

## 1. GENERAL

### 1.1 Materials

- .1 Materials shall be new and without flaws or defects of any type.
- .2 For substitutions, supply material with descriptive literature and samples, at least ten (10) working days before commencement of work. Any substitutions must meet or exceed specifications and performance standards of the proposed system, without any additional cost to the owner.
- .3 All major components used in the system must have all the manufacturer's identification, i.e. make, model and serial number clearly shown on the equipment. Electrical or mechanical equipment used in the system which is subject to Federal, Provincial or Municipal standards must be installed to comply with the standard and where required, clearly be identified as approved by the **Canadian Standards Association**.

### 1.2 Piping and Fittings

- .1 The piping and fittings at the point of connection at the water service riser to the exit points of the vault shall be galvanized. Exit points include only the piping on the downstream side of the water service components (i.e.) isolation valve or electric zone valve. Fittings shall all be galvanized. The Contractor shall use the manufacturer's recommended fittings to convert from the water service riser to the mainline piping. Water service vault shall be a minimum of 10ft (3m) away from City service point.
- .2 Irrigation mainline piping shall be:
  - .1 C.S.A. high density polyethylene pipe DR 13.5 for maximum pressure below 120psi; or
  - .2 C.S.A. high density polyethylene pipe DR 11 for maximum pressure between 120 and 160psi.
- .3 All lateral lines on the downstream side of the electric zone valves shall be sized to flow at a maximum 5ft/ sec. 1.5in (38mm) shall be the smallest size allowed, unless otherwise approved.
- .4 All lateral lines on the downstream side of the electric zone valves shall be C.S.A. high density polyethylene pipe series 160 up to 2in (50mm) in size. C.S.A. high density polyethylene pipe DR 13.5 shall be used on pipe sizes above 2in (50mm) outside diameter.

- .5 The use of any size or type of pipe that is different from that specified must be approved by the Project Manager.

### **1.3 Controllers, Cabinets and Concrete Bases**

#### **.1 General**

- .1 All computerized automatic controllers used shall be C.S.A. Certified as a Class II power limiting circuit capable of handling the zones as noted on the drawings and have the capacity to add modules for future expansion of the computerized controller.
- .2 The Contractor shall confirm the size of the irrigation cabinet with the Project Manager prior to the start of work. Adjustments in size shall be made depending on the number of controllers housed in the cabinet.
- .3 Interior controller mount shall consist of a  $\frac{3}{4}$ in (19mm) thick plywood backplate, consisting of G1S fir plywood and installed in a 14 gauge powder coated controller cabinet lockable with a padlock.
- .4 Exterior controller mount shall consist of a  $\frac{3}{4}$ in(19mm) thick plywood backplate, consisting of G1S fir plywood and installed in a powder coated metal weatherproof, lockable controller cabinet and mounted on a powder coated metal pedestal.
- .5 Suggested manufacturer: ACE Manufacturing Metals Ltd. Box 600 Bittern Lake AB, TOC 0L0. Local supplier: EECOL Electrical Ltd.

#### **.2 Large Controller Cabinet**

- .1 The size of the irrigation cabinet for a Large Controller Cabinet shall be 36in (900mm) wide, 44in (1,100mm) high and 16in (400mm) in depth. It shall be constructed of 12 gauge metal, powder coated, A1103 park green in colour.
- .2 The large controller cabinet shall be fitted with single doors mounted on pin hinges tack mounted to the cabinet. The doors shall have a 3in (75mm) lip on the bottom, a crossroke driphood and are to be fitted complete with neoprene gasket to ensure that the interior of the cabinet is weatherproof. The doors are to be fitted with hardware to facilitate locking the cabinet with a padlock. Closure brackets, hinge attachments and plywood mounts are to be welded from the inside

wherever possible to eliminate openings and protrusions. The exterior of the cabinet should be smooth and rounded with no protrusions or sharp edges evident. Any point of entry into the cabinet shall be sealed with a waterproof sealer.

- .3 The controller pedestal shall consist of a 36in (900mm) long metal pedestal with a 90 degree welded elbows gradually extending out to the front 12in (300mm) at the bottom of the conduit past the concrete pile and consisting of metal conduit welded to it for the following:
    - .1 Two 4in (100mm) metal conduit for the irrigation zone valve/hydrometer wire(s).
    - .2 One 1½in (38mm) metal conduit for the communication cable.
    - .3 One 1½in (38mm) metal conduit for the grounding rod wire
    - .4 One 2in (50mm) metal conduit for the electric power supply.
  - .4 The length of the metal conduit for irrigation zone valve/hydrometer wires, communication cable and grounding rod is 36in (900mm) while the length of the metal conduit for the electrical power supply is 56in (1,400mm).
  - .5 The pedestal shall have a 36in (900mm) length by 16in (400mm) wide ¼in (6mm) metal base plate welded to pedestal. The base plate shall have 3/8in (9mm) holes drilled in all 4 corners 2½in (63mm) from the edge and 12in (300mm) from each corner (lengthwise) for attaching the controller cabinet.
  - .6 The pedestal shall be powder-coated metal, A1103 park green in colour.
  - .7 The pedestal shall extend 18in (450mm) into the ground.
  - .8 A concrete pad 44in (1,100mm) length, 24in (600mm) width and 6in (150mm) depth complete with concrete pile 40in (1,000mm) in depth.
- .3 Small Controller Cabinet
- .1 The cabinets for all small controller cabinets shall be a 14 gauge metal powder coated green, A1103 park green in colour.
  - .2 The size of the small irrigation cabinet is 26in (660mm) x 26in (660mm) x 12in (300mm).

