

SECTION 02830

IRRIGATION STANDARD SPECIFICATIONS

PART 1 - DESCRIPTION

1.01 General

Work in this section consists of all labor, materials, and equipment necessary to install the irrigation system as indicated on the plans and includes, but not necessarily limited to: Lawn and shrub sprinkler system automatic controller and remote control valves, the proper execution of the work, including trenching, boring under driveways, walks, and curbs, installation of pipe sleeves, and backfilling.

PART 2 - MATERIALS

2.01 Submittals

- A. Before any irrigation system materials are delivered to the job site, submit to the Owner a complete list of all irrigation system materials proposed to be furnished and installed. Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to method of installation.
- B. Provide at least one person who shall be present at all times during execution of this portion of the work, and who shall be thoroughly familiar with the type of materials being installed, and material manufacturer's recommended methods of installation, and who shall direct all work performed under this section. The Contractor shall have a minimum of 5 years experience in commercial or residential lawn irrigation installation

2.02 Materials

- A. Polyvinyl Chloride (PVC) Pipe
 - 1. All mainlines and transmission lines shall be Schedule 40 PVC; laterals shall be Class 200 PVC. Pipe shall be rigid unplasticized conforming to ASTM D-1784 and D-2241 standard specifications for PVC pipe. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents.
 - 2. All pipe shall be continuously and permanently marked with the following information: Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73°F (23°C), and National Sanitation Foundation (N.S.F.) approval.
- B. Risers

1. All stationary spray heads shall have risers of high density polyethylene plastic pipe (“funny pipe”) with spiral barbed ell fittings. Minimum length of “funny pipe” shall be eighteen inches (18”) (450mm).
2. All rotor pop-up sprinklers shall have an adjustable pre-assembled double swing joint riser. Swing joints shall be Lasco or Spears Marlex ells MIPT x FIPT or equal approved in advance by the City. Swing joints shall be twelve inches (12”) (300mm) long and shall be threaded on both ends. The swing joint riser shall be of proper pipe size to match head threads.

C. Manual Valves

1. All manual ball valves, sizes three-inch (3”) (75mm) and smaller, shall be full ported ball valves with maximum working pressure of 175 psi (1200kPa) and 350 psi (2400kPa) hydrostatic test pressure.
2. All manual gate valves of four-inch (4”) (100mm) size or larger shall be iron body, brass trimmed, double disc wedge type with integral taper seats and with non-rising stems, and shall be Mueller A-2360 resilient wedge gate valves with mechanical joints or equal accepted in advance by the City. All manual gate valves shall be 200 psi (1380kPa) rated.

D. Valve Boxes

1. All remote control valves, manual control valves, zone shut-off valves, ball valves, or globe valves unless otherwise indicated, shall be installed in valve access box of proper size as required for easy access to the valve.
2. Valve boxes shall not be located within a playing field. Valve boxes shall be placed with a minimum of five feet (5’) (1.5m) separation between each valve box.

E. Sprinkler Heads

1. All heads of a particular type and for a particular function in the system shall be of the same manufacture and shall be marked with the manufacturer’s name and identification, in such a position that they can be identified without being removed from the system.

F. Automatic Irrigation Controllers

1. Field controllers shall be model numbers and manufacturers as shown on the plans or an acceptable equal.
2. Field controllers shall be installed on approved concrete bases in accordance with the manufacturer’s recommendations as shown on the drawings.
3. Field controllers shall be installed with manufacturer’s lightning and surge protection.

4. Central controller shall be model number and manufacturers as shown on the plans, or acceptable equal. Central controller shall be located as shown on the drawings.
5. On site lockable disconnects or lockable fuse block and a 110 volt outlet shall be installed at each controller in a separate lockable water-tight enclosure.

G. Automatic Remote Control Valves

1. All remote control valves shall be two-inch (2") (50mm) Toro 216, two-inch (2") (50mm) Rainbird GB globe pattern, or approved equal. All valves shall be 24-volt, with epoxy-sealed solenoid coils and throttling stem. All splices shall be installed with 3M DBY and DBR types and all splices shall be made inside the valve box.

H. Control Cable

1. All electric control and ground wire shall be irrigation control cable or approved equal, 14-gauge unless otherwise indicated on the drawings. All wiring to be used for connecting the automatic remote control valve to the automatic controllers shall be Type "UF", 600 volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder cable.
2. Insulation shall be 4/64-inch (1.6mm) thick minimum covering of ICC-100 compound for positive waterproofing protection. All control or "hot" wires shall be of one color (black) and all common or "ground" wires shall be white. When more than one valve is operated by a single controller station, provide separate control wire from the controller to each valve, and one valve per box. Each valve should have no less than twenty-four inches (24") (600mm) of control cable inside valve box. Each wire shall be labeled at the valve box and at the controller to what zone each wire controls.
3. Verification of wire types and installation procedures shall be checked to conform to local codes.

