

1. GENERAL

1.1 Materials

- .1 Materials shall be new and without flaws or defects of any type. Submission of shop drawings of any material shall be submitted and approved prior to material order.
- .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 powder coated steel both upstream and downstream. Refer to Parks & Recreation Standard Drawing PK 200A & 200B for details. Fittings shall all be powder coated steel. 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 11 (PE4710). No Low Density or PVC Pipe shall be considered.
 - .2 4in (100mm) shall be the smallest size allowed, unless otherwise approved.
 - .3 2in (50mm) mainline will only be acceptable for parks where a 2" irrigation service has been approved by Parks & Recreation.
- .3 All lateral lines on the downstream side of the electric zone valves shall be C.S.A. high density polyethylene pipe DR 11 (PE4710) with a minimum 1in (25mm) diameter.
- .4 The use of any size or type of pipe that is different from that specified must be approved by the Consultant.

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 Consultant 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 ¾" G1S fir plywood backplate and installed in a 14 gauge powder coated controller cabinet lockable with a padlock. Refer to Parks & Recreation Standard Drawing PK 205 & 207 for details.
- .4 Exterior controller mount shall consist of a ¾" thick G1S fir plywood back plate and installed in a powder coated metal weatherproof, lockable controller cabinet and mounted on a powder coated metal pedestal. Refer to Parks & Recreation Standard Drawing PK 205 & PK 207 for details.

..2 Large Controller Cabinet

- .1 The irrigation cabinet shall be constructed of 12 gauge metal, powder coated and dark green in colour. A colour is to be submitted for approval prior to ordering Refer to Parks & Recreation Standard Drawing PK 207 for details.
- .2 The large controller cabinet shall be fitted with two single doors mounted on pin hinges tack mounted to the cabinet. 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:
 - o Two 4in (100mm) metal conduit for the irrigation zone valve/hydrometer wire(s).
 - o One 1½in (38mm) metal conduit for the communication cable.

- One 1½in (38mm) metal conduit for the grounding rod wire.
 - 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 metal base plate welded to pedestal. The base plate shall have 3/8in (9mm) holes drilled in all 4 corners from the edge for attaching the controller cabinet. Refer to Parks & Recreation Standard Drawing PK 208 for details.
- .6 The concrete pad complete with broom finish surface and chamfered edge shall be installed along with a concrete pile. Concrete pad shall be reinforced with rebar, mesh or fibrecrete to enhance the structural integrity of the concrete pad.
- ..3 Small Controller Cabinet
- .1 The cabinets for all small controller cabinets shall be a 14 gauge metal powder coated dark green in colour. Colour swatch to be submitted for approval along with shop drawing prior to ordering. Refer to Parks & Recreation Standard Drawing PK 205 for details.
- .2 The controller mount shall consist of a ¾” thick G1S fir plywood back plate.
- .3 The small controller cabinet shall be fitted with a single door mounted on pin hinges tack mounted to the cabinet. 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 pedestal shall have a metal base plate welded to pedestal. The base plate shall have holes drilled in all 4 corners for attaching the controller cabinet. Refer to Parks & Recreation Standard Drawing PK 206 for details.
- .5 The concrete pad complete with broom finish surface and chamfered edge shall be installed shall be installed and reinforced with rebar, mesh or fibrecrete to enhance the structural integrity of the concrete pad.

1.4 Antenna, Base and Mast

- .1 The mast shall consist of a 20 ft metal, vertical pole, painted dark green with a bolt circle 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.
- .4 The Contractor shall supply and install a pull rope and conduit.

1.5 Sprinkler Heads

- .1 Spacing of the sprinkler heads shall not exceed the manufacturer's maximum spacing and must provide head to head coverage.
- .2 The specified irrigation heads shall be under warranty by the manufacturer against defects in material and workmanship for a period of five (5) years from the date of installation. The contractor shall submit a certificate for head warranty at time of CCC inspection.

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 in splice boxes and made waterproof with the use of the following:
 - o 3M DBR/y splice kits to be used when splicing. Heat shrink connections are to be used where 3 or more wires need to be spliced. All splices to occur in either a valve box or splice box.
- .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. Each hydrometer requires its own dedicated common wire. 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

- .5 All two wire systems to include a grounding grid installed to the manufactures installation guidelines. All wire to be a minimum 6-gauge bare copper. All grounding grids to be tested by a certified tester to ensure they achieve a resistance of 10 ohms or less prior to CCC. Results to be provided to the Consultant with 7 days of Substantial Completion. Grounding rods shall be Paige Grounding Systems Copper-clad 10' (3.05m) Part #182007 and Grounding plates shall be Paige Grounding Systems Copper Grounding Plate Part #182199IC or approved alternatives.

