## 1.0 GENERAL

### 1.1 Related Work

.1 Coordinate the requirements of this section with all other sections, including but not limited to:

.1 Section 02212 Topsoil

.2 Section 02933 Seeding

.3 Section02950 Plant Material

.4 Section 02998 Landscape Maintenance

### 1.2 Quality Control

.1 **City of Prince Albert, Public Works** to approve irrigation materials and construction for Work.

.1 Submit the following:

.1 Proof of Irrigation Experience (Min. 3 years).

.2 Butt Fusion and Backflow Technician Certificates.

.3 Shop Drawings (3 sets).

.4 Copy of Plumbing Permit.

.5 Copy of Electrical Permit.

.6 As-Built / Project Record Drawing (Mark-up Print), and

.7 Operation and Maintenance Manuals (1 set).

.2 Irrigation Contractor / Sub-contractor must have three years experience in installing irrigation systems in commercial or industrial (50mm pipe or larger) applications.

.3 Backflow preventer testing if required, performed by qualified backflow technicians with valid registered certificate. Butt fusion Work if required, performed by qualified butt fusion technicians with valid registered certificate.

.4 120 Volt electrical and water service box installed by qualified journeyman.

## 1.3 Measurement and Payment

.1 The Lump Sum and Unit prices submitted are for supply of all labour and equipment and materials as specified or required to complete the Work as intended.

.2 The prices submitted to be full compensation for supplying (if applicable), hauling, installing, cleaning and placing in service the Work as specified and detailed, together with all incidental Work.

.3 Measurement for Payments to be calculated on the basis of a percentage of completion of the Lump Sum and Unit prices for the applicable item of Work or at Unit rates of Force Account Rates as entered on the Tender Form.

.4 Specified items of irrigation Work (lump sum / each / lin. m.) includes all associated costs for that item.

.5 Excavation or trenching of materials which cannot be excavated by normal mechanical excavation means will be an addition to the Contract, as agreed.

## 1.4 Inspections

.1 Notify City of Prince Albert, Public Works for inspection of:

- Main Service Connection
- Layout of Components
- Main Line low points
- Main line Butt fusion's
- Trenching Depth Laterals
- Swing Joints
- Lateral Lines Flush (Zone)
- Main Line Final Test (Hydrostatic to 90psi)
- Service Connection Flush Trenching depth Mainline
- Main Line Flush
- Main line Primary Test (City Pressure)
- Details (Number/Sheet)
- Saddle Hole Cuts
- Wire tags
- Winterization (Blow-out)
- Spring Start Up

## 1.5 Testing

.1 Primary Test: After flushing, test main line with main line components installed at City water pressure prior to covering main line. Some joints may be covered to anchor main line.

.1 Testing consists of main line services connection from street curb box - service box components and all fused joints and mechanical connections inclusive of main line installation.

.2 Test duration is one hour after closure of main curb box supply.

.2 Final Test: Upon completion of irrigation system, hydrostatically test main line system to 620 kPa (90 psi) with all components installed for a duration of one hour.

.1 Check all related components for proper operation.

## 1.6 Shop Drawings

.1 Before fabrication and installation of any materials or equipment submit three (3) sets of shop drawings and data sheets covering all items of equipment furnished and intended for installation.

.2 Insert shop drawings in duo tang cover with tab inserts for each item and include all information necessary to indicate the following:

.1 Dimensional data for roughing-in and installation.

.2 Technical data to ensure that equipment meets requirements of drawings and specifications.

.3 Wiring, piping and service connection data for all trades.

.4 Electric valves complete with voltage and ampere ratings.

.5 Job name, irrigation contractor, supplier or agent, manufacturer, consultant.

.3 Shop drawings are required for the following irrigation components:

- Backflow preventer
- Clamps
- Controller
- Gauges
- Irrigation heads
- Pump
- Saddles
- Wire
- Polyethylene & PVC pipe
- Rain Sensor
- Pressure reducing valves
- Valve electrical and mechanical
- Pressure switch
- Water service valve & box
- Strainer
- Valve boxes

.4 Consultant review and acceptance of shop, data and layout shop, data and layout shop drawings does not relieve the Contractor of full responsibility for performance of the work as specified and detailed.