- .3 The small controller cabinet shall be fitted with a single door mounted on pin hinges tack mounted to the cabinet. The doors shall have a 3in (75mm) lip on the bottom, a crossroke driphood and are to be fitted complete with neoprene gasket to ensure that the interior of the cabinet is weatherproof. The doors are to be fitted with hardware to facilitate locking the cabinet with a padlock. Closure brackets, hinge attachments and plywood mounts are to be welded from the inside wherever possible to eliminate openings and protrusions. The exterior of the cabinet should be smooth and rounded with no protrusions or sharp edges evident. Any point of entry into the cabinet shall be sealed with a waterproof sealer.
- .4 The controller pedestal shall consist of a 72in (1,800mm) metal pedestal with a 90 degree welded elbow gradually extending out to the front 12in (300mm) from the bottom of the pedestal and consisting of a 4in (100mm) metal conduit welded to it for the electrical zone wires and with a 1½in (38mm) metal conduit welded to it for electric power supply.
- .5 The depth of the 4in (100mm) metal conduit shall be 20in (500mm) while the depth of the 1½in (38mm) metal conduit is 36in (900mm).
- .6 The pedestal shall have a 16in (400 mm) square ¼in (6 mm) metal base plate welded to pedestal. The base plate shall have 3/8in (9mm) in holes drilled in all 4 corners 1½in (38 mm) from the edge for attaching the controller cabinet.
- .7 The pedestal shall be powder-coated metal, A1103 park green in colour.
- .8 The pedestal shall extend 36in (900mm) into the ground.
- .9 The concrete pad shall be 24in (600mm) length, 18in (450mm) width and 6in (150mm) depth.

#### **1.4 Irrinet Antenna, Base and Mast**

- .1 The mast shall consist of a 20ft (6m) vertical post, top luminaire pole, painted A1103 park green with 11in (280mm) bolt circle diameter on mounting base.
- .2 The extension shall consist of a minimum height of 20ft (6m) of 2in (50mm) (outside diameter) rigid pipe.

- .3 The City shall supply, install and aim the antenna.

### **1.5 Sprinkler Heads**

- .1 All full circle (360 degrees) sprinkler heads and all part circle (less than 360 degrees) shall be as indicated on the drawings.
- .2 Spacing of the sprinkler heads shall not exceed the manufacturer's minimum specifications and must provide head to head coverage.
- .3 The specified irrigation heads shall be warrantied by the manufacturer against defects in material and workmanship for a period of five (5) years from the date of installation.

### **1.6 Wire Requirements**

- .1 Wiring to and from controllers and valves shall conform to the Canadian Electric Code and any other regulatory conditions which govern this type of installation.
- .2 Control wire used shall be minimum 14 Gauge TWU, Copper, Solid Core unless otherwise approved.
- .3 Wire shall be furnished in minimum 2,500ft (762m) reels and splicing shall be minimized, with such splices made waterproof with the use of the following:
  - .1 3M DBR6 splice kits to be used when splicing inside valve boxes. Heat shrink connections are to be used where 3 or more wires need to be spliced in a direct burial application, for water proofing the connection.
- .4 The two pairs of wires for the hydrometer shall be differentiated from the zone wires. If there is more than one hydrometer installed at one location, the wires must be bundled separately and identified separately, although if the site conditions allow, they may be run in the same trench. The color coding sequence is as follows:

For the Pulse	2 Blue Wires
For the Valve Control	1 Yellow wire and 1 White (Common) wire
For the Hydrometer Spare	1 Black wire

## **1.7 Double Check Valve Assembly and Water Meter**

- .1 Double check valve assemblies must be installed. The double check valve used shall be CSA approved and clearly labelled. The installation must meet all Federal, Provincial and Municipal requirements.
- .2 All double check valves shall be Watts Series 007-QT.
- .3 All test cocks are to be removed, once the double-check valve assembly has been tested and approved. Each test cock is to be replaced by a brass plug. Test cocks shall then be placed in a plastic bag with the location noted, and shall be passed on to the Project Manager, in a clean condition.
- .4 Hydrometers shall be electrically operated, compatible with the **Motorola** central irrigation control system, and shall be **Arad Model BM** control/control valves, complete with a drain plug on the body to drain the meter housing. Flow shall be measured in cubic metres with a pulse rate of 0.1.

## **1.8 Gate Valves**

- .1 All gate valves for drainage and flow control shall be bronze body with replaceable seals, and have a removable handle with a minimum pressure rating of 10-kg/cm<sup>2</sup> (150 p.s.i.). All gate valves shall be full ported.
- .2 All gate valves shall have standard pipe threaded ends or adapters provided for proper installation in the lines in which they are located. All valves to be of same size as the lines in which they are used.
- .3 Valves up to 3in (75mm) in diameter shall be 10 kg/cm<sup>2</sup> (150 p.s.i.) bronze gate valves.
- .4 Valves 4in (100mm) in diameter and larger shall be iron body bronze or brass mounted gate valves conforming to standard specifications and meeting local standards.

