
IRRIGATION

PART 1 GENERAL**1.1 Related Work**

- .1 All Division 1 Specification Sections
- .2 Section [01450](#) Quality Control & Inspection
- .3 Section [02315](#) Excavation, Trenching & Backfilling

1.2 Scope Of Work

- .1 The Work consists of installing a complete underground sprinkler system to efficiently irrigate the areas identified in the Contract Document drawings.
- .2 Plumbing and Electrical work will conform to all prevailing codes.
- .3 The construction of the sprinkler system will include the furnishing, installing, and testing of irrigation equipment, along with the restoration of the site to its original condition.

1.3 Referenced Guidelines

- .1 212 Irrigated Median Bed (Cross Section)
- .2 220 Irrigation-Park Water Service
- .3 221 Irrigation-Backflow Prevention Device
- .4 222 Irrigation-Drip Control Zone
- .5 223 Irrigation-WVC Controller
- .6 224 Irrigation-Drip Zone Layout (End Feed)
- .7 225 Irrigation-Drip Zone Layout (Centre Feed)
- .8 226 Irrigation-Drip Zone Layout (Irregular Shape)
- .9 227 Irrigation-Dripline Subgrade Installation

1.4 Materials and Workmanship

- .1 Systems and products will be installed as shown on the design with no deviation on the number, type, size, nozzle radius, or features of sprinklers without the written approval of the Consultant.
- .2 Whenever systems and products are specified by name or product number thereof, such specifications will be used for the purpose of facilitating a description of materials and establishing quality.
- .3 No substitutions will be permitted unless the Consultant approves the material(s).
- .4 Sufficient descriptive literature and samples must be furnished for all materials submitted for "approval alternate" status.

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- .5 All materials will be new and without flaws or defects.
- .6 All materials will be guaranteed for a period of two (2) years against material defects and Workmanship.

1.5 Electrical Supply and Controller Location

- .1 The irrigation controller location will be designed on the irrigation drawings.
- .2 Refer to Contract Document electrical drawings; the Contractor is to ensure connections is coordinated.

1.6 Backflow Prevention

- 1. The correct backflow device will be installed at the point of connection to a potable water service, in agreement with the local plumbing code.
- 2. Where a backflow prevention connection is required, Contractor to ensure the installation is as per the Region of Peel standard details.

1.7 Point Of Connection

- .1 Building under construction where water source is in the mechanical room:
 - 1. The Contractor will be supplied a point of connection of the size shown in the contract documents, drawings and specifications, outside the building into the nearest soft landscape. Refer to building mechanical, electrical, and civil drawings and specifications.
- .2 Existing outdoor water sources:
 - .1 The Contractor is responsible for installing all necessary devices and the blackflow device to the existing water source to make the point of connection conform to all applicable codes.

1.8 Water Source

- .1 The Contractor is to confirm the pressure of the existing Region of Peel watermain;
- .2 All interior piping and all visible exterior piping shall be type "M"

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copper. If condensation is considered to be detrimental to the adjacent interior areas, the copper piping shall be installed with $\frac{3}{4}$ " (20 mm) pipe insulation. It is the responsibility of the Irrigation Contractor to properly grout and waterproof the exterior wall of the building at the point of penetration.

1.9 Winterization

- .1 All irrigation systems located in freezing climates must be drained to avoid damage prior to winter. This will be accomplished by:
 - .1 Utilizing an air compressor with the required adaptor to clear all excess water from irrigation lines, valves and heads.
 - .2 The Contractor is responsible for the supply and installation of the appropriate winterization provision (access) and will complete the winterizing operation the first year as part of the Contract.

1.10 Warranty

- .1 The irrigation system will be installed as shown on the design to provide complete coverage without excessive overthrow onto streets, driveways and buildings.
- .2 The entire system will be guaranteed to be complete and function perfectly in every detail for a period of (2) two years from the date of Substantial Performance of the Work.

1.11 As Built Drawings

- .1 Upon completion of Work as as-built drawing(s) of the system will be prepared indicating the following:
 - .1 Sprinkler model and location
 - .2 Pipe size and location
 - .3 Automatic valves model and location
 - .4 Winterizing adapter location (if applicable)
 - .5 Wire or control tube location
 - .6 Controller location
 - .7 Main shut-off valve and any isolation valve locations

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.8 Dimensioned location of buried sleeves.

.2 The as-built drawing(s) will be drawn to scale.

PART 2 PRODUCTS**2.1 Pipe**

.1 Identification

.1 All pipe will be continuously and permanently marked with the manufacturer's name or trademark, size, schedule and type of pipe, and a working pressure at 21 degrees Celsius.