## 1.7 As-Built Drawings

.1 Keep one set of drawings, one set of shop drawings and specifications on job site for the sole purpose of recording any changes to Work.

.1 Update drawing set daily as Work progresses.

.2 Mark up print with changes done to the project as a “Project Record Copy”.

.2 Submit irrigation “Project Record Copy” to **City of Prince Albert, Public Works** for revision to “As-Built” status to reflect total irrigation system installed. Minimum requirements for acceptable submission include but are not limited to the following:

.1 Legend to be revised to indicate head type, flow rate, nozzle size, controller type, electric valve type and any other changes.

.2 Revise wiring schematic to reflect actual installation.

.3 Water service connection:

- Show location of service box
- Add dimensions from service box to curb box valve and main drain.

.4 Main line:

- Add sufficient dimensions to identify its location.
- Dimension tie points connections for main branch lines.
- Dimension location of isolation valves.
- Dimension starts and ends of major bends.

.5 Dimension location of electric valves.

.6 Dimension location of drain valves.

.7 Dimension location of electric splices.

.8 Dimension location of buried wires (i.e. to controller, electrical power supply).

.9 Revise lateral lines and heads to show installed locations.

.10 Delete from drawing any symbols, lines, or contract limit that has been abandoned during construction.

.11 Any existing operational lines on drawings are to remain as part of mark-up print.

.12 Indicate colours of all wires.

.13 Incorporate changes made to the contract by addendum and by change order.

.14 Submit ‘As built’ drawings prior to CCC site inspection.

## 1.8 Operating and Maintenance Manuals

.1 Submit one (1) set of irrigation operation and maintenance manuals for each piece of equipment and system that are supplied and installed.

.2 Place documents in black hard cover three-ring binder with clear plastic pocket on outer spine inscribed with:

.1 Operating and Maintenance Manual -Project Name and Year

.3 Content for each binder arranged according to following index system.

.1 Page One: Title page with binder title, project name and location, project date, Owner, Contractor and Designers, in clear plastic cover.

.2 Page Two: Operating and Maintenance Manual index in clear plastic cover.

.3 Tab 1: Main line and back flow test reports. Letter of Warranty

.4 Tab 2: Include list of suppliers addresses and phone numbers.

.5 Tab 3: Controller information: Manufacturer Data to describe its operation, performance, maintenance requirements, parts list and trouble shooting data.

.6 Tab 4: Irrigation Heads: Manufacturer Data to describe its operation, performance, maintenance requirements and part list.

.7 Tab 5: Electric valves: Manufacturer data to describe its operation, performance, maintenance requirements and parts list.

.8 Tab 6: Backflow preventer valve: Manufacturer data describing field test procedure, installation instructions, and trouble shooting guide.

.9 Tab 7: Remainder of components used for project.

.10 Tab 8: Clear plastic cover (for final As-Built Drawing).

## 1.9 Winterization

.1 Winterization of irrigation system as follows:

.1 Turn off main curb stop.

.2 Open main drain next to the curb stop.

.3 Open water meter drain.

.4 Open Backflow preventer.

.5 Open and activate quick coupler at end of main line.

.6 To blow out main line manually activate electric valve furthest downstream on the main or valves in low area. Leave zone open until mainline is blown dry.

.7 Hook up an air compressor (a minimum size of 375 CFM) to 50 mm ball valve downstream of all service box components. Set compressor pressure regulator at 585 kPa (85 psi). Minimum 50mm hose from compressor.

.8 Install pressure gauge downstream on main line quick coupler.

.9 Blow out system, with minimum of 206 kPa (30 psi) and maximum of 520 kPa (75 psi).

.10 Visually inspect quick coupler activated in step 5. Remove key from quick coupler when discharge water begins misting . Activate zones manually in sequence, working back to main source. Deactivate when all water is discharged. Continue operation until zones have been blown dry. Insure all quick coupler lines have been blown dry.

.11 Run system through timer to complete final blow-out.

.12 Leave drain open.

.13 Check drains at low points on main line. Leave in closed position.

.14 Close street side main gate valve in service box. Secure this valve. Tag and date blow-out. Lock service box.

