

**Irrigation Standards and Specifications**  
**2-wire decoder systems**  
**2014**



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## **1 GENERAL**

### **1.1 General Requirements**

.1 All Contract Documents form an integral part of this section.

### **1.2 Description**

.1 Furnish all equipment, materials, labour, and services necessary for the complete supply and installation of fully operational, automatic irrigation system including but not limited to trenching, excavation, backfill, sleeving, connection to municipal water supply and supply of water to irrigation heads. Coordination of reviews, testing, and approvals with the City Representative.

### **1.3 Related Work in Other Sections**

.1 Not applicable

### **1.4 Codes and Regulation**

.1 Work of this section shall be installed in accordance with the requirements of local and applicable provincial and federal regulations. Any Work shown on the Drawings or described in the Specifications that varies from the regulations shall be changed to comply with the requisite authority at no cost to the Owner.

.2 WorkSafe BC regulations shall be followed.

### **1.5 Permits and Fees**

.1 Obtain and pay for all permits covering the Work connected with the installation of the systems specified and as shown on the Drawings.

### **1.6 Quality Assurance**

.1 Irrigation Work shall be done by an experienced and competent irrigation Contractor having adequate equipment and fully trained personnel for all phases of the Work specified.

.2 The irrigation Contractor shall be a member in good standing of the Irrigation Industry Association of British Columbia (IIABC) and have met the qualification standards currently applied to Contractors by that organization. The Contractor must provide proof of membership to the City Representative prior to the start of Work of this section.

.3 Contractor shall verify Site measurements as they relate to irrigation coverage. If any conditions are observed on Site that will impair proper and intended uniform irrigation coverage, notify the City Representative before proceeding with Work that would yield unsatisfactory coverage.

### **1.7 Submittals and Instructions**

.1 Maintenance Data and Operation Instructions/Manual: prior to and as a condition of substantial performance, submit to the City Representative two copies of all operating and maintenance manual for all components including cleaning and lubrication schedules, overhaul/adjustment schedules, and similar maintenance operations. Each manual shall be bound in a three ring binder. Clearly indicate the Project name, name, address, and telephone number of the irrigation Contractor, and date of substantial completion on the spine of each of the binders.

.2 As-Built Drawings: submit an accurate, detailed as-built drawing, drawn on a clean copy of the original design drawings. CAD drawing file of the irrigation system as-built drawings to be submitted to the City. All components of the irrigation system shall be shown as installed including the location of the controller, water source, backflow preventer, and pressure reducing valves.

.3 As-Built Record Sketches: the Contractor is to maintain a set of as-built record sketches on Site at all times. The as-built record sketches are to be updated daily noting changes made to the irrigation design Drawings. The City Representative will without notice, periodically review the as-built record sketches during the irrigation installation process.

.4 Maintenance Materials: submit to the City Representative two sets of all special tools, keys, and

equipment provided by the manufacturer for proper operation and maintenance of the installed system.

.5 System Demonstration: as part of the requirements for the completion and acceptance of the Work of this section, demonstrate the complete operating and maintenance procedures for this system to a designated representative of the City of New Westminster. This instruction shall include but not be limited to demonstration of the relative timing differences between zones, of different precipitation rates and a schedule of run times suggested for various weather conditions.

### **1.8 Delivery and Storage**

.1 Deliver and store materials in new condition, in unopened containers and protect until installed. Ensure that the pipe is not gouged, bent, or cracked during delivery, handling, and storage.

### **1.9 Site Conditions**

.1 Existing Conditions/Underground Services: prior to the start of Work, verify and mark the location of all below ground Site utilities/underground services by hand digging or employing personnel trained in the use of an electronic toning device or M-scope. Verify the location of any above ground elements that may impede the Work of this section. Notify the City Representative immediately for directions as to the procedure should any piping, conduit, structures, or utilities be encountered during excavation or trenching.

.2 Repair to Underground Services: the Contractor shall employ the appropriate skilled trades to repair all damage to underground services caused by the Work of this Contract. Damage to services that are shown on the Drawings or have been brought to the Contractor's attention in the field prior to commencement or during construction of the Work shall be repaired at the Contractor's expense.

.3 Repair of damages to underground services where the location of services were clearly unknown after all reasonable measures were taken by the Contractor to ascertain the existence of these services will be paid for by the Owner.