.2 Delivery

.1 Plastic pipe will be delivered to the site and stored in such a manner that will provide adequate protection for the pipe ends wither threaded or plain.

.3 P.V.C Piping and Fittings

.1 P.V.C pipe will be class 160 (SDR26) direct burial pipe conforming to CS-256-63 and will be homogeneous throughout and free from visible cracks, dents, holes, or foreign materials.

.2 All plastic pipe fittings to be installed shall be schedule 40 molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld, slip ring tight seal, or screwed connections.

.3 All threaded connections under pressure shall be Teflon taped.

.4 Polyethylene Pipe and Fittings

.1 All polyethylene pipe will have a minimum 75-psi pressure rating.

.2 All insert fittings shall be constructed of PVC Type 1 cell classification 12454-B adhering to ASTM standard D 2609.

2.2 Sprinklers

.1 **Spray Head Sprinkler**

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- .1 The sprinkler will be capable of operating at pressures ranging from 15 to 70 psi.
- .2 The sprinkler nozzles will provide matched precipitation rates (MPR) across sets and patterns in 7' (2134 mm) through 17' (5182 mm) fixed arc series nozzles.
- .3 The Micro-spray and short radius nozzles will provide matched precipitation rates across patterns in 2' (610 mm) through 6' (1829 mm) fixed arc nozzles.
- .4 The variable arc nozzle sets will provide infinite arc adjustment from 25 to 360 degrees.
- .5 The pop-up sprinkler will be available in 4" (100 mm), 6" (150 mm) and 12" (305 mm) full pop-up height.
- .6 The sprinkler will contain a ratcheting riser assembly for easy arc orientation once installed.
- .7 The sprinkler will have ½" (13 mm) NPT inlet. All sprinklers will be supplied water from the bottom inlet.

.2 Rotor

- .1 The full or part circle sprinkler will be a single stream, water lubricated, gear drive type capable of covering a fifty (50) foot (15.5 m) radius at sixty (60) psi pressure with a discharge rate of 12.2 GPM.
- .2 The part circle sprinkler will have adjustable arc coverage of 40 to 360 degrees.
- .3 The sprinkler will be available in 4" (100 mm) and 12" (305 mm) pop-up heights.
- .4 The sprinkler will have nineteen (19) interchangeable nozzles: twelve (12) standard nozzles and seven (7) low angle nozzles.

2.3 Valves**1. PGV Valve**

- .1 The remote control valve will be a normally closed 24 VAC 50/60 cycle solenoid actuated type capable of having a flow rate of .2 to 120 gallons per minute (GPM) with pressure loss of up to 6psi.

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- .2 The valve pressure rating will be up to 150 psi (1.0 MPa).
- .3 The valve body will have a Female National Pipe Thread (FNPT) inlet and outlet.
- .4 The valve will be actuated by a low power, 0.40 amps in-rush current, 0.40 amps holding current.
- .5 The valve will be capable of manual on/off control.

2.4 Quick Coupling Valve

.1 **One Piece Quick Coupling Valve**

- .1 The quick coupling valve will a one-piece type constructed of heavy cast brass. The cover will be a durable, protective self-closing rubber cover. When so specified, the cover will be a locking rubber cover (LRC).
- .2 The valve will be opened and closed by a brass key of the same manufacturer having a 1" (25mm) (MNPT) and 1" (25mm) (FNPT) outlet. The valve throat will have a keyway with detent positions of regulating water flow.
- .3 The quick coupling valves will be installed in a 10" (255mm) round valve box, with the top of the valve box flush to the ground. The quick coupling valves will be installed on unitized swing joints with side pressure stabilizers on the valve body.

2.5 Controllers

.1 **Controller**

- .1 The irrigation controller will be a hybrid type, that combines electromechanical and microprocessor based circuitry capable of fully automatic, semi-automatic, and manual control of irrigation systems. The controller will be housed in a wall-mountable, heavy-duty, plastic, and weather resistant cabinet with a key-lockable door and will be suitable for indoor and outdoor applications.
- .2 The controller will operate on 115 VAC at 60 Hz and will be capable of operating two solenoid valves plus a master valve or pump start relay.
- .3 The controller will have an electronic, diagnostic circuit

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breaker.

- .4 The controller will have four fully independent programs.
- .5 The controller will have eight start times per program.
- .6 The controller will be of modular design with up to forty-eight (48) stations available.
- .7 The controller will have global water budgeting from 10% to 150%.
- .8 The controller will be capable of start staking.
- .9 The controller will have a 365-day calendar with an odd/even watering schedule(s).
- .10 The controller will be capable of "Cycle and Soak" by station.
- .11 The controller will be capable of programming a delay between stations.