## 1.10 Spring Start-Up

.1 Spring start-up of irrigation system as follows:

.1 Connect blow off hose to ball valve or quick coupler, street side of main shut off valve in service box.

.2 Close drain cocks on backflow preventer assembly and water meter.

.3 Close furthest gate valve down stream on backflow preventer assembly in service box.

.4 Check to make sure all drains along main line are closed.

.5 Open and activate quick coupler at end of main line.

.6 Manually activate electric valve furthest down stream on main line.

.7 Manually activate electric valve in vicinity of service box.

.8 Close main drain on service supply to service box.

.9 Open curb stop valve very slowly to charge line between street service and service box.

.10 Remove blow off hose in sequence .

.1 Check main drain with stethoscope to confirm its holdings.

.11 Open gate valves and throttle to maintain and not exceed a flow of 5.0 l/s (80 G.P.M.) until main line is fully charged.

.12 Close valves in sequence .5, .6, .7.

.1 Check with stethoscope in valve box to confirm main line is holding. Alternately, check dial on meter.

.2 Open valves in service box fully if main line is holding.

.13 Operate each electric valve manually and adjust all equipment for a smooth trouble free operation of system.

.14 Check controller operation. Leave in off position.

.15 Close main gate valve in service Box, the one closest to street side. Secure this valve Tag and date - check out "Lock Service Box ".

## 1.11 Existing Water Distribution System

.1 Notify **City of Prince Albert, Public Works** irrigation maintenance 24 hours prior to shutting down an existing irrigation system.

.2 Existing water distribution system on irrigation site can be turned off when working on new main line.

.1 Identify in service box with a tag attached to valve that system was locked and closed, provide contact name and phone number.

.2 Close isolation valve and install lock and chain.

.3 Integrate new installation with existing system to function as one installation.

### 1.12 Repairs (During Warranty)

.1 Contractor to correct soil depressions and defects or misalignment of any part of the Work caused by settlement of bedding or backfill material within warranty period.

.2 Repairs of an emergency nature may be required to protect property or permit operation of the Work with Contractor notified by phone and follow up letter.

.1 Make repairs within twenty-four (24) hours otherwise repairs arranged by **City of Prince Albert, Public Works**, are at Contractors expense.

.2 Notification of required non-critical repairs in writing only.

## 2.0 PRODUCTS

### 2.1 Pipe & Fittings

.1 Lateral lines: 50 mm in diameter and smaller use low density polyethylene pipe conforming to CSA B137.1 Series 75. Use schedule 40 PVC Type 1 elbows, tees, coupling, bushings, plugs and unions conforming to ASTM D-2464.

.2 Main lines: 75 mm diameter and larger or pipe over 70 psi, use SDR17 high density polyethylene pipe conforming to ASTM F714-85 for 690 kPa rated pipe. Require manufacturer pre-fused socket weld fittings.

.3 Polyvinyl chloride (PVC) nipples are Schedule 80 Type I to ASTM D-2609.

.4 Steel or galvanized steel pipe and fittings are not allowed where these pipes are buried.

### 2.2 Clamps

.1 Global Fasteners or approved equal stainless steel pipe clamps with stainless steel screws. Welded backing on screw housing. Crimp clamps not acceptable.

### 2.3 Sleeves

.1 Use PVC pipe of any grade two nominal pipe sizes larger than pipe required for that portion of system.

.2 Sleeve for power feed at the controller is 50mm (2") PVC sceptre conduit c/w 50 mm (2") PVC sceptre conduit 900 bends (6 times the pipe diameter).

### 2.4 Wiring

.1 Identify control wires individually with heat shrink and acid pen method in all valve and splice boxes.

.2 All wires are direct burial CSA approved TWU 40 wire of a different colour than 115 volt service to controller.

.1 All wires (tracer, common, spare and control) are #12 wire.

.3 Colours:

.1 Tracer wire is Green. Common wire is white. Spare wire is blue.

.2 Control wires can be any colour except green, white or blue.

.3 Wires to be one continual colour.

.4 Wire each valve individually back to controller. Use DBR connectors for #12 wire. Manual valves shall be supplied with control wire to allow for future upgrade.