## **1.9 Fittings & Unions**

- .1 All fittings shall be connected to the pipe utilizing the appropriate welding, clamping or gluing method and materials as per manufacturer's recommendation.
- .2 All fittings for low density polyethylene pipe shall be either polyethylene insert fittings, or galvanized insert fittings. All fittings for PVC pipe shall be PVC fittings.

- .3 Swing joints shall be used to attach the sprinkler heads to the lines.
- .4 Swing joints shall consist of three 90-degree elbows. They shall have a minimum diameter of  $\frac{3}{4}$ in (19mm) for sprinkler heads with a flow rate of up to 6 gpm, one inch for sprinkler heads with a flow of up to 12 gpm, or as indicated on the drawings for sprinkler heads with flow rates exceeding 12 gpm.
- .5 All fittings on swing joints shall be P.V.C. Schedule 40 threaded elbows or street elbows.

#### **1.10 Electric Zone Valves**

- .1 Electric zone control shall be C.S.A. Certified as Class II power limiting circuit low voltage (i.e. 24-volt) operated only. Closing time for zone valves shall be not less than 5 seconds.
- .2 Zone control valves shall be electrically operated and self-cleaning, **Hunter IBV Series**.
- .3 Valves sizes shall be as follows:  
  
     $1\frac{1}{2}$ in (38mm) for flows up to 50 ush.  
    2in (50mm) for flows up to 100 ush.  
    3in (75mm) for flows up to 200 ush.

#### **1.11 Irrigation Enclosure Boxes**

- .1 Where manufactured irrigation enclosure boxes are used, they shall be of heavy weight polyolefin and shall be capable of withstanding the weight of a heavy tractor on their surface, and shall have a locking capability.
- .2 Zone valves shall be housed in a “Jumbo” sized 26in x 16in (660mm x 406mm) irrigation enclosure box that is 18in (450mm) depth. The size of the irrigation box shall be such that there is a minimum of 6in (150mm) of vertical and horizontal clearance between the box and any point of the valve.
- .3 Gravel bed in boxes or vault shall consist of 12in (300mm) of clean, washed pea gravel,  $\frac{1}{8}$ in (3mm) to  $\frac{3}{8}$ in (9mm) with area marginally larger than box opening.

## **1.12 Clamping Systems**

- .1 All C.S.A. series 75 LDPE, 1½in (38mm) or greater is to be double clamped with stainless steel gear clamps. Clamps are to be installed mid-way on the coupler. The tightening points of the clamping bands should be on opposite sides of the coupler.
- .2 HDPE piping shall be fused/welded (unless otherwise approved).

## **1.13 Miscellaneous Systems Components**

- .1 All miscellaneous systems components such as air relief valves, concrete vaults, meter boxes, shall be of the type and size as indicated on the drawings or details.
- .2 Install according to approved manufacturer's directions or at the direction of the Project Manager.

## **1.14 Thrust Blocks**

- .1 Local conditions shall determine the type and extent of thrust blocking to be used. Approval from the Project Manager on the best method (whether concrete, rock, rebar or a combination of the former) shall be required before proceeding.

## **1.15 Booster Pump**

- .1 Where a water service requires a booster pump, the pump and all the other irrigation water service components shall be installed above grade in a 12 gauge metal enclosure. The size of the enclosure shall be such that there is 1ft (300mm) clearance around the perimeter of the components.
- .2 The booster pump shall be the brand name and model as specified on the drawings.
- .3 The enclosure box shall be constructed of 12 gauge metal. The roof shall have a slight crease in it to ensure moisture drains off the roof. It shall have mesh vents on 2 sides of the box, with openings not exceeding 16 inches<sup>2</sup> (40.5 cm<sup>2</sup>). The vents shall have mesh, attached from the inside and the vents shall have covers installed inside the cabinet which can be manually closed.



- .4 The door(s) of the enclosure box shall be constructed of the same material. The door(s) are to be mounted/welded with heavy-duty pipe hinges. The door(s) shall be lockable and have handles for ease of opening. The door(s) should be weatherproof.
- .5 The enclosure box and door(s) shall be painted a medium to dark green colour with a rust inhibitive, weather resistant paint.
- .6 The size of the concrete base for the booster pump will be constructed such that there will be a 4in (100mm) overhang on all sides of the cabinet. The bases shall be installed 2in (50mm) above grade.
- .7 The concrete base shall be constructed with 4 (four) 8in (200 mm) cardboard tubes (Sono tubes or equivalent) filled with concrete, 24in (600 mm) in depth.
- .8 The concrete base shall be formed and shall be a minimum of 6in (150mm) in depth, with wire mesh or rebar in the concrete.
- .9 The Contractor shall use L - shaped rebar to tie the base and sono tube together.
- .10 Concrete mix shall be in accordance with the following:

Minimum 28 Day Strength .....	25 MPa*
Designated Aggregate Size .....	maximum 1in (25mm)
Slump .....	1-3in (25-75mm)
Air Entrainment .....	5 - 7 %
Cement .....	Type 10 Normal Portland Cement
Calcium Chloride .....	ASTM D98, 2% maximum, with Project Managers approval

### **1.16 Irrigation Vault**

- .1 The wooden vault shall be constructed of pressure treated 4in x 4in (100mm x 100mm) lumber, and constructed in continuous lengths with no piecing of any sides of the vault. Contractor to provide shop drawing for review prior to placing order.
- .2 The vault shall be a minimum of 20in (500mm) in height. The corners should be alternately overlapped for stability. The end cuts of the lumber shall be coated with a wood preservative material. Each layer of 4in x 4in (100mm x 100mm) should be nailed together at regular intervals with 6in (150mm) galvanized nails.

- .3 The lid(s) shall be constructed of 1/8in (3mm) split 4ft (1.22m) intervals and have a bent offset/overlap where a split occurs. The lids shall be constructed such that they open in sequence with the lid over the water service the first lid to be opened. A 2in x 2in (50mm x 50mm) angle iron metal support shall be welded into the vault under the split in the lid(s) for support. The lid(s) are to be mounted/welded with A53 schedule 40 gas pipe. It hinges onto a 3in x 3in x 1/4in (75mm x 75mm x 6mm) angled frame dropped over the outside of the frame of the vault and is then lag bolted to the vault at regular intervals. The hinges shall consist of a 4in (100mm) round 1/2in (12.5mm) thick pipe welded to the frame, with a 2in (50mm) round 1/2in (12.5mm) thick pipe on either end complete with a 9/16in (14mm) pin. The lids shall be lockable and have recessed handles for ease of opening. The lids and metal frame shall be painted a medium to dark green colour with a rust inhibitive weather resistant paint. The lids shall not be larger than 4ft x 4ft (1.22m by 1.22m) in size.
- .4 All piping and conduit openings shall be cut around the pipe or conduit with 2in (50mm) of clearance between the pipe or conduit and the vault. The pipe or conduit shall be centred in the opening. Any patching of the openings shall be done with 3/4in (19mm) pressure treated plywood which is to be screwed with wood screws, not nails to the interior of the vault.

### **1.17 Conduit**

- .1 In ground conduit SDR 35 Series PVC shall be a minimum of double the size of the pipe being sleeved.
- .2 Roadway conduit SDR 35 Series PVC shall be a minimum of double the size of the pipe being sleeved. There shall be two conduits placed for all road crossings, one for the pipe and one for the wire.
- .3 All irrigation piping or wire running under an asphalt trail, shale trail or concrete sidewalk shall be sleeved with Series SDR 35 Series PVC.

### **1.18 Backfill Material**

- .1 Backfill material for irrigation pipe trenches within 6in (150mm) of pipe shall be clean sand or fill, free of organic matter, stones and sharp objects capable of damaging pipe.

## **2. LAYOUT**

### **2.1 Job Conditions**

- .1 Proceed with irrigation installation only during suitable weather conditions.
- .2 Report to the Project Manager, prior to commencing work, of any conditions or defects encountered on the site upon which work of the section may depend and which may adversely affect the performance of the work.
- .3 Do not commence work until such conditions or defects have been investigated and corrected.
- .4 Protect the system from being contaminated during construction by enclosing all open ends on all lines.

### **2.2 Lay Out**

- .1 Verify the location of all underground utilities and use standard precautions when working near such. Make good all damages to same at Contractor's expense.
- .2 Stake out entire system, including locations of sprinkler heads and/or quick coupler valves. Confirm that lay out is within project boundary and property lines. Heads shall be spaced according to what is specified on the drawing to ensure adequate coverage. Heads shall not be installed any more than 6in (150mm) off the property line.
- .3 Verify, on-site, the location of all conduit under asphalt, shale and concrete and adjust to suit.
- .4 Have lay out inspected and approved by the Project Manager before commencement of work.
- .5 Due to changes in landscape elements, it may be necessary to adjust the spacing of the sprinklers in the field. These changes shall be approved by the Project Manager. Such changes that do not require extra materials or labour shall be done at no extra cost to the Owner. If such changes result in extra cost, all such changes shall be approved, in writing, by the Project Manager before proceeding with work.

.6 Water Service Schematic

- .1 Water Service Schematic (with a booster pump): The irrigation components shall be installed according to the following schematic: water service, main shut off valve (gate valve), galvanized union, hydrometer/ water meter, galvanized union ; double check assembly; galvanized union; booster pump; galvanized union; isolation valve no. 1, quick coupler turf valve and an isolation valve no. 2.
- .2 Water Service Schematic (without a booster pump): The irrigation components shall be installed according to the following schematic : water service, main shut off valve (gate valve), galvanized union, hydrometer/ water meter, galvanized union; double check assembly, galvanized union, quick coupler turf valve and isolation valve.