.4 The Contractor shall cooperate with the Owner and utility companies to keep their respective utilities in operation.

.5 Site Preparation: prior to the Work of this section, carefully inspect any installed Work of other trades or Contractors and verify with the City Representative that all such Work is complete to the extent that the Work of this section may commence.

.6 Discrepancies: the Contractor is to immediately notify the City Representative in the event of discrepancy, errors, or conflicts between the Drawings and the actual Site conditions

### **1.10 Protection**

.1 Protect existing buildings, equipment, sidewalks, landscape reference points, monuments, markers, and other completed Work. At no expense to the Owner, make good any damage resulting from Work of this Contract.

.2 The Contractor shall bring only vehicles or equipment onto the Site that are essential for construction of the system.

.3 Trenching and other excavations for vaults, valve boxes, etc. are not to be left open during non-Work hours unless they are protected to current WorkSafe BC standards. Cover, clearly mark, and protect all open excavations to ensure public safety.

### **1.11 Guarantee**

.1 The Contractor shall provide a written warranty for all workmanship for a period of one year from date of substantial performance.

.2 Manufactured Products, including but not limited to irrigation heads, piping, quick couplers, controllers, valve boxes, and valves shall be warranted from the date of substantial performance as per the manufacturer's standard warranty period or a minimum of two years, whichever is greater.

### **1.12 Equals**

.1 Equals will not be considered for Work of this section. All items are as specified in the Specifications or on the Contract Drawings.

### **1.13 Sequence**

.1 As required, coordinate the layout and location of the water supply/municipal connection point(s) for the automatic irrigation system with the city representative.

.2 As required, coordinate with the city representative for the layout and location of the electrical conduit for the low voltage control wire from the controller location in the service building to a location accessible outside the building face.

### **1.14 Inspection**

.1 Prior to commencement of Work of this section, the Contractor is to arrange an on Site meeting with the City Representative to review procedures and protocols

.2 Work is to remain uncovered for inspection of workmanship and materials. Notify the City Representative a minimum of 48 hours prior to required inspections. Failure to provide such notice or closing in Work that has not been inspected is sufficient grounds for withholding any payments due to the Contractor. The City Representative will request all buried Work not approved to be unearthed for proper inspection.

## **2 PRODUCTS**

### **2.1 Pipe and Fittings**

.1 Wherever "as per manufacturer's Specifications" is used, it shall mean in strict accordance with the manufacturer's printed directions. Review any conflicts between manufacturers instructions and this Specification with the City Representative prior to proceeding with Work.

.2 All materials throughout the system shall be new and in perfect condition.

.3 Plastic Pipe: plastic pipe shall be rigid un-plasticized polyvinyl-chloride (PVC):

.3.1 Lateral Lines: unless otherwise noted, non CSA Schedule 40 PVC.

.3.2 Main Lines: non CSA Schedule 40 PVC conforming to ASTM D-2466-97.

.3.3 All pipe to be continuously and permanently marked showing manufacturer's name or trademark, type of material, pipe size, and pressure rating.

.3.4 The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign material, blisters, deleterious substances, wrinkles, and dents.

.3.5 There shall be no ¼ pipe sizes used (3/4", 1 ¼"). Systems must be designed to minimize the variety of pipe sizes used, and to allow for future expansion.

#### **.4 Plastic Pipe Fittings:**

.4.1 Schedule 40 PVC conforming to ASTM D-2466-97 (and F438-97 for CPVC) standards designed for solvent welding to PVC pipe except where valves, risers, etc. require threaded joints.

.4.2 Fittings for PVC pipe shall be to ⅔ interface fit to ensure a fully sealed joint. Provide minimum 25 mm (1 in.) clearance between fittings to allow for repair. City Representative will require fittings that do not provide this clearance to be removed and reinstalled in accordance with the Specification.

.4.3 All threaded connections shall be joined with a minimum of three wraps Teflon tape or an Teflon based pipe lubricant approved for use with plastic pipe.

.4.4 Threaded nipples shall be Schedule 80 PVC and be manufactured from the same material specified for the pipe.