I. Fittings

1. All plastic pipe fittings shall be permanently marked with the following information: Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73°F (23°C), and National Sanitation Foundation (N.S.F.) approval.
2. All plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld or screwed connections.
3. Slip fitting socket taper shall be so sized that a dry unsoftened pipe end, conforming to these special provisions, can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only schedule 80 fittings may be threaded.
4. When connection is plastic to metal, plastic male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon Tape and Teflon paste. No oil based products permitted.

5. Solvent weld fittings shall be manufactured by Lasco, Spears, or acceptable equal. All lateral line fittings and mainline fittings two inches (2") (50mm) and smaller shall be schedule 40 solvent weld fittings.

J. Pipe Sleeves

1. Pipe sleeves shall be Schedule 40 PVC pipe, or equal.

K. Concrete

1. All concrete shall be 3,000 psi (20,700kPa) at 28 days, transit mixed. Provide certifications with each delivery.

L. Other Materials

1. All other materials, not specifically described, but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds, and subject to the approval of the City.

PART 3 - EXECUTION

3.01 Product Handling

- A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installed work and materials of all other trades.
- B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the City and at no additional cost to the Owner.

3.02 Surface Conditions

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that trenching may be completed in accordance with the original design and the referenced standards.
3. In the event of discrepancy, immediately notify the City. Do not proceed with installation in areas of discrepancy until all discrepancies have been fully resolved.

3.03 Trenching

- A. Perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these Specifications.

- B. Make all trenches in accordance with OSHA Requirements with sufficient width to provide free working space at both sides of the trench and around the installed item as required for gluing, joining, backfilling, and compacting while minimizing width of trenches.
- C. All mainline shall have a minimum cover of fourteen inches (14") (350mm) and a maximum cover of twenty inches (20") (500mm) above the pipe. All laterals shall be the same depth as the mainline. All lateral and main lines shall be installed in a straight line with no arching or bending of pipe. Change in direction of pipe shall occur only with the use of proper fittings only.
- D. Where trench excavation is inadvertently carried below proper elevations, backfill with material approved by the City and then compact to provide a firm and unyielding subgrade to the approval of the City and at no additional cost to the Owner.
- E. Trench Bracing
 - 1. Properly support all trenches in strict accordance with all pertinent rules and regulations.
 - 2. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind will be fully protected from damage.
 - 3. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the City and at no additional cost to the Owner.
 - 4. Arrange all bracing, sheeting and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.
 - 5. Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported.
- F. Grading and Stockpiling Trenched Material
 - 1. Control the stockpiling of trenched material in a manner to prevent water running into the excavations.
 - 2. Do not obstruct surface drainage but provide means whereby storm and waste waters are diverted into existing gutters, other surface drains, or temporary drains.
- G. All trench excavation shall be made by open cut. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading, and to prevent slides or cave-ins. The Contractor shall remove all material not required for backfill or not suitable for backfill, from the site. Banks of trenches shall be kept as nearly vertical as possible, and shall be properly sheeted and braced as may be necessary to prevent caving.

- H. Trench widths in paved streets or in areas where proximity to other structures require vertical cuts, shall not be wider than is required for proper handling, jointing and bedding of the pipe.
- I. The bottom of the trenches shall be accurately graded to line and grade, and provide uniform bearing and support for each section of the pipe on undisturbed soil, at every point along its entire length. Depressions for joints shall be dug after the trench bottom has been graded, and shall be only of such length, depth and width as required for properly making the particular type joint. Care shall be taken not to excavate below the depths indicated.
- J. Where rock occurs in trench excavation, the rock shall be removed to a depth of six inches (6") (150mm) below the established grade line, and to a width of twelve inches (12") (300mm) greater than the outside diameter of the pipe to be installed in the trench.
- K. Where excavation of trenches requires the removal of asphalt pavement, the pavement shall be cut in a straight line along the edge of the excavation by use of a spade-bitted air hammer, concrete saw, or similar approved equipment to obtain straight, square and clean break; and, after backfilling and subgrade preparations are completed, hot plant mix asphalt concrete shall be replaced and compacted in accordance with the appropriate standard specification. Replaced base course and asphalt shall match removed sections, with minimum of two inches (2") (51mm) asphalt concrete over eight inches of suitable (8") (203mm) base course.
- L. Excess material, including rock, broken concrete, bituminous materials, debris, or other materials not suitable for backfill, shall be removed from the site and disposed of by the Contractor.