**3. SERVICING**

**3.1 Electrical**

- .1 Contractor to contact Electric Customer Service Office (403-529-8270) to confirm service point location and available voltage details.
- .2 Contractor to complete City Electric Department “Electric Service Request Form” for a Commercial Service).  
[Electric Service Request Form Hyperlink](#)  
Forward same to Electric Department at 2172 Brier Park Place NW  
email: [eleccomm@medicinehat.ca](mailto:eleccomm@medicinehat.ca).
- .3 A service point will normally consist of either a conduit stub, service box, pad mounted transformer or power pole.
- .4 Contractor to obtain electrical permit and cost of electric permit to be paid for by the Contractor.
- .5 The Parks and Outdoor Recreation Department shall be responsible for any charges by the Electric Department for the final connection at the service box.

- .6 The Contractor is responsible for:
- .1 all trenching, backfilling and compaction to 85-90% Standard Proctor Density. Minimum depth of service cable trench to be 3ft (1m) below final grade.
  - .2 supply, installation and connecting of main service equipment.
  - .3 supply and installation of electrical service cable from main disconnect in panel to Electric Utility service point.
  - .4 supply and installation of 2ft – 10ft (3m) galvanized or copper clad ground rods or a suitable ground plate at main panel location. This applies to both unmetered and metered services.
  - .5 connection of main service cables at service panel
- .7 Service conduit, when required to be 2in (50mm) rigid PVC, DB-2 or FRE buried at a depth of 3ft (1m) below final grade.
- .8 For 30 amp services and less (metered and unmetered), the service conductors are to be 3 - No. 10 copper x-link colour coded or colour taped as follows:
- |       |  |
|-------|--|
| Black | line for 120 or 240 volt service         |
| Red   | line for 240 volt service                |
| White | for neutral 120 volt service             |
| Green | ground for both 120 and 240 volt service |
- If service size is 31 - 60 amps use No. 6 copper x-link conductors.  
If service size is 61 - 100 amps use No. 3 copper x-link conductors.  
NMW-10 bundled cable can be used instead of single conductors.
- .9 Contractor to allow 3ft (1m) length per service conductor for connection at cable stub, submersible service box or pad mount transformer for use by Electric Utility to connect service.
- .10 Contractor to provide cable, conduit and straps for pole risers. Cable and conduit lengths will be determined in field after contact with Electric Utility.

- .11 At conduit stub locations:
- .1 Stub location will be indicated with a 2ft x 4ft (.61m x 1.22m) above ground and or an electronic cable marker supplied and installed below ground by the Electric Utility. Contractor will contact Electric Utility to locate below ground cable marker if 2ft x 4ft (.61m x 1.22m) is not visible.
  - .2 Contractor must supply and install adapter (if required) for connecting service conduit to Electric Utility conduit stub.
  - .3 Contractor will dig down and connect his 2ft (50mm) conduit to the Electric Utility conduit stub.
  - .4 Contractor will pull service cables from main disconnect in controller to service point from which conduit stub originates. Contractor to notify Electric Utility 48 hours before cable is pulled to arrange for opening of underground service box or pad mount transformer into which service cables will be installed.
  - .5 Contractor will provide additional pulling points, if required, to install the service cables from the main disconnect to the Electric Utility service box or pad mount transformer.
  - .6 Electric Utility will connect service cables at service box or pad mount transformer.
- .12 At underground service box, pad mount transformer and power pole locations:
- .1 Contractor will contact Electric Utility (phone 403- 529-8270) 48 hours prior to installing service cables and conduit at the above locations.
  - .2 **Contractor will not dig into a service box or pad mount transformer unless under the supervision of the Electric Utility.**
- .13 For an unmetered service, the Contractor is responsible for all work which will include but not be limited to:
- .1 supply and install 1-15 amp single pole breaker (main disconnect) to operate at 120 volts single phase.
  - .2 supply and install service cables and conduit as required from main disconnect to Electric Utility service point.

- .3 supply and install grounding.
- .14 For a metered service, the Contractor is responsible for all work which will include but not be limited to the following:
  - .1 Supply and install 60 amp 2-pole main service disconnect to operate at 120 / 240 volts or 120 / 208 volts single phase 3-wire.
  - .2 Supply and install 4-jaw (for 120 / 240 volt service) or 5-jaw (for 120 / 208 volt service) Jumbo meter base. Meter base to be located on load side of main disconnect unless special permission given by Electric Utility to install on line side of main disconnect.
  - .3 Supply and install subpanel as required.
  - .4 Supply and install booster pump starter.
  - .5 Supply and install grounding.

#### **4. EXECUTION**

##### **4.1 Trenching**

- .1 Excavate trenches to 18in (450mm) depth to the top of the pipe to ensure adequate coverage, regardless of pipe size. Width of trench shall be a minimum of three times the diameter of the pipe.
- .2 All trenching shall have a level base to ensure proper drainage of the whole irrigation system and minimize trapped water. In the event of over excavation the trench shall be backfilled to the proper elevation and compacted to 85% - 90% Standard Proctor Density prior to installing pipe.
- .3 All main and lateral lines shall have a depth of 18in (450mm) to the top of the pipe.
- .4 In the following spring, the Contractor shall repair any settlement of the trenches by bringing them to grade with topsoil and sodding.
- .5 Place conduit as required to enclose piping under asphalt, shale or concrete. Depths of conduit shall be at the same level with irrigation pipe to avoid water collection spots a minimum of 18in (450mm) under amenity areas, 36in (0.84m) under roadways.