1.7 Double Check Valve Assembly and Water Meter

- .1 Double check valve assemblies must be installed prior to connecting the mainline to the water service. The double check valve used shall be CSA approved and clearly labelled. The installation must meet all Federal, Provincial and Municipal requirements. Shop drawing submission is required prior to ordering of part.
- .2 All double check valves shall be selected from the Approved Irrigation Product List or an approved alternate.
- .3 All test cocks are to remain, once the double-check valve assembly has been tested and approved. Each test cock is to be plugged by a brass plug. The assembly shall be tested by a qualified person prior to the servicing being turned on. The report shall be provided to the Consultant within 3 days.
- .4 Hydrometers shall be electrically operated, compatible with the irrigation control system, and shall be selected from Approved Irrigation Product List 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. DCVA and Hydrometer are to be installed prior to water service being turned on and tested.

1.8 Isolation 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/cm² (150 p.s.i.). All gate valves shall be full ported.
- .2 All gate valves shall have standard pipe flanged 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 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 for high density polyethylene pipe shall be either butt or electro fused except as detailed elsewhere in this specification or on the Parks & Recreation Standard Drawings.
- .2 All pipe and fittings upstream of the first main shut off valve inside the water service vault shall be PVC and shall be mechanically restrained. Refer to Parks & Recreation Standard Drawing PK 201A, 201B & 201C for details.
- .3 Swing joints shall consist of three PVC Schedule 40 90-degree threaded street elbows and a PVC Schedule 80 12in (300mm) nipple. 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.
- .4 All HDPE fittings shall be DR 11 Butt Fusion or Electro Fusion **ONLY**. No other means of connection are acceptable. Use of mechanical saddles is not permitted. Electro Fusion saddles for change of direction and head installation is acceptable.

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. Refer to Parks & Recreation Standard Drawing PK 211A & 211B for details.
- .2 Each zone valve shall have a dedicated, single zone decoder.
- .3 Zone control valves shall be electrically operated and self-cleaning and shall conform to the approved Irrigation Product List.

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. See Approved Irrigation Product List.
- .2 Zone valves shall be housed in Jumbo sized irrigation enclosure box, refer to Approved Irrigation Product List. 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. Extensions will be required and are to be of the same manufacturer as the initial box.

- .3 Gravel bed in boxes or vault shall consist of 4in (100mm) depth of clean, washed 1in (25mm) washed rock with area larger than box opening

1.12 Pipe Connection Systems

- .1 All HDPE piping shall connected by Butt Fusion or Electro Fusion only. NO other methods of connections are acceptable.

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 Consultant.

1.14 Restraining Systems

- .1 Local conditions shall determine the type and extent of restraining systems to be used. Approval from the Consultant on the best method (whether concrete, rebar or a combination of the former) shall be required before proceeding.
- .2 Restraining system for the water service shall use mechanical restraints, Refer to Parks & Recreation Standard Drawing PK 200A & 200B for details.

1.15 Booster Pump Enclosure

- .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 1.5ft (450mm) clearance around the perimeter of the components, refer to Parks & Recreation Standard Drawings PK 201C, 202A, 202B, 202C, 202D.
- .2 The booster pump shall be as specified on the drawings and shall be from the Approved Irrigation Product List or approved alternate.
- .3 The enclosure box shall be constructed of 12 gauge metal. It shall be securely bolted to the concrete pad. Metal spacers shall be used to provide sufficient space between the enclosure and concrete pad for ventilation underneath the enclosure.
- .4 Install a metal screen around the bottom of the enclosure for rodent control. Set the enclosure level and square on the concrete pad.

