/warranty, and the installation details, as specified herein. This shall include repairs to existing irrigation systems for all areas disturbed by construction. Items of work specifically included are:
1. Procuring all applicable licenses, permits and fees.
 2. Inspecting worksite prior to construction and ascertaining utility locations.
 3. Installing irrigation system, including pumps, filters, sleeving and other appurtenances.
 4. Connecting electrical power supply to the irrigation control system.
 5. Maintaining system until final acceptance.

1.2 GENERAL

- A. CONTRACTOR shall inspect the site where the work is to be performed and become aware of the ground structure and obstacles which may be encountered and all other relevant matters in connection with the work.
- B. Beginning work implies CONTRACTOR acceptance of existing conditions.
- C. OWNERS manufacturer preference for irrigation systems and components is “Rainbird” or “Toro”. CONTRACTOR shall confirm system/component manufacturer with OWNER prior to ordering materials.

1.3 SUBMITTALS

- A. Materials list to include pipe, fittings, mainline components, water emission components and control system components.
- B. Manufacturers catalog cuts, specifications and operating instructions for equipment included in the materials list.

1.4 DELIVERY, STORAGE AND HANDLING

- A. CONTRACTOR shall exercise care in handling, loading and unloading the pipe and fittings. Pipe shall be stored in accordance with the manufacturer’s recommendations regarding skids, blocking, etc. to prevent damage to the pipe.

1.5 GUARANTEE AND REPLACEMENT

- A. The purpose of the guarantee/warranty is to ensure that the OWNER receives irrigation materials of prime quality; installed and maintained in a thorough and careful manner.
 - 1. Guarantee/warranty applies to originally installed materials and equipment and to replacements made during the guarantee/warranty period.

PART 2 PRODUCTS

2.1 GENERAL

- A. Unless otherwise stipulated in the specifications, all equipment, materials and articles incorporated into the project are to be new and in the best grade of their respective kinds for this purpose.
 - 1. Pipe and Tube
 - a. Mainline: PVC Class 200 SDR-21
 - b. Lateral Lines: PVC CC160 SDR-26
 - 2. Mainline Components
 - a. Point-of-Connection (P.O.C.) Assembly: As shown on the installation details or matches existing.
 - b. Isolation Gate Valve Assembly: As shown on the installation details.
 - c. Quick Coupling Valve Assembly: As shown on the installation details.
 - 3. Sprinkler Irrigation Components
 - a. Automatic Remote-Control Valves Assembly for Sprinkler Laterals: As shown in the installation details. Match existing heads.
 - b. Sprinkler Assembly: As shown in the drawings and installation details.
 - 4. Pipe Sleeve
 - a. Pipe Sleeve: PVC Schedule 40.
 - 5. Thrust Blocks
 - a. Concrete for thrust blocks shall meet the following standards:
 - 1. PSI: Minimum of three thousand five hundred (3,500).
 - 2. Water/Cement Ratio: Not greater and fifty-three hundredths (0.53).
 - 3. Air Content: Range between four and eight percent (4-8%).
 - 4. Slump: Minimum of four (4) inches.
 - 6. Control System Components
 - a. Irrigation Controller Unit:
 - 1. As presented in the drawings and installation details.
 - 2. Wire markers are to be pre-numbered or labeled with indelible non-fading ink and made of permanent, non-fading material.
 - 3. Primary surge protection arrestors as per manufacturer's recommendations.
 - b. Control Wire:

1. Type: Electric wire from the controller unit(s) to each remote-control valve shall be American Wire Gauge (AWG) No. 14 solid copper, Type UF cable, UL approved for direct underground burial. Common wire shall be AWG No. 12 solid copper, Type UF cable, UL approved for underground burial.
 2. Color: Wire color shall be continuous over its entire length. Use white for common ground wire. Use easily distinguishable colors for other control wires. Spare control wires shall be of a color different from that of the active control wire.
 3. Splices: As presented in installation details.
7. Accessories
- a. CONTRACTOR shall provide to OWNER operating keys, servicing tools, test equipment and other items and spare parts as indicated in the general notes on the drawings.

PART 3 EXECUTION

3.1 GENERAL

- A. CONTRACTOR shall appoint a competent resident superintendent to be onsite whenever work is in progress. The superintendent shall not be replaced with notice to the OWNER.
- B. CONTRACTOR is responsible for locating and avoiding underground utilities, for notifying all appropriate agencies prior to beginning excavation, and for any damage caused by CONTRACTOR. CONTRACTOR is required to notify OWNER and the utility company should there be any damage to utilities.
- C. OWNER shall at all times have access to the work whenever it is in preparation or progress. OWNER shall be notified prior to burial of piping or other components so that OWNER may conduct a pre-burial inspection.
- D. OWNER shall have the right to reject materials and workmanship or require their correction. Any rejected or faulty work shall be repaired or replaced at no cost to OWNER.
- E. Record Drawings:
 1. CONTRACTOR shall maintain an up-to-date set of record drawings on the job site detailing any changes made during construction.
 2. Following completion of the project, CONTRACTOR shall furnish OWNER with an “as-built” drawing. The “as-built” drawing shall show the correct location of all piping, valves, heads, and control lines. Instruction sheets and parts lists covering all operating equipment shall be bound in a folder and furnished to the OWNER.