.2 Rain Sensor

- .1 The rain sensor will be a micro-electric, solid state type, capable of interrupting the power for the irrigation controller to the valves when rainfall exceeds a pre-selected amount.
- .2 The rain sensor will have a "Quick Response" feature that will shut off the irrigation system with minimal rain fall.

2.6 Wiring

- .1 All 115 volt wiring will conform to the local electric codes.
- .2 All 24 volt control wire between the solenoid valves and the controllers will be #14 gauge TWU-10 solid conductor, white jacket for the common wire, and coloured for the power wire. For runs less than 500 feet (150 m), and single valve operation, 16-18 gauge multi-coloured conductor wire may be used. If two or more controllers are used, each unit must have their own common wire.

2.7 Manual Control and Isolation Valves

- 1. All manual valves will be bronze gate valve construction, featuring a non-rising stem and minimum operating pressure of 125 psi (0.9 MPa). Bronze full-port ball valves are also acceptable.

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2.8 **Valve Boxes**

- .1 All manual and automatic valves will be enclosed in proper irrigation thermoplastic Carson Brooks valve boxes, of size as required to permit 'ease of access' for serving purposes. The boxes will feature locking or hinged covers, with an impregnated green colour.
- .2 The terms 'ease of access' means that every solenoid and manual valve should have adequate access for all types of maintenance.
- .3 All valve access boxes will be installed in a suitable base of gravel for proper foundation of box and easy levelling of box to proper grade, and also to provide proper drainage for the access boxes. All valve access boxes will be provided with proper length and size extensions, wherever required, to bring the valve box level with the finish grade, unless specified to be buried below grade.
- .4 Valve boxes will be located in planting areas whenever possible.
- .5 Locking bolts and keys need to be provided to the Owner.

2.9 **Sleeves**

- .1 All sleeving material will be Class 160 PVC.
- .2 Separate sleeves must be provided for all electrical wiring.

2.10 **Drip Irrigation**

- .1 Not applicable

PART 3 **EXECUTION****3.1** **Excavation and Backfill**

- .1 **Trenching**
 - .1 Trenches for sprinkler lines and wiring will be sufficient width (minimum of six inches (6") (150mm) to permit proper handling and installation of the pipe and fittings.
 - .2 Top of piping shall be minimum 8" (200mm) below finished grade for all non-aerated sports fields.
 - .3 Top of piping shall be minimum 14" (360mm) below finished

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grade to allow for all aerated sports fields (aerator clearance required, minimum 12").

- .4 The first four inches (4") (100mm) of backfill material over the pipe shall be free of stone or any foreign objects greater than $\frac{3}{4}$ " (19mm) diameter. The top six inches (6") (150mm) of backfill shall be free of rocks over one inch, or trash. Piping less than 1 $\frac{1}{2}$ " (35mm) in diameter will have a minimum cover of ten inches. Piping greater than 1 $\frac{1}{2}$ " (35mm) in diameter will have a minimum cover of fifteen inches. Any road crossings shall have a minimum eighteen inches (18") (455mm) of cover.
- .5 The backfill will be thoroughly compacted in six-inch (6") (150mm) lifts, and evened off with a minimum of one inch top soil.
- .6 In rocky areas, the trenching depth will be two inches (2") (50mm) below normal trench depth, to allow for replacement of selected fill. All trenches that are opened during any particular Working day will be closed and backfilled the same day.

.2 Pulling

- .1 Where soil conditions allow the pipe depths of cover described above to be met: the irrigation piping may be directly installed without trenching by use of a vibratory plough. The feed blade must be equipped with a minimum bullet diameter of 1.5 times the outside diameter of the pipe to be installed.
- .2 In each of the above operations, the irrigation Contractor is responsible for keeping each pipe interiors free from dirt and debris. The site is to be restored to its original condition, including any damage to existing trees, shrubs, and structures, along with settlement of trenches within the warranty period.
- .3 Piping under concrete or asphalt will be installed by jacking, boring or hydraulic driving. Where any cutting or breaking of sidewalks, concrete Work or asphalt is necessary, it shall be removed and replaced by the Contractor. Permission to cut or break sidewalks, concrete or asphalt will be obtained from those having proper jurisdiction. Where piping on the drawings is shown under paved areas but running parallel and adjacent of planted areas or turf areas, the intent of the

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drawings is that the pipe be installed in the planted or turf areas.