- .6 Extend conduit a minimum of 3ft (1m) beyond edge of pavement or amenity area. Enclose ends to prevent debris intrusion.

## **4.2 Installation**

- .1 **Controllers, Cabinets and Concrete Bases**
  - .1 Controllers mounted indoors shall be securely mounted inside the cabinet on a plywood back board, securely mounted to the wall and easily accessible for maintenance with a minimum of 10in (250mm) of horizontal and vertical clearance between the walls of the irrigation cabinet and the controller.
  - .2 Controllers mounted outdoors shall be installed in the cabinet on a plywood back board and bolted to a powder coated metal pedestal complete with base plate. Controller cabinet shall be bolted to the base on all 4 corners and these points shall be sealed with a waterproof sealer. A 10ft (3m) copper clad grounding rod with wire connecting to the controller shall be installed. The grounding rod shall protrude a minimum of 4in (100mm) above the top of the concrete base inside the cabinet or outside the cabinet in an irrigation enclosure box, at a location designated by the Project Manager.
  - .3 No doubling up of zones on the controller shall be allowed.
  - .4 Each controller shall be installed at a location approved by the Project Manager.
  - .5 The pedestal shall be installed in a 20in (500mm) diameter concrete tube, 36in (1m) in depth. The elbow of the pedestal shall extend beyond the concrete tube.
  - .6 The concrete base shall be formed and shall be 24in (600mm) length, 18in (450mm) width and 6in (150mm) depth and installed level with the final grade. The contractor shall use L-shaped rebar to tie the base and the concrete tubing together.
  - .7 The metal pedestal shall be smooth and rounded where it attaches to the base plate.
- .2 **110 Volt Electric Wiring**
  - .1 All 110 volt wiring shall be installed in accordance with local electrical codes.



- .2 110 volt wiring shall be colour coded to differentiate from 24 volt wire.
- .3 The power supply shall be connected thru a ground fault receptacle.

.3 Wire Requirements

- .1 The control wire from the controllers to the zone valves and hydrometer valves shall be placed in the trench alongside or on top of the water line with the wires having slack to allow for curves in the water line.
- .2 Multiple runs of wires must be bundled.
- .3 A minimum of 36in (900mm) of slack wire must be left at each control valve, the end of every length of wire and at every change in direction and at each junction to allow for ease of maintenance. Lay wire with sufficient slack to accommodate backfill operation.
- .4 White is to be used **only** as the common wire. The signal wire shall be coloured wire, following the colour coded sequence in these specifications. The use of black wire shall be minimized whenever possible.
- .5 All splices shall be housed in a standard 14in x 19in (350mm x 475mm) irrigation enclosure box or incorporated into the zone valve box.
- .6 The wire in the cabinet shall be neatly bundled with plastic tie wraps at 4in (100mm) intervals, shall be secured with screws that do not penetrate the exterior of the cabinet, shall be secured at every third tie wrap to the cabinet and shall follow the perimeter of the boards and cabinet, allowing a minimum of 12in (300mm) of slack. Zone wires shall be sorted and identified separately from the hydrometer wires.
- .7 One additional wire shall be installed from the controller to the farthest zone. This wire shall be **red** and shall be identified according to the standards in these specifications. Where the zones split in more than one direction from a controller, an additional wire shall be run in both directions. The wire shall be placed in the zone valve box, with a minimum slack of 36in (1m) and left bare.

- .8 Wiring within the controller cabinet shall be neatly bundled, securely mounted to cabinet and colour coded according to the following standard:
- .1 Starting from the furthest station the colour sequence shall be black, red, blue for #12 gauge feeds and black, red, blue, orange, yellow, brown for #14 gauge feeds.
  - .2 Spare zone wire:
    - 1 Red wire                      1 spare zone wire for every 5 - 6 valves along mainline
  - .3 Multiple wires to be bundled together.
  - .4 The Contractor shall be responsible for confirming correct gauge of wire, prior to the start of work.
  - .5 If and where necessary, the same colour coding sequence shall be repeated. All of the wires shall be marked with electrical number tape to differentiate the zones. The markings will be made with a permanent waterproof marker. No duplicate colours which do not follow the standard will be allowed.
  - .6 Other equivalent colour coding standards may be approved, subject to prior written approval of the Project Manager.
  - .7 The Contractor shall be responsible for removing and replacing (at no cost to the City), any wire that does not conform to the wire colour coding standards, or where he has not received prior written approval.
  - .8 The two pairs of wires for the hydrometer and 1 spare wire for the hydrometer shall be colour differentiated from the zone wires. The colour coding sequence is as follows:
    - For the Pulse:                      2 Blue wires
    - For the Valve Control:              1 Yellow wire and 1 White (Common) wire
    - For the Hydrometer Spare          1 black wire

- .9 A terminal strip shall be supplied and installed for the field wire to terminate in the cabinet, interconnect wiring from terminal strip to the Controller.
  