3.2 PREPARATION

- A. CONTRACTOR shall stake out the irrigation system. Items staked include sprinklers, pipe, control valves, manual drains, pumping plant, controller, and isolation valves. After staking out the system, OWNER shall be contacted for approval before trenching.

3.3 EXCAVATION AND BACKFILL

- A. General: All excavation shall be done by open cut except where boring is permitted or required. All trenches shall be straight with bottoms on uniform slopes. Trenches shall be graded along their entire length to ensure firm bedding of the pipe.
- B. Excavation: CONTRACTOR shall do all necessary excavation for the proper installation of the work. Over-excavation shall be backfilled and hand-tamped prior to installation of the pipe. Any pumping, bracing or shoring shall be included as part of the work. CONTRACTOR shall excavate to permit the pipes to be laid at the intended elevations, and to permit workspace for installing connection and fittings.
- C. Minimum Cover (Distance from Top of Pipe or Control Wire to Finish Grade):
 - 1. 36-inch minimum over mainline pipe.
 - 2. 18-inch over lateral pipe.
 - 3. 12-inch over lateral pipe to pop-up sprinklers.
 - 4. 12-inch over lateral pipe to rotary sprinklers.
- D. Backfill: The materials excavated from trenching may be used for backfill when meeting the following standards. The material placed directly on top of the pipe to a depth of six (6) inches shall be free of all foreign matter and rock. After this, rock two (2) inches in diameter or less will be allowed in the backfill material. All rock or foreign matter not incorporated in the backfill material shall be removed from the site at the CONTRACTOR'S expense. In the event that clean backfill material from the excavation is insufficient, CONTRACTOR shall import clean fill material as needed.
- E. Compaction: All trenches shall be compacted within the pipe area by hand-tamping. After the initial backfill has been properly placed and tamped around the pipe, the remaining backfill material may be placed and compacted by machine. All trenches shall be compacted to the density of the surrounding material. Special attention shall be given to traffic areas to protect the pipe and to avoid future settlement due to poor compaction. Any settlement occurring during the warranty period shall be repaired at no additional cost to the OWNER.

3.4 PIPE INSTALLATION

- A. General:
 - 1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
 - 2. Keep ends of pipe capped. Remove caps only when necessary to continue assembly.
- B. Mainline Pipe and Fittings:
 - 1. Threaded Plastic Pipe: Use only strap-type friction wrenches for threaded plastic pipe.
 - 2. PVC Rubber-Gasketed Pipe: Use pipe lubricant. Join pipe in the manner recommended by the manufacturer and in accordance with accepted industry practices.

3. PVC Solvent-Welded 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 thirty (30) minutes before handling and twenty-four (24) hours before allowing water in pipe.
 - c. Snake pipe from side to side within the trench.

C. Lateral Pipe and Fittings:

1. Threaded Plastic Pipe: Use only strap-type friction wrenches for threaded plastic pipe.
2. PVC Solvent-Welded Pipe:
 - a. Use primer and solvent cement. Join pipe in the manner recommended by the manufacturer and in accordance with accepted industry practices.
 - b. Cure for thirty (30) minutes before handling and twenty-four (24) hours before allowing water in pipe.
 - c. Snake pipe from side to side within trench.
3. Permissible Deflection at Joints: Whenever it becomes necessary to deflect the pipe from a straight line in either the horizontal or vertical plane, the degree of deflection shall be within the limits set by the manufacturer and shall be approved by the OWNER.
4. Deviations for Existing Tree Roots: Avoid cutting tree roots larger than one (1) inch in diameter.
5. Thrust Blocking: All pipe, fittings and valves shall be carefully placed in the trenches with concrete thrust blocks to be poured at all fittings that result in a change of flow direction in the main line on pipe with a diameter exceeding three (3) inches. Any concrete that is judged to be of inferior quality shall be replaced at OWNER's request. The thrust blocks shall be left exposed for forty-eight (48) hours for inspection.
6. Sleeves: All pipe under pavement shall be in sleeves of PVC Schedule 40 and shall be sized two (2) times the diameter of the pipe being sleeved.