## 2.5 Manual Valves

.1 Ball valves:

- 50 mm and smaller use bronze body, screwed ends, full port, 1380 kPa
- W.O.G. with chromium plated bronze ball and teflon seat. Use Newman Hatterly
- 1969F Kitz #58, Crane #9322 or TOYO 5044A..2.

.2 Gate valves:

- 50 mm and smaller use bronze, screwed ends, internal seats, 1380 kPa
- W.O.G. Gate valve with solid wedge disc and non-rising stem. Use Newman Hatterly
- 150's,Kitz #40, Crane #438 or Red and white #206.

.3 Gate valve:

- 75 mm and larger use iron body, flanged ends, 1380 kPa
- W.O.G. gate valve with bronze trim and non-rising stem. Use Newman Hatterly
- 150's, Kitz #75, Crane #461 or Red and white #415A.

## 2.6 Valve Boxes

.1 Prefabricated Carson #1220-12, 1419-12 and 910 heavy duty plastic valve boxes green in colour or approved equal and complete with locking cover.

.1 Install 316 stainless steel hex head bolt (3/8" x 2.5") through lid into manufacturer's pre-tapped box body.

.2 Identify valve box lids as follows:

.1 Manual valve Controller # - Zone # (i.e. MV-4)

.2 Quick coupler QC-# (i.e. QC-5)

.3 Drain valve DV-#

.4 Blow out valve BV-#

.5 Splice box SB-#

.6 Isolation valve IV-#

## 2.7 Service Boxes

.1 Prefabricated Carson #2436 heavy duty plastic valve boxes green in colour or approved equal and complete with locking cover.

.1 Install 316 stainless steel hex head bolt (3/8" x 2.5") through lid into manufacturer's pre-tapped box body.

## 2.8 Crushed Rock

.1 Use approved 25 mm nominal size washed crushed drainage rock at valve boxes and meter pit. **City of Prince Albert, Public Works** to provide name of supplier.

## 2.9 Saddles

.1 Cal-AM series 4400 saddles for main line pipe 75mm and larger or approved equal.

.1 Install 4x2 Rowbar or Ford brass saddle in service boxes. 45 lbs maximum torque on bolts.

.2 Use heavy brass for lateral pipe saddles. Size as required. Do not use saddles on pipe size 25mm and smaller.

## 2.10 Irrigation Heads - Rotors

.1 Institutional quality pop-up grey water sprinkler heads gear driven, low angle and standard angle nozzles, part circle forty degrees to three hundred and sixty degrees arc, heavy duty retracting spring, matched precipitation, 100 mm pop-up, compatible with different nozzles and fully adjustable to allow for field adjustment.

.1 Use Hunter I-20 Ultra and Hunter I-25 Heaps

.2 Sprinkler head equipped with built in check valve, rubber cover, and filter screen and grey water compatible.

.3 Sprinkler head body and riser constructed of non-corrosive heavy duty ABS plastic.

.4 Rotors require a five (5) year unconditional non-prorated manufacturer warranty.

## 2.11 Irrigation Heads – Sprays and Bubblers

.1 Institutional quality pop-up spray heads, 100 mm pop up, pressure regulating, check valve and stainless steel spring.

.1 Hunter Institutional series.

.2 Spray heads require a five (5) year unconditional non-prorated manufacturer warranty.

## 2.12 Pressure Gauge

.1 65 mm diameter glycerine gauge (pressure rated to 850 kPa minimum), filled in nylon case, bronze internal components, geared brass movement, extruded brass socket 3% full scale accuracy.

.1 Use brass ball valve on pressure gauge taps meeting or exceeding valve pressure rating specified for the system.

## 2.13 Back Flow Preventer

.1 Wilkens Zurn Model 350 for 100mm size. Wilkens 950xl for 25 - 50mm sizes.

.2 Conbraco Model DC for 100mm size. Conbraco 40-100 series for 25-50mm sizes.

.3 Watts 709-NRS for 100mm size. Watts 007M2-QT for 50mm size.