.4.5 Threaded connections of PVC to metal shall have male threads on the PVC and female threads on the metal

.5 Primers and Pipe Solvents: CSA approved type as recommended by pipe manufacturer for the temperature and conditions under which the Work is being performed. Solvent cement to be heavy bodied gray 711, Primer to be P70 purple, all to be delivered in sealed labeled containers clearly marked with name of manufacturer and lot number. Use of non CSA specialty primers or solvents such as "Wet R Dry" are not acceptable.

.6 Sleeves: shall be Schedule 40 PVC to the extent and locations noted on the Contract

Drawings. Coordinate the location of sleeves with Work of other trades:

- .6.1 Sized a minimum of two pipe sizes larger than the irrigation lateral line to be carried.
- .6.2 Sized a minimum of three pipe sizes larger if carrying a mainline:

## **2.2 Valves and Valve Boxes**

- .1 Solenoid Valves: Rainbird, size and type as shown on drawing.
- .2 Quick Coupler Valves and Blow-Out Tees: Rainbird 33DRC, brass body, 19 mm (¾ in.).
- .3 Isolation Valves: cast bronze gate valves with non-rising stems; R&W Model 280 for valves up to 63.5 mm (2½ in.) diameter, or pre-approved equal.
- .4 Bronze Ball Valves: Jones J1949SG-19 mm to 50 mm (¾ in. to 2 in.), size as required, 90 degree shut off curb stop type, or pre-approved equal.
- .5 Valve Boxes: shall be heavy duty, green plastic irrigation boxes complete with captive lock bolt covers; sized to suit valves and other components with adequate room for operating and maintenance access.

## **2.3 Sprinkler Heads**

### **2.3.1 Sprinkler Heads**

- .1 Sprinkler heads shall be Rainbird, types and sizes as indicated on Drawings with the diameter or radius of throw, pressure, and discharge required for head-to-head coverage.
- .2 All sprinkler Rainbird heads shall be marked with the manufacturer's name and identification such that they can be identified without being removed from the system

### **2.3.2 Sprinklers Risers**

Not applicable

### **2.3.3 Rainbird Stationary Pop-Up Sprinklers**

- .1 The risers shall be of sufficient height so as not to cause any interruption of the stream from the sprinkler nozzle when the plant material has reached its optimum growth.

## **2.4 Control and Common Ground Wire**

- .1 Insulated 14/2 Rainbird brand maxi cable, or 14/2 NMWU sized to suit load, resistance, and distances. Insulated cover colour for control/signal wire to be consistent. White wire shall be common wire.
- .2 Locate Wire: **Yellow** 14-gauge insulated solid copper, TWU, RW90 or approved equal.
- .3 Direct Bury Splice Kit: 2.5.1 DBY or DBR by 3M or approved equal.
- .4 Confirm control wire size with the manufacturer of zone control valves to ensure wire is sized to the length of its run and in compliance with the BC Electrical Code, latest edition.
- .5 Wire, breakers, conduits, and related materials that comprise the electrical supply to the controller shall be CSA approved.

## **2.5 Automatic Controller and Control Equipment**

- .1 Rainbird Model ESP-LXD two-wire decoder controller automatic irrigation controller.
- .2 Line Surge Protection: Rainbird LSP - one line surge protector.
- .3 Grounding Plate for Surge Protectors: Paige 100 mm by 914 mm by 1.6 mm (4 in. by 36 in. by 0.064 in.) solid copper ground plate or approved equal. Ground plates and surge protectors to be installed accordance with manufacturer's recommendations.
- .4 Decoder: Rainbird FD - turf two wire decoder. See Drawings for number of addresses decoder is to accommodate.
- .5 Rain Sensor: Rainbird RSD - CEx rain sensor.

## **2.6 Back Flow Preventer**

Watts 007 DCVA sized to system as per design.

## **2.7 Pressure Reducing Valve**

If required by design - Watts Series 223 sized to suit system.

## **2.8 Yellow Warning Tape**

.1 S-14687, 75 mm (3 in.), 5 mL, yellow 'caution' tape as supplied by ULINE, [www.uline.ca](http://www.uline.ca) or pre-approved equal.

## **2.9 Pipe Bedding Sand**

.1 Clean sharp, washed sand with particle size passing a 5 mm sieve.

## **2.10 Valve Box Drain Rock**

.1 19 mm ( $\frac{3}{4}$  in.) clean round stone or crushed rock.