3.2 Pipe

1. PVC

1. One inch (1") (25mm) or smaller will be Class 200 (SDR21). One and a quarter inch (1 ¼") (30mm) or above shall be Class 160 (SDR26) or approved alternate.
2. Plastic pipe will be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturers, along with the installation of concrete thrust blocks where the pipe changes direction.
3. All plastic to plastic joints will be solvent-weld joints or slip seal joints. Only the solvent recommended by the pipe manufacturer shall be used. All plastic pipe and fittings will be installed as outlined and instructed by the pipe and solvent manufacturers.
4. All plastic to metal joints will be made with male plastic adapters.

2. Polyethylene

- .1 Polyethylene pipe will be of medium density with a minimum pressure rating of 75 psi (.5 MPa).
- .2 The fittings will be secured with all stainless construction gear drive clamps. Stainless steel squeeze clamps may also be used. Half inch (1/2") (12mm) stainless steel banding material may be used on two inch (2") (50mm) pipe. All main line piping will be double clamped.
- .3 All polyethylene of 1 ½" (35mm) or larger should be double clamped whether under continuous pressure or not.
- .4 All polyethylene will be manufactured by Oil Creek Plastics or IPEX.

3.3 Sprinklers and Turf Valves

- .1 The Contractor will stake out the location of all sprinkler heads and turf valves prior to commencing installation to allow the Consultant to verify all locations and give their approval. Spacing of the sprinkler

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heads and turf valves shall comply with the manufacturer's recommendations and drawings, and will not be exceeded except with permission of the Consultant.

- .2 Heights of sprinkler heads and turf valves to be installed in areas where the turf has not yet been established will be determined in consultation with the Consultant, prior to installation.
- .3 All sprinkler heads and turf valves will be set perpendicular to finished grades unless otherwise designed on the drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs and other paved areas will be set to grade.

3.4 Sprinkler Risers

- .1 All rotor sprinklers and quick coupling valves will be installed with PVC unitized swing joints.
- .2 All risers for shrub spray heads, bubbler heads, etc that are in shrub, ground cover or flower bed areas and planters, shall be Schedule 80 PVC pipe or Schedule 80 nipple, unless otherwise specified or shown on the Contract Drawings.

3.5 Control Valves

- .1 All control valves will be installed in proper irrigation valve boxes, in such a manner as to readily permit servicing and operation.
- .2 A six inch (6") (150mm) gravel sump shall be included in the excavation of each valve box.

3.6 Mounting of Automatic Controller

- .1 The controller will be installed at the location showed on the irrigation drawings.
- .2 The unit shall be installed as the manufacturer had intended, utilizing fasteners specifically designed for the application.

3.7 Wiring

- .1 All 110 volt wiring to the controller will be enclosed in PVC electrical conduit or completed with BX cable.
- .2 The unit is to be grounded in compliance with the manufacturer's recommendations and the local electrical code.

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- .3 All visible low voltage wires will be enclosed in PVC electrical conduit. Direct burial wire may be trenched or placed in a common trench beneath plastic irrigation pipes, or lain with a vibratory plough (but not pulled), and must have a minimum cover of ten inches (10") (255mm). Provision must be made for expansion and contraction of all direct burial wire, including protection from foreign objects.
- .4 All electrical wire connections to remote control electric valve and splices in the field will be completed with a weatherproof wire connector.

3.8 Flushing and Setup

- .1 Upon completion of each Section or of the entire installation, and prior to assembly of nozzles and pop-up components, the control valves will be opened and a full head of water used to flush out the system. Sprinkler assembly can be completed, including all necessary adjustments and setup procedures.

3.9 Sleeves

- .1 The irrigation pipe and wiring will be protected at all sidewalk, roadway and creek bed crossings with a sleeve measuring 50 mm larger than the irrigation pipe. Sleeving material at roadways shall have eighteen inches (18") (460mm) cover and walkways twelve inches (12") (300mm) respectively to be installed by others and are assumed to be existing in place for Work performed under this Section.

PART 4 TESTING AND OPERATION

4.1 Testing

- .1 Flush all lines and ensure that all air is expelled from the system.
- .2 Inspect all visible piping, and walk all buried lines for any leakage.
- .3 If a pump is included verify direction of rotation (if applicable), operating pressure, and any leakage.
- .4 Any repairs necessary to render the system in good working order will be completed prior to the Owner assuming maintenance.

4.2 Operation

- .1 Verify all sprinkler settings, overlap, nozzle sizes, and operating

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pressures.

- .2 Adjust the flow control on automatic valves where necessary.
- .3 Program the controller into a logical sequence to comply with local watering by-laws or endeavour to accomplish heavy infrequent water cycles.
- .4 Program each station to satisfy the watering requirements of the relevant plant material.

4.3 Inspection

- .1 **The system will not be considered complete and in compliance with the intent of the Contract Documents until inspected and approved by the Consultant.**

END OF SECTION - 02810