.4 Back flow preventer valves are cast iron, internally epoxy coated, cast iron bonnet, spring

.1 Loaded poppet type check, with reversible seat discs and bronze fitted non-rising stem and nut. Valve assembly rated to 1203 kPa (175 PSI) water working pressure and water temperature from 00C (320F) to 460C (1400F). Meet requirements of ASSE Standard 1015, AWWA Standard C506-78, and USC for cross connection control and hydraulic research latest edition.

.5 Back flow preventer valves supplied with ball type drain valves mounted at the base of each check valve.

## 3.0 EXECUTION

### 3.1 Laying Out Work

.1 Establish and maintain line and grade controls using appropriate survey personnel and equipment.

.1 Layout of all Work and its accuracy is Contractor's responsibility.

.2 Changes to the irrigation layout or design must be approved before changes are implemented.

.2 Stake locations of sprinkler heads and notify **Consultant** of any deficiencies that may affect performance of the irrigation system so that adjustments may be made.

### 3.2 Flushing (Main Line and Lateral Lines)

.1 Flush main line between City of Prince Albert water main and service box water meter before water meter is installed.

.2 Flush main line prior to activating system.

.3 Flush lateral lines prior to installing end head on line. Retain full line size with pipe extended above ground level.

.1 Removing end head is not acceptable.

.4 **City of Prince Albert, Public Works** to observe flushing and requires 24 hours' notice.

### 3.3 Excavation

.1 Notify utility and other underground service companies prior to undertaking Work.

.1 Notify **Consultant** of underground utilities and services including power, gas, telephones cable, traffic lights and others and have locations staked prior to commencing excavations.

.2 Trench 120 volt service for controller and park lights, pipes and control wiring. Excavation is unclassified and includes materials encountered except which cannot be excavated by normal mechanical excavation means.

.3 Minimum and maximum depth of cover over lateral lines and main lines:

.1 Main Lines pipe sizes 450mm to 550mm.

.2 Lateral Lines pipe sizes 400mm to 500mm.

.4 Backfill and tamp over excavated trenches to provide compacted bearing for pipe.

.5 Remove from backfill material rocks, stones and other unsuitable substances that could damage pipe or create unusual settling problems. Backfill in 150mm layers and tamp each layer to prevent excessive settling with mechanical device.

.6 Equip chain trenchers with a crumber, or manually clean trenches of loose material before laying pipe.

.7 Backfill mainline trench within 72 hours of excavation.

.8 Repair all concrete and asphalt damaged in the course of this contract.

.9 Backfill trenches containing pipe when pipe is cool avoiding excessive stress and heaving of pipe due to expansion. All trenches must be tamped with a mechanical tamper.

.10 Install PVC sleeves where electrical wires and main line pass under roads or concrete walks. Sleeves two nominal pipe sizes larger than water pipe. No sleeve smaller than 100mm (4") nominal. Extend sleeve a minimum 300mm beyond edge of surfaces. Install 50 mm sleeve for wire only where it passes under asphalt walks. No butt fusions on main line where it passes under asphalt walk.

.11 Minimum width of trenches for main pipes to be 150mm (6") wider than nominal size of the pipe in the trench (i.e. 100 mm (4") pipe requires 200 mm (10") trench width etc.)

.12 Where trenches cross areas that are to be re-seeded or sodded the backfill trench must be re-compacted and re-seeded using a seed mixture that matches existing. After trench has been backfilled and re-compacted, remove trenching debris from grass on each side of the trench by hand raking or other suitable means. Water trench area until turf is established and accepted to specification standard. Repair any trench settling during warranty period. Do not trench across pathways for lateral lines.

.13 Backfill pits for valve boxes, quick couplers, curb valves and isolation valves with 25 mm crushed rock from undisturbed soil to required elevation.

**3.4 Water Service Connection and Service Box**

.1 Install water service connection in accordance with Section 02315 – Trenching, Backfilling and Compaction for Utilities, Section 02510 – Water Distribution and Section 02539 Building Services.

.2 Backfill around water service box evenly with 150 mm lifts.

.3 Install Irrigation Service Box Marking Post.

## 3.5 Backflow Preventer

.1 Install and field test the back flow preventer to manufacturer's recommendation and submit test result to **City of Prince Albert, Public Works**. Installation to be done with approved, qualified personnel only.