## **2.11 Filter Medium**

.1 Needled, non-woven polypropylene mat. Acceptable Products include Nilex 4545 by Nilex Geotechnical Projects, Burnaby, BC, or Mirafi 150N by Tencate Systems, Oakville, Ontario, or approved equal.

## **2.12 Miscellaneous Materials**

.1 Electrical Tape: all weather, black plastic 19 mm ( $\frac{3}{4}$  in.) wide, minimum 0.1778 mm thick.  
.2 Thread Lubricant: type manufactured for plastic to metal connections such as Teflon tape or Liquid Teflon.

## **3 EXECUTION**

### **3.1 Irrigation System Layout**

.1 Coordinate exact locations of lines, valves and heads, within lawn areas and planting beds, with the Work of other trades to avoid conflicts during installation.  
.2 Layout of sprinkler heads shall be in accordance with the construction Drawings. Irrigation construction Drawings are diagrammatic in nature, Contractor to ensure that full head to head coverage on a triangular layout is achieved throughout the entire Project. Alternative layouts shall be reviewed with the City Representative and the adjustments made recorded on the 'as-built' Drawings.  
.3 Prior to the start of installation of Work for this section, the Contractor shall, using 'on-Site flagging', layout all irrigation system components. The City Representative may require minor changes to system layout that will not affect quantities of components to ensure that on-Site elements and situations have been accommodated.

### **3.2 Installation of Piping**

.1 Layout the piping system in accordance with Drawings. Route piping to take into account Site elevation changes and to minimize possible low head drainage issues.  
.2 No irrigation line shall be directly over and parallel to another irrigation line or service line of any other trade. Ensure minimum horizontal and vertical clearance requirements as dictated by Canadian Electrical Code for all piping installations near any electrical conduit/service.  
.3 Where possible, main supply lines may occupy the same trench as sprinkler lines, provided a minimum horizontal clearance of 150 mm (6 in.) is maintained. Multiple lateral lines may occupy the same trench provided that a minimum of 50 mm (2 in.) horizontal clearance can be maintained and the pipes are all in the same plane.  
.4 Install pipes in long 'S' curves to allow for expansion and contraction. Ensure longest mainline straight run is installed and sized to compensate for potential surges in system.  
.5 Comply with all the manufacturer's printed data and recommendations regarding pipe cutting, cleaning, bevelling, deburring, fitting preparation, primer and cement application, and correct joining techniques. Ensure that all joints are properly fused and bonded and that all curing times given Site climatic conditions are fully observed prior to testing or charging of piping system.  
.6 Prior to the start of construction, verify that all pipe, fittings, primers, and cements are compatible for uniform installation.  
.7 Obtain field assistance from pipe manufacturer/Supplier as necessary to ensure correct installation and joining techniques are used.

- .8 Do not cement pipe and fittings under wet or muddy conditions.
- .9 Pipes that are not run with a parallel traceable control wire shall have a yellow, 14-gauge, insulated solid copper; TWU, RW90 or equivalent locate wire installed adjacent to the pipe run over its entire distance. Terminate all trace wires in the nearest valve box to allow for connections to locator.
- .10 Install yellow warning tape 250 mm (10 in.) above all mainline runs with low voltage wiring located beside and below piping. Yellow warning tape on lateral lines is not required

#### **.11 Trenching and Backfilling:**

- .11.1 Open excavation operations shall be carried out in a safe and orderly manner and in accordance with the requirements of WorkSafe BC. Approved shoring shall be used where required for safe working conditions.
- .11.2 Irrigation main and zone lines shall be buried to a depth of at least 400 mm (16 in.) below finished grade measured to top of pipe. Trenches are to be straight with uniform slopes to the bottom of the trench.
- .11.3 Prior to backfilling, all lines, valves, and fittings shall be inspected by the City of New Westminster inspector. Any Work closed in before inspection will be required to be exposed for inspection at no extra cost to the Owner. Provide 48 hours minimum notice to City Representative to arrange inspections.
- .11.4 All material refuse such as pipe pieces, excess wire, rags, fittings, or PVC cement canisters left shall be removed from trenches prior to backfill operation.
- .11.5 Backfilling shall take place in an orderly fashion. Where the line is within an enclosed planting bed or sodded lawn area and does not penetrate below the growing medium, the growing medium shall be carefully placed over the pipe and be carefully tamped by hand, or using a jumping jack type compactor to achieve compaction equivalent to the surrounding area.
- .11.6 Contractor is responsible to repair all trenches which have settled below the adjacent grade for a period of one year from date of substantial performance.