3.04 Boring

- A. Boring shall be used to route pipe, wiring, or both under concrete structures such as walks or curbs where trenching is impractical. Sleeves shall be installed in all bored holes.
- B. Boring shall be accomplished with a drill, auger, water jet, or any other instrument approved by the City capable of producing a precise hole. Boring shall not disturb overlaying structures or cause settlement and damage to those structures.

3.05 Sleeves

- A. Sleeves shall be installed wherever routing of a pipe, wiring, or both crosses a paved area or passes through a bored hole.
- B. Sleeves laid in open trenches shall be uniformly and evenly supported by undisturbed soil on the trench bottom. Backfill shall conform to standards hereinafter specified.
- C. Sleeves installed in borings shall be forced through and shall have a snug fit throughout the length of the bored hole. Sleeves cracked or broken shall not be accepted.

3.06 Backfill

- A. The trenching shall not be backfilled until inspection by the City has been completed and the pipe installation, including the grade, alignment, and jointing has been found to be in compliance with the requirements of the plans and specifications.
- B. Select backfill material consisting of sand, fine gravel or select earth, free of large lumps or rocks larger than one inch (1") (25mm) shall be used in backfilling around and over the installed pipe.
- C. The select material shall be obtained from the excavation material removed from the trench and shall be processed by screening, sifting, or selective sorting, so as to produce the type of backfill herein specified. The Contractor may at his option and own expense provide an acceptable imported material.
- D. This backfill material shall be carefully deposited around and over the pipe in layers not more than six inches (6") (150mm) thick, loose measurement, unless otherwise permitted by the City, wetted to optimum moisture content and uniformly compacted to at least 95 percent of the maximum density obtainable at optimum moisture content as determined by AASHTO T99 Method A or D (latest revision), until the pipe has a cover depth of at least 14 inches (14") (350mm).
- E. The remaining depth of the trench shall be backfilled with excavation material removed from the trench, which shall be wetted or dried to near optimum moisture content.

3.07 Field Measurements

- A. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design.

3.08 Installation of Piping

- A. Perform all trenching and backfilling as specified by the specifications in this Section.
- B. Lay out the piping system in strict accordance with the plans. Where piping is shown on the plans to be under paved areas, but running parallel and adjacent to planted areas, the intention is to install the piping in the planted areas.
- C. All mainlines and laterals shall be installed with twelve inches (12") (304 mm) minimum cover, and a maximum of eighteen inches (18") (457 mm) cover, over the pipe.
- D. All lines shall have a minimum clearance (horizontal and vertical) of four inches (4") (100mm) of adjacent pipe from each other, and six inches (6") (150mm) from lines of other trades, except through pipe sleeves. Parallel lines shall not be installed directly over one another.
- E. Carefully inspect all pipe and fittings before installation, removing all dirt, scale, and burrs and reaming as required; install all pipe with all markings up for visual inspection and verification.

F. PVC Pipe

1. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.
2. All plastic joints shall be solvent-weld joints. Only the solvent cement recommended by the pipe manufacturer shall be used. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.
3. All plastic to metal joints shall be made with plastic adapters.
4. The solvent-weld joints shall be made dry.
5. The solvent-weld joints shall be allowed to set at least 24 hours before pressure is applied to the system on PVC pipe.
6. Swing joints shall be installed on the same side of the pipe as the head. Swing joints may not cross pipe laterally.

G. Thrust Blocks

1. Provide concrete thrust for all pipe as required by the following schedule:

Sizes		Pipe Tees and Dead Ends				Elbows											
						22 ½ degrees				45 degrees				90 degrees			
		Length		Height		Length		Height		Length		Height		Length		Height	
In	Mm	In	Mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm
3-4	75-100	24	600	12	300	9	225	12	300	17	425	12	300	21	525	18	450
6	150	33	825	18	450	12	300	18	450	24	600	18	450	32	800	24	600
8	200	40	1000	24	600	16	400	24	600	30	750	24	600	45	1125	30	750
10	250	50	1250	30	750	20	500	30	750	40	1000	30	750	61	1525	36	900
12	300	61	1525	36	900	28	700	30	750	56	1400	30	750	87	2175	36	900

2. All thrust blocks shall bear directly on undisturbed earth. Pipe shall be centered in the middle of thrust block. Contractor shall install a plastic barrier between the thrust block and the pipe and/or wires, so as not to encase them in the concrete thrust block.