- .5 The door(s) of the enclosure box shall be constructed of the same material as the enclosure box. The door(s) are to be rolling doors and shall be weatherproof. The door(s) shall be lockable and have handles for ease of opening.
- .6 The enclosure box and door(s) shall be powder coated a Parks Green, inside and outside the enclosure box.
- .7 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 base shall be installed 2in (50mm) above grade.
- .8 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.
- .9 Concrete mix shall be supplied by a reputable concrete supplier and a batch ticket is to be provided to the Consultant prior to installation. Mixing onsite will not be allowed.
- .10 Concrete mix shall be in accordance with the following:
 - Minimum 28 Day Strength25 MPa*
 - Designated Aggregate Sizemaximum 1in (25mm)
 - Slump..... 1-3in (25-75mm)
 - Air Entrainment.....5 - 7 %
 - Cement Type 10 Normal Portland Cement
 - Calcium ChlorideASTM D98, 2% maximum, with
Consultants approval

1.16 Water Service Vault

- .1 The wooden vault shall be constructed of pressure treated lumber and constructed in continuous lengths with no piecing of any sides of the vault. Refer to Parks & Recreation Standard Drawing PK 203.
- .2 Contractor to provide shop drawing for review prior to ordering materials.
- .3 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 wood should be screwed together at regular intervals with 5/16in (8mm) x 6in (150mm) lag bolts.

- .4 The checker plated hinged lids 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 main shut off valve is 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.
- .5 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 Irrigation Service Connection

- .1 For large diameter irrigation service connections greater than 2", refer to Environmental Utilities Standard Water Drawings EU-218.

<https://www.medicinehat.ca/government/departments/environmental-utilities/construction-standards-and-specifications>

- .2 For standard park irrigation service connections of 2", refer to Environmental Utilities Standard Water Drawings EU-207.

<https://www.medicinehat.ca/government/departments/environmental-utilities/construction-standards-and-specifications>

1.18 Conduit

- .1 All in ground conduit shall be a minimum of double the size of the pipe being sleeved, see table below. Wire conduit shall be a minimum of 2in (50mm) diameter and wires shall have a separate conduit from irrigation piping.

Nominal Irrigation Pipe Size	Nominal Conduit Pipe Size
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Control Wire	2in (100mm)
1.5in (38mm)	4in (100mm)
2in (50mm)	4in (100mm)
3in (75 mm)	6in (150mm)
4in (100 mm)	8in (200mm)
6in (150 mm)	10in (250mm)

- .2 All conduit under Roadway shall be PVC C900 or HDPE DR11 and 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 other conduit under hard surface (ie. asphalt trail, shale trail or concrete sidewalk) shall be SDR 35 Series PVC or HDPE DR11 and 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.

1.19 Backfill Material

- .1 Native backfill material is to be used for irrigation pipe excavation. Backfill within 6in (150mm) of pipe shall be clean sand or fill, free of organic matter, stones and sharp objects capable of damaging pipe.
- .2 The use of provisional import fill as backfill material can be used only where approved by the Consultant prior to the placement of the imported material.
- .3 Clumps of sod are not acceptable as backfill material.

2. LAYOUT

2.1 Job Conditions

- .1 Proceed with irrigation installation only during suitable weather conditions.
- .2 Protect the system from being contaminated during construction by enclosing all open ends on all lines.
- .3 Contractors are expected to leave the site in a safe and clean environment, free of hazards daily.

2.2 Layout

- .1 Verify the location of all underground utilities and use standard precautions when working near utilities. Any damage to the underground facilities shall be repaired at the Contractor's expense.
- .2 Stake out entire system, including locations of sprinkler heads and/or quick coupler valves. Heads shall be spaced according to the manufactures recommended spacing and following the general layout provided within the drawing package. The existing site shape and dimensions will differ from the plans so the Contractor must verify actual spacing onsite.
- .3 Heads shall be installed at 12in (300mm) off the property line where possible. Variations from this may be accepted based on site conditions and with the approval of the Consultant on a case-by-case basis.
- .4 Verify, on-site, the location of all conduit under asphalt, shale and concrete and adjust to suit.
- .5 Have layout inspected and approved by the Consultant before commencement of work.
- .6 Due to variations in the park from existing site features such as, but not limited to, resident fences, shallow utilities and landscaping elements it may be necessary to adjust the spacing of the sprinklers or add sprinklers in the field. These changes shall be identified by the Contractor and approved by the Consultant prior to installation. Contractor shall receive payment for additional heads but all other work accommodating existing site features is incidental to the project.

3. SERVICING

3.1 Electrical

- ,1 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.
- ,2 Once Electric Service Request Form is submitted a Designer will be assigned and can be your point of contact for determining available voltage and confirm service point location.
- ,3 A service point will normally consist of either a conduit stub, service box, pad mounted transformer or power pole.