### **3.3 Pipe Pulling**

- .1 Pipe pulling will be allowed where appropriate.
- .2 Plow bullet to be a minimum of one pipe size larger than the pipe being pulled. This is to minimize the friction on the pipe being installed.
- .3 Trenches and plow lines to be compacted with a vibratory compactor within 48 hours of pipe installation. The contractor will be responsible for continuing compacting and/ or removal of excess fill until final level grade is achieved.

### **3.4 Installation of Equipment**

- .1 **General:** install all equipment as shown on plans and details to City of New Westminster Parks and Recreation standards.
- .2 **Valve Boxes:** install valves in valve boxes, allowing adequate space within boxes for proper operation/servicing of each component. Valve box installation to meet the following requirements:
  - .2.1 Install whole valve boxes whenever possible. Minimize cutting of valve boxes.
  - .2.2 Valve boxes to be blocked (with brick or concrete pavers) so that neither blocking or valve box rest on lateral or mainlines when supporting the weight of expected traffic.
  - .2.3 All valve boxes to be wrapped from underneath using a full piece filter medium cut to accommodate pipes and/or wiring contained in the box. Filter medium shall be large



enough to fully cover any opening into the valve box to minimize the migration of soil into the bottom of the box.

.2.4 Place 150 mm (6 in.) of drain rock on filter medium. Ensure drain rock completely covers the bottom of the valve box.

.2.5 The top of the valve box is to be level and flush with grade, and located in shrub areas where possible.

.2.6 Valves to be installed vertical and centered in the valve box.

.2.7 Quick coupler valves to be installed within valve boxes upstream of any solenoid valves.

.3 Automatic Controllers: locate controller at location indicated on Drawings.

Coordinate location with City Representative. Ensure all line voltage connections are made by the electrician to Canadian Electrical Code requirements. Provide the appropriate number of conduits into the base of the controller to accommodate all control wires.

.4 Rain Sensor:

.4.1 Location of rain sensor to be determined on site by the City Representative.

.4.2 Wiring of rain sensor receiver to controller in accordance with manufacturers written instructions.

.4.3 Calibrate and test rain sensor to ensure it is operational and performing as specified.

### **.5 Two-Wire Bus Control Wiring:**

.1 Irrigation control system design is based on the use of a common two-wire bus (TWB) full loop design. This allows for the connection of all irrigation devices to the main central control via the TWB. Ensure white wire only as the common wire.

.2 Protect wiring by taping to main line at 600 mm (24 in.) intervals. Ensure an additional 600 mm (24 in.) of extra wire is looped in valve box for each valve. Provide an additional 300 mm (12 in.) of wire at all direction changes. Do not run decoder wire above main line.

.3 Wire splices are to be made in accessible locations such as valve boxes or 250 mm (10 in.) round valve box.

.4 Provide for a minimum of 300 mm (12 in.) wire slack above finish grade of top of valve box at all splice locations, valve wiring, and miscellaneous locations to allow for future expansion.

.5 Wire splices shall be made using CSA approved direct bury splice kit. Minimize the number of splices wherever possible ensuring continuous uninterrupted wire runs.

.6 The Contractor shall obtain approval from Consultant for all wiring to be installed in separate trench. Cable runs in separate trenches shall be marked with yellow caution tape 75 mm (3 in.) above cable for the entire length of cable run.

.7 Control wire runs from stub-out outside of building to controller to be in 50 mm (2 in.) diameter galvanized steel pipe or rigid Schedule 40 PVC conduit buried a minimum of 600 mm (24 in.) below grade to connection point at controller inside mechanical room.

.8 Two-wire bus layout shall accommodate shortest runs from device to device"

.6 **Quick Coupler Valves (QCV):** install in valve box to allow for free insertion and rotation of quick coupler keys 50 mm (2 in.) below box lid on swing jointed piping to provide sufficient "give" should a hose or line be pulled. Ensure QCV installation is stabilized. Piping from the mainline to the QCV to be brass up to and including the first direction change. Brass male fittings into plastic female fittings are not acceptable and will be rejected.