3.5 SPRINKLER INSTALLATION

- A. General: All sprinklers shall be installed by CONTRACTOR at the locations indicated on the drawings. It shall be the responsibility of the CONTRACTOR to notify OWNER of any deviation which may affect the spacing or location of the sprinkler heads. Unless written permission is provided, CONTRACTOR shall not extend the head spacing beyond one hundred percent (100%) head-to-head coverage.
- B. Sprinkler Heads: All sprinkler heads shall be installed in strict accordance with the manufacturer's recommendations. Prior to installation of the nozzles, all piping shall be thoroughly flushed. Sprinklers shall be installed at grade.

3.6 CONTROL EQUIPMENT

- A. General: All manual and/or automatic control valves, automatic controllers pressure reducing valves, vacuum breakers and other control equipment shall be installed at the locations shown on the drawings or as specified by the OWNER. In addition to these specifications, CONTRACTOR shall follow the local code requirements. In the event that a discrepancy exists between the specifications and local codes, the adopted code shall prevail.

- B. Automatic Valves: Use brand model and size noted on drawings. Automatic control valves shall be installed in accordance with the manufacturer's recommendations.
1. Flush mainline before installation of remote-control valve (RCV) assembly.
 2. Install where indicated on the drawings. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wires. Install connectors and sealant per manufacturer's recommendations.
 3. Adjust RCV to regulate downstream operating pressure.
- C. Irrigation Controller Units:
1. The location of the controller units shall be as shown on the drawings or by OWNER.
 2. A surge protection arrestor shall be installed on each control wire.
 3. Attach wire markers to the ends of control wires inside the controller unit housing. Label wires with the identification number of the remote-control valve to which the control wire is connected.
 4. Connect control wires to the corresponding controller terminal.
- D. Control Wire:
1. Bundle control wire where two (2) or more are in the same trench. Bundle with pipe wrapping tape spaced at ten-foot (10') intervals.
 2. Control wiring may be pulled into the soil using a vibratory plow device specifically intended for pipe pulling. Minimum burial depth equals minimum cover as shown on the drawings.
 3. Provide a twenty-four inch (24") excess length of wire in an eight inch (8") diameter loop at each ninety (90) degree change of direction, at both ends of sleeves, and at one-hundred (100) foot intervals along continuous runs of wiring. Do not tie wiring loop. Coil the twenty-four inch (24") length of wire within each remote control valve box.
 4. Install common ground wire and one control wire for each remote-control valve. Multiple valves on a single control wire are not permitted. Install control wires along the entire length of the mainline. Provide a twenty-four inch (24") length of coiled wire for each end of the spare control wires coiled in the control enclosure and provide a twenty-four inch (24") length of coiled wire for each spare control wire in a valve box at each distal end of the mainline pipe.
 5. If a control wire must be spliced, make the splice with wire connectors and waterproof sealant, per the manufacturer's instructions. Locate the splice in a valve box which contain an irrigation valve assembly, or in a separate six-inch (6") valve box.
 6. Unless noted on drawings, install wire parallel with and under mainline pipe.
 7. Protect wire not installed within mainline pipe with a continuous run of warning tape placed in the backfill six inches (6") above the wiring.

3.7 FIELD QUALITY CONTROL

- A. Major Inspections: CONTRACTOR shall obtain OWNER approval at the following construction milestones before proceeding to the next operation:
1. Trenching and mainline installation, including thrust blocks.
 2. Head layout

3. Final punchlist

B. Periodic Spot Checks:

4. OWNER or OWNER's representative may make periodic spot checks to observe work in progress.
5. Follow-up visits will occur as needed.
6. Checks to ensure proper operation/coverage of sprinklers.

D. System Adjustment: Adjustment of sprinkler heads, control systems and performance tests shall be performed by the CONTRACTOR to provide the OWNER with a professional, complete installation. All performance tests shall be made in the presence of the OWNER or OWNER's representative. Any components which do not conform to operational requirements due to unauthorized changes or poor installation practices shall be immediately corrected by the CONTRACTOR at no additional cost to the OWNER.

D. Acceptance:

1. Once the system is operating in conformance with the specifications, the OWNER will issue written final acceptance of the system.
2. If the system is not in acceptable condition prior to the end of the watering season, the CONTRACTOR will be responsible for winterizing the system and restarting it the following Spring.
3. The OWNER is not required to make partial or staged acceptances of the system.

3.8 RESURFACING

A. In areas where it becomes necessary to remove the existing pavement on sidewalk, roads, or drives, this material shall be replaced by the CONTRACTOR with material at least equal to the quality of the original. Prior to replacement, all exposed edges shall be trimmed to a neat straight line (saw cut) to provide an unobtrusive patch.

3.9 CLEANING

A. Upon completion of the work, CONTRACTOR shall remove all machinery, tools, excess materials and rubbish from the site.

END OF SECTION