3.09 Installation of Equipment

- A. All fittings, valves, etc. shall be carefully placed in the trenches as shown on the plans.
1. All control wires shall be clearly labeled, by station, using weatherproof material, both at the controller and at the valve. The outside cover of all automatic valve boxes shall also have the station number clearly stamped on the cover.
 2. All sprinklers, having adjustable nozzles, shall be adjusted for proper and adequate distribution of the water over the coverage pattern of the sprinkler.

3. All nozzles on stationary pop-up sprinklers or stationary spray heads shall be tightened after installation. All sprinklers having an adjusting screw, adjusting stem or adjusting friction collars shall be adjusted as required for the proper arc of coverage, radius, diameter and/or gallonage discharge.

B. Lawn Sprinkler Heads

1. Install lawn sprinkler heads where indicated on the plans and in strict accordance with the manufacturer's recommendations.
2. Along walks and driveways where finished grade is established, set all heads one-quarter inch (1/4") (5mm) below surface of pavement at time of installation and one and one-half inches (1-1/2") (40mm) from pavement. Stake all temporary risers.
3. Set all heads to final grade where sod lawn will be installed.
4. Upon completion of maintenance period, reset all lawn sprinkler heads flush with grade and firmly anchor with soil.

3.10 Testing and Inspection

A. Closing-in Work

1. Do not allow or cause any of the work in this section to be covered up or enclosed until it has been inspected, tested, and approved by the City.
2. Where trenches are not closed at the end of the day Contractor shall accept all liability for any damage or injury that may result from open trenches. Provide barricades and warning tape as necessary around all open trenches.

- B. Before backfilling the mainline, and with all control valves in place, completely flush and test the mainline and repair all leaks; flush out each section of lateral pipe before sprinkler heads are attached.

C. Testing

1. Make all necessary provisions for thoroughly bleeding the line of air and debris.
2. Before testing, fill the line with water for a period of at least 24 hours.
3. After valves have been installed, test all installed irrigation lines for leaks at a pressure of 150 psi (1035 kPa) for a period of two hours, with all couplings exposed and with all pipe sections center loaded.
4. Furnish all necessary testing equipment and personnel.
5. Correct all leaks and retest until acceptance by the Engineer.

D. Final Inspection

1. Thoroughly clean, adjust, and balance all systems.
- E. Demonstrate the entire system to the Engineer, proving that all remote control valves are properly balanced, that all heads are properly adjusted for radius and arc of coverage, and that the installed system is workable, clean, and efficient.

3.11 Record Drawings

- A. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavement, etc.). Locations shown on as-built drawings shall be kept day to day as the project is being installed. All dimensions noted on drawings shall be neat and legible.

Show locations and depths of the following items:

- Point of connection
- Routing of sprinkler lines
- Ball valves
- Sprinkler control valves
- Quick coupling valves
- Routing of control and power wires
- Sprinkler heads
- Other related equipment

- B. Record drawings must be delivered to the Owner upon completion.

3.12 Operations and Maintenance Manuals

- A. Prepare and deliver to the Owner within ten calendar days prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in four individually bound copies of the operations and maintenance manual. The manual shall describe the material installed and shall be in sufficient detail to permit operating personnel to understand, operate and maintain all equipment. Spare parts lists and related manufacturer information shall be included for each equipment item installed. Each complete, bound manual shall include the following information:

1. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment with names and addresses of local manufacturer representatives.
2. Complete operating and maintenance instructions on all major equipment.

- B. In addition to the above maintenance manuals, provide the maintenance personnel with instructions for system operation and show written evidence to the Owner at the conclusion of the project that this service has been rendered.

- C. Final payment will not be made until record drawings and operation and maintenance manuals have been submitted and approved.

3.13 Warranty

- A. Warranty requirements will be submitted to Owner upon substantial completion of work.
- B. The Contractor shall winterize the system and perform spring start-up of the system during the guarantee period. These functions shall be coordinated in advance with the Owner, and the Owner's personnel shall be encouraged to participate.
 - 1. Upon re-energizing the system, the Contractor shall repair any leaks or breaks and shall check each head and valve, making any adjustment necessary.

3.14 Crossing and Repairing Existing Irrigation Systems

- A. The Contractor shall coordinate all work with the City of Lakeland for locating the existing irrigation pipelines. The ends of the pipe shall be cleaned and plugged with a solvent weld cap. The pipeline shall be kept clean and free of debris.
- B. After installation and backfilling the Contractor shall expose the irrigation crossings and repair the pipeline in accordance with this specification. The Contractor shall coordinate his activities with the City of Lakeland to ensure that the lines are adequately flushed and leak tested at static pressure following the repairs.

END OF SECTION