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- ,4 Contractor to obtain electrical permit and cost of electric permit to be paid for by the Contractor.
- ,5 The Parks & 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 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 5/8th x 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 100 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 secondary 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 treated 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 2" (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 100 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 from the top of finished grade 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. When trenching, the sod should be separated from native materials and disposed of as incidental to the Work.
- .2 All trenching shall have a level base to minimize trapped water. In the event of over excavation, the trench shall be backfilled to the proper elevation and compacted to 95% Standard Proctor Density +/- 3% optimum moisture prior to installing pipe. Moisture conditioning and mechanical compaction may be required.
- .3 In the following spring, the Contractor shall repair any settlement of the trenches by bringing them to grade with topsoil and sodding.
- .4 Conduit shall be open cut or directional drilled and placed as required to enclose piping under asphalt, shale or concrete, followed by backfill. Depths of conduit shall be at the same level with irrigation pipe to avoid water collection spots at a minimum of 18in (450mm) under amenity areas. Under roadways the top of conduit shall be placed at a consistent grade, below the road subgrade and shallow utilities to a minimum depth of 18in (450mm) under roadways.
- .5 Extend conduit a minimum of 3ft (1m) beyond edge of hard surface 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 fir 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. Refer to Parks & Recreation Standard Drawing PK 205 & 207

- .2 Controllers mounted outdoors shall be securely mounted inside the cabinet on a fir plywood back board 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. It shall be bolted to a powder coated metal pedestal complete with base plate.
 - .3 No doubling up of zones on the controller station shall be allowed.
 - .4 Each controller shall be installed at a location approved by the Consultant.
 - .5 The metal pedestal shall be smooth and rounded where it attaches to the base plate. Refer to Parks & Recreation Standard Drawing PK 206 & 208.
- .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 through 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 the water line with the wires having slack to allow for curves in the water line.
 - .2 A minimum of 36in (900mm) of slack wire must be left at each control valve 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.
 - .3 For 2 wire decoder systems, 2 - 14ga wires (of 2 different colours) must be used in accordance with the manufactures specifications.
 - .4 All splices shall be housed in a standard irrigation enclosure box or incorporated into the zone valve box. The top/open connection end of the splice is to be positioned facing upward. Sufficient wire slack

- (1.0m) must be allowed for in order to be able to extract the splices from the valve box for examination.
- .5 The wire in the cabinet shall be neatly secured 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..
- .6 Wiring within the controller cabinet shall be neatly bundled, securely mounted to cabinet. 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 prior to the connection with the irrigation system. The double check valve shall be tested by a qualified professional and results submitted to the Environmental Utilities Department and Consultant prior to delivery of water to the system.
- .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 Hydrometers and water meters to be installed as shown on Parks & Recreation Standard Drawing PK 201A, 201B, 201C & 201D. Victaulic couplers can be used as an alternate to flanges and all pipe is to be powder coated prior to grooving.
- .7 Hydrometers and water meters shall be supported by concrete blocks.
- .8 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 installed with the mounting apparatus enclosed in the concrete. The concrete pad shall have a minimum overhang of 4in (100mm) and be installed plumb with the finish grade.
 - .3 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. The City shall supply and install antenna and antenna wire. A 1in (25mm) PVC conduit shall be installed at an 18in (450mm) depth from the inside of the mast to the inside of the controller box.
 - .4 The mast shall be securely fastened to the concrete base.
 - .5 5ft (1.5m) of the extension shall be securely welded to 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.
 - .6 The mast and the extension shall be painted Parks Green with a rust prohibitive, weather resistant paint.
 - .7 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. Contractor is to submit a shop drawing for review prior to confirming order.
 - .8 The dome antennas for the controllers shall be installed on the controller boxes and shall have silicone 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.
- .7 Isolation Valves

- .1 All gate valves shall be installed centred within the box for ease of accessibility, with no obstructions and enough room to operate the valve.
 - .2 A gate 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 stainless steel or brass union and nipples shall be installed between the zone isolation valve (gate valve) and the electric zone valve.
- .8 Irrigation Heads and Piping
- .1 Make all joints and connections tight in accordance with manufacturer's recommendations and Parks & Recreation Standard Drawing PK 213 & 214. Teflon tape shall be used on all threaded joints of the swing joint assembly. 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 joints as detailed. Ensure the horizontal pipe is no more than 45 degrees out of level when setting sprinklers.
 - .3 Sprinkler heads shall be set plumb with the turf. Ensure that heads are adjusted at the proper height and angle to ensure adequate coverage.
 - .4 Irrigation heads are to be installed no closer than 12in (300mm) from all property lines or buildings.
 - .5 Leave a minimum of 5ft (1.5m) from a T-intersection before changing pipe sizes or direction. Cross intersections are not allowed.
 - .6 After turf is established and the ground has settled, the Contractor shall, within ten (10) working days of notification, adjust the heads to the finished grade.
- .10 Irrigation Enclosure Boxes
- .1 Top level of gravel in the boxes or vaults shall be kept at the lowest point of irrigation system and shall be 4in (100mm) thick.