- .4 Double Check Valve Assembly and Water Meter
  - .1 The Contractor is responsible for obtaining the appropriate permits. The double check assembly and the installation shall be approved, in writing, by the City Planning, Building and Engineering Department. All back flow prevention assemblies must be installed in accordance with the Federal, Provincial and Municipal requirements.
  - .2 Double check assemblies and water meters shall be installed with the rest of the water service components in an irrigation vault.
  - .3 The double check assembly shall be supported by concrete blocks.
  - .4 Valves sizes and locations shall be indicated on the drawing.
  - .5 Hydrometers shall be installed at the water service as indicated on the drawings.
  - .6 Where a hydrometer is NOT to be installed at a water service, provisions shall be made for the future installation of a hydrometer. This shall be accomplished by the installation of a galvanized pipe, installed with galvanized unions at the point where the hydrometer is to be installed. The length of the pipe shall be exactly the length of the hydrometer to accommodate the future installation of a hydrometer. The wiring required for the future installation of the hydrometer shall also be installed.
  - .7 Hydrometers and water meters to be installed with galvanized unions on both sides of the meter to ensure ease of removal.
  - .8 Hydrometers and water meters shall be supported by concrete blocks.
  
- .5 Antenna Base and Mast
  - .1 The mast and the controller box shall be installed in the same concrete base, wherever practical.

- .2 The concrete base for the mast portion shall be a minimum size of 18in x 18in x 48in (450mm x 450mm x 1,200mm) deep with the mounting apparatus enclosed in the concrete. The concrete pad shall have a minimum overhang of 4in (100mm) and be installed level with the finish grade. The Contractor shall make any adjustments to the size of the concrete base to make sure that the size of the base is appropriate for the size and weight of the mast.
- .3 Concrete mix shall be in accordance with the following:
- |                                 |   |
|---------------------------------|---|
| Minimum 28 Day Strength.....    | 25 MPa*   |
| Designated Aggregate Size ..... | maximum 1in (25mm)                                      |
| Slump.....                      | 1-3in (25-75mm)   |
| Air Entrainment .....           | 5 - 7 %   |
| Cement.....                     | Type 10 Normal Portland Cement                          |
| Calcium Chloride.....           | ASTM D98, 2% maximum, with<br>Project Managers approval |
- .4 The wiring from the controller shall follow the most logical path and minimize the distance between the controller and the antenna. The Contractor shall supply a pull wire for ease of installation of the antenna cable. A 1in (25mm) PVC conduit shall be installed at a 18in (450mm) depth from the inside of the mast to the inside of the controller box.
- .5 The mast shall be securely fastened to the concrete base.
- .6 5ft (1.5m) of the extension shall be securely welded to the interior of the mast ensuring a maximum of 15ft (4.5m) available for an extension. The City shall verify extension requirements prior to the installation of the mast.
- .7 The mast and the extension shall be painted standard A1103 park green with a rust prohibitive, weather resistant paint.
- .8 For masts installed on a building, the masts shall be anchored, equal distance apart, by a minimum of three (3) anchoring devices suitable for the building material. The mast shall be bolted to a 1ft (3m) square steel plate that is bolted to the roof. Any devices attached to the roof shall be sealed to prevent leaks and according to standard building practice.

- .9 The dome antennas for the controllers shall be installed on the controller boxes and shall be siliconed around the base to provide weatherproof protection.
- .6 Communication Tie In
  - .1 The Contractor shall complete all the necessary communication tie ins to ensure a fully functioning system.
  - .2 The Contractor shall submit a completed Computerized Irrigation Installation Report Form PK211 for each controller location.
  - .3 The City shall complete the field data input for controller including input of site address and all necessary field data.
- .7 Gate Valves
  - .1 All valves shall be installed with the handle parallel to the length of the cover of the enclosure for ease of accessibility, with no obstructions and enough room to operate the valve.
  - .2 A gate or butterfly valve shall be installed on the pressurized side of each electric zone valve.
  - .3 Gate valves shall be the same size as the electric zone valve in that line.
  - .4 A galvanized union shall be installed between the zone isolation valve (gate valve) and the electric zone valve.
- .9 Irrigation Heads and Piping
  - .1 Make all joints and connections tight in accordance with manufacturer's recommendations. Use expansion couplers where required. Protect system from being contaminated during construction by enclosing all open ends on all lines.
  - .2 All sprinklers are to be adjusted and set flush with final grade using the three street elbow swing joint as detailed. Ensure that horizontal pipe is no more than 45 degrees out of level when setting sprinklers. Where utility easements or property lines preclude the standard assembly, a swing joint shall be used as detailed or specified on the approved irrigation plan.  
  
Sprinkler heads shall be set plumb and level with the turf.