## 3.6 Installation of Pipes

.1 Install pipes and fittings in accordance with manufacturer's instructions and proceed from point of supply connection. Install concrete thrust blocks at directional changes in pipelines in accordance with pipe manufacturer's instructions.

.2 Connect sprinkler heads to polyethylene pipe with brass saddles and insert tee.

.3 Install lateral lines by pulling in pipe.

.1 Use a vibrator type pipe plough for pull-in method with a Mole or Bullet 25mm larger in diameter than outside diameter of the pipe.

.2 Eliminate ridge created by the vibrator plough by mechanical tamping so soil over pipe is returned to final grade.

.4 Lay 75mm and larger main water pipe in trench. Saw cut saddle holes on High Density Polyethylene (HDPE) main line pipe. Do not burn hole in HDPE pipe.

.1 Leave pipe uncovered at this stage for inspection.

.2 Do not backfill until approved.

.5 Slope main lines to provide gravity drainage to local low points in the pipe.

.1 Run a survey of the main line to establish exact low points.

.2 See 3.13 of this specification.

.6 Double clamp insert fittings.

.7 Follow pipe manufacturer butt-fusion procedure for pipe and fittings.

## 3.7 Wiring

.1 Install wires in a neat and orderly fashion in pipe trenches. Bundle wires together and tape every 2m.Test the wires for continuity prior to burying the wires.

.2 Assemble splices in services boxes or valve boxes when required. Loop 610 mm (24") of electrical wire in splice box.

.1 Apply brass tag with zone number on each side of splice having wire run through tag hole.

.2 One splice allowed per leg of wire. Go to nearest valve box with wire if more required.

.3 T-splice a 150mm tail on common and attach valve wire to common tail.

.4 Install electrical wiring in accordance with existing Canadian Electrical codes.

.1 Loop 600mm (24") of spare, common, and applicable control wire in each valve box.

.2 Loop at 90 degree changes in direction along main line.

.5 115-volt wiring installed and connected by Contractor **Electrician**.

.6 Install tracer wire in all main line trenches from service box to end of main lines.

.1 Attach tracer wire to 18mm x 600mm copper clad ground rod with 18mm brass ground clamp inside each last box on the main line.

.7 Install spare wire in main line trench with wire bundle from controller to last control valve.

## 3.8 Valves

.1 Install valves according to manufacturer's instructions. No pipe dope or oil base lubrication on threads.

.1 Install valve in a valve box set plumb and flush with grade.

.2 Align valve boxes perpendicular to main line.

.3 Do not install valve boxes in bottom of swales.

.4 Tamp the ground around each valve box to its original grade.

.2 Min. 50mm and maximum 100mm clearance from top of valve to bottom of lid.

.3 Valve box is supported by 300mm of crushed rock and compacted soil so that it can support the weight of turf maintenance machinery without sinking.

.4 Tag zone valves with brass tags and correspond number with controller station number.

.1 Correspond valve cover identification with valve tag marking.

## 3.9 Sprinkler Heads

.1 Follow manufacturers directions for installation. Use four elbow swing joint.

.1 Connect swing joints on top or side of lateral pipe.

.2 Tamp the excavated ground around each head to its original grade.

.2 Do not use saddles on pipes 25mm and smaller. Use insert tee fitting with double clamps.

.3 Burn or drill with a hole saw for saddle. Do not use ordinary steel bit.

## 3.10 Drains

.1 Install drains along main line in locations as approved.

.1 Install drain valve box with 25mm ball valve at low points.

.2 Install where depressions occur and water is likely to collect in pipe.

.3 Do not install drains in bottom of swales or below existing water table.

## 3.11 Balancing and Adjustments

.1 Balance and adjust various components of sprinkler system so overall operation and coverage meets the design specifications prior to final inspection.

## 3.12 End of Season

.1 If irrigation system has not had a final inspection in the current year, then blow-out irrigation water lines prior to October 8 and activate system in spring of the following year.

.1 Cease irrigation installation prior to October 15, unless otherwise approved.

## 3.13 Clean-Up

.1 Clean adjacent walks and road surfaces at the end of each working day.

**END OF SECTION**