.7 **Irrigation Heads:** install all heads on unitized swing joint assemblies or swing pipe as specified below. Adjust all heads to 12 mm (½ in.) below finished grade for sodded lawn areas and flush with finish grade in planter areas:

.7.1 All sprinkler heads to be installed a minimum 50 mm away from any hard surface.

.7.2 All pop-up sprinklers (spray heads and rotors) with 13 mm (½ in.) and 19 mm (¾ in.) inlets to be installed on 13 mm (½ in.) swing pipe with manufacturer recommended fittings. Swing pipe length to ensure proper vertical alignment of head, and future height adjustment.

.7.3 Maximum flow through swing pipe to be 23 ℓ per minute (5 gpm). If a sprinkler head requires more than 23 ℓ per minute (5 gpm), a properly sized unitized swing joint is to

be used.

.7.4 All pop-up sprinklers with 25 mm (1 in.) or larger inlets to be installed on unitized swing joints.

.7.5 Swing pipe to be used to feed sprinkler heads on lateral lines only. No other uses will be accepted.

### **3.5 Testing**

.1 **Flushing:** mainline: allow for a thorough flushing of mainline piping before allowing any water to pass through the newly installed solenoid valves. Lateral lines: prior to attaching the last sprinkler on a pipe run, flush out each section to remove any accumulated dirt.

.2 **Adjustment:** adjust the irrigation heads for optimum coverage and rate of flow, including minor adjustment in actual head locations. Controller operation settings shall be coordinated with the City Representative and the City of New Westminster inspector. The Contractor is required to balance and adjust the various components of the system to ensure the efficient operation of the system. This includes the adjustment of any pressure regulators, full and part circle radius heads, valves controller settings.

.3 **Coverage Test:** when the irrigation system has been completed, a coverage test will be carried out in the presence of the City Representative and the City of New Westminster inspector to demonstrate head-to-head coverage in planting and lawn areas. The Contractor shall carry all necessary adjustments to ensure head-to-head coverage.

.5 **Controller Test:** when the irrigation system has been completed, a demonstration of the irrigation controller will be carried out in the presence of City Representative and the City of New Westminster inspector. The demonstration shall include but not be limited to the sequencing through each irrigation zone. The Contractor shall carry all necessary adjustments to ensure full automated operation to the satisfaction of the City Representative and the City of New Westminster inspector.

.6 Irrigation systems that are substantially complete after September 15, 2011 shall be fully winterized by the Contractor including but not limited to blowing out all main and lateral lines from the water source to each irrigation head, zone by zone. The Contractor is responsible to return in the following Spring agreed to with the City Representative and the City of New Westminster inspector and start-up the system performing all maintenance functions necessary to provide a fully operating system.

### **3.6 Winterizing**

.1 Winterize the system for the first time with the City of New Westminster's designated representative(s) observing. Winterizing shall include all operations necessary to protect the system from freezing temperatures, including manual and solenoid valve operations to isolate vulnerable parts of the system and draining components and pipes and/or blowing water out of all pipes with compressed air.

### **3.7 Spring Start-Up**

.1 Provide Spring "start-up" with the City Representative and the City of New Westminster inspector. Spring start-up shall include charging the system with water, reviewing zone scheduling and duration, head operation and replacement as required, leak repairs and general maintenance to ensure system is operating to the satisfaction of the City Representative and the City of New Westminster Inspector.

### **3.8 Site Maintenance/Clean-Up**

.1 The job Site shall be kept in a neat, clean, and orderly condition at all times during the installation process.

.2 Trenching, laying pipe, and backfilling shall be continuous so that the amount of open trenching at the end of each workday is minimized. Any open trench or other excavations shall be barricaded and marked with high visibility marking tape to current WorkSafe BC requirements.

.3 Any damage to paving, planting, or any other structures/elements due to settlement of improperly compacted trenches shall be immediately repaired at the Contractor's expense to

satisfaction of City Representative and the City of New Westminster inspector.  
.4 Remove and dispose of off Site all surplus material, excess excavated materials, trash, debris, and waste material from the Work of this section.

**\*\*\* END OF SECTION \*\*\***