- .3 Ensure that heads are set at the proper height and angle to ensure adequate coverage.
  - .4 Leave a minimum of 5ft (1.5m) from a T-intersection before changing pipe sizes or direction. Cross intersections are not allowed.
  - .5 After turf is established and the ground has settled, the Contractor shall, within ten (10) working days of notification, adjust the heads to finished grade.
- .10 Irrigation Enclosure Boxes
- .1 The manual gate valves shall be installed with the handle in an open position and parallel with the length of the cover.
  - .2 Top level of gravel in the boxes or vaults shall be kept a minimum of 16in (150mm) below lowest point of irrigation system. Where necessary, the components shall be supported by bricks to prevent any stress on the system.
  - .3 All valve enclosure boxes shall be stacked on top of another box for support. Large enough holes must be cut in the boxes to ensure that the boxes do not settle on or rest on the irrigation piping.
  - .4 Wherever possible, 2 or more electric zone valves at the same location shall be enclosed in a common enclosure or vault in order to reduce the total number of enclosures at any one Park location. Vault show drawings to be submitted to Parks for approval.
- .11 Thrust Blocks
- .1 Thrust block all changes of direction and pipe endings of all pipe 3in (75mm) and larger. If concrete thrust blocks are used protect pipe from concrete spill over.
- .12 Tracer Wiring
- .1 Tracer wire (orange wire colour) shall be installed in the trench from each zone valve to the end of each run of pipe.
  - .2 The tracer wire shall be marked and identified according to the standard in these specifications.

- .3 The tracer wire is not to be left bare and should be terminated into 3M DBR6 with the end in the zone valve box left unattached in the valve box with a minimum of 36in (900mm) of slack.

.13 **Booster Pump**

- .1 The piping shall be looped in the enclosure and alignment of the irrigation components shall be installed such that size of the enclosure box is minimized while ensuring a minimum of 1.5ft (.45m) clearance around the perimeter of the components, inside the enclosure box.
- .2 The booster pump shall be bolted to a concrete pad, with the concrete pad overhanging enclosure box by a minimum of 4in (100 mm) on all sides. The concrete pad shall be constructed to the same specifications as a controller box concrete pad.
- .3 The enclosure box shall be bolted to the concrete base such that the entire enclosure box can be removed. The enclosure box should also be locked onto the frame to prevent the accidental movement of the enclosure box.
- .4 All Electrical breakers for the booster pump shall be located in the controller cabinet.

.14 **Irrigation Vault**

- .1 All irrigation components including the hydrometer or water meter, the double check valve and the blow out quick coupler shall be installed below grade in an irrigation vault.
- .2 The size of the vault shall be as site hardware configuration dictates to ensure that there is 12in (300mm) clearance around all components. Prior to the construction of the vault, the Contractor shall contact the Project Manager to confirm the service configuration and the size of the vault.
- .3 There shall be a minimum of 12in (300mm) clearance around the vault perimeter between the downstream side of the required components, and the inside the vault.
- .4 The bottom of the vault shall have 12in (300mm) of  $\frac{3}{4}$ in (19mm) washed gravel with the top of the gravel a minimum of 6in (150mm) below the lowest point of the water service. All water service components shall be supported by bricks.

- .5 The vault shall be level with the finished grade.
- .6 The lids shall not open onto roadways or other obstructions. There shall be a minimum of 6.6ft (2m) clearance between the open lid and any obstructions.
- .15 Conduit
  - .1 Run all necessary wiring through conduit as required. Conduit must be double the size of the group of wires. Any group of wires that is larger than 2in (50mm) shall be run through two, 2in (50mm) conduit. If located outdoors, ensure that storage chamber is waterproof and lockable.

#### **4.3 Testing**

- .1 Prior to backfilling at joints and connections, the piping is to be flushed and then filled with water, ensuring that any entrapped air has been completely expelled. The Contractor shall flush the system in the presence of the Project Manager.
- .2 Once the lines have been completely filled with water, the Contractor is to test the system in the presence of the Project Manager.
- .3 All pipes, whether main lines or laterals shall be tested for a minimum period of one (1) hour at 100 psi (6.5 kg/cm<sup>2</sup>) or at the pressure equivalent to the pressure of the water main to which the irrigation system is connected, whichever is higher, and upon visual inspection of all joints, should any leak be found, it shall be repaired and testing continued until all visible leaks have been eliminated from the entire system or the part of the system under test.
- .4 Adjustment of the sprinkler heads and controllers shall be carried out by the Contractor upon completion of the installation so as to obtain maximum performance from all parts of the system.
- .5 Adjustment of the controllers shall be done by the Contractor to ensure the system is operating properly. The final commissioning of the system shall be done in the presence of the Project Manager.
- .6 All sprinkler heads, valve enclosures and other system component enclosures shall be adjusted to the proper relative elevation relative to the final turf grade by the Contractor.
- .7 A sign-off sheet will be required verifying the test was completed.



#### **4.4 Backfilling**

- .1 After Open Trench inspection and written approval by the Project Manager, backfill with approved fill. Excavated material may be used for backfilling only when approved by the Project Manager.
- .2 Place backfill in 6in (150mm) lifts, placing and compacting all lifts until 6in (150mm) below finished grade. Place topsoil, seed or sod as required.
- .3 Adjust sprinkler heads to the correct spray angle and height to provide adequate coverage without excessive over-spray.
- .4 The Contractor shall level off any trenches that have slumped, fill with topsoil and reseed the area.
- .5 Remove off site all debris and excess material left over from installation at the end of each working day or as required.

**END OF SECTION**