- .2 A maximum of 3 valve box extensions shall be use per valve. Sufficiently sized holes must be cut in the boxes to ensure that the irrigation piping does not come into contact with the box.
- .3 Wherever possible, 3 or more electric zone valves at the same location shall be enclosed in a vault in order to reduce the total number of enclosures at any one park location.

The irrigation designer shall show on the drawings, which valves shall be placed in vaults.
- .4 Vault shop drawings are to be submitted to Consultant for approval prior to installation. Refer to Parks & Recreation Standard Drawing PK 211B.

.12 Tracer Wiring

- .1 A 14 gauge tracer wire (orange wire colour) shall be installed in the trench from each zone valve to all sprinkler heads to the end of each lateral line. The wire shall be extended to all heads that are more than 12in (300mm) off the lateral line. Care should be taken to ensure the wire closely follows the piping.
- .2 The tracer wire is not to be left bare and should be terminated into 3M DBR/y with the end in the zone valve box left unattached with a minimum of 36in (900mm) of slack measured from top of valve box.

.13 Booster Pump

- .1 The enclosure and alignment of the irrigation components shall be installed such that the 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. Refer to Parks & Recreation Standard Drawings PK 201C, 202A, 202C, & 202D.
- .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.
- .5 Powder coated metal pipe stands to be installed supporting the piping at maximum intervals of 2ft (0.6m).

.14 Water Service Vault

- .1 All water service components including the hydrometer or water meter, the double check valve and the blow out quick coupler shall be installed below grade in a vault.
- .2 The size of the vault shall be as site hardware configuration dictates to ensure that there is 18in (450mm) clearance around all components. Prior to fabrication, a shop drawing shall be provided to the Consultant for review.
- .3 The bottom of the vault shall have 16in (400mm) of 1in (25mm) washed gravel with the top of the gravel a minimum of 4in (100mm) below the lowest point of the irrigation components. Irrigation components shall be supported by bricks every 2ft (0.6m).
- .4 The vault shall be level with the finished grade.
- .5 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. The first lid shall open over the main shut off.

.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.
- .2 Should control wires deviate from the irrigation main alignment, they shall be installed in a conduit.

4.3 Testing

Issuance and acceptance of Contractor's construction schedule is needed prior to agreement of inspection and testing.

- .1 The Contractor shall have an approved set of drawings and specifications available prior to calling the Consultant for an

inspection. As-built drawings are needed prior to acceptance of a CCC inspection.

- .2 Flushing of Irrigation System - the Contractor shall, in the presence of the Consultant, flush all the irrigation piping and then fill it with water.

The Consultant must be made aware of the proposed flushing schedule a minimum of 2 business days in advance of any flushing activities. Flushing activities must take place between Monday to Friday and during typical City hours of operation. If the Consultant has not been properly informed of the flushing schedule, the Contractor must repeat all flushing activities. The Contractor must flush all ends of the mainline, lateral, and swing-joint a minimum of 3 water turnovers per line, prior to the installation of the sprinkler head. If silt, soil, or other debris enters the pipe during the flushing period, the process must be repeated to the satisfaction of the Consultant. The contractor must dispose of the flushing water in an environmentally responsible manner while not creating damage or hardship to adjacent properties.

- .3 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 Consultant.
- .4 Once the lines have been filled with water, the Contractor is to complete a pressure test of the system in the presence of the Consultant.
- .5 Testing 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 Consultant after adjustments are made and the Contractor has confirmed its operating properly.
- .6 All sprinkler heads, valve enclosures and other system component enclosures shall be adjusted to the proper elevation relative to the final turf grade by the Contractor.
- .7 A sign-off sheet will be required verifying the test was completed.
- .8 Backflow Prevention Assembly Installation, Certification, and Testing.
 - .1 The Backflow Prevention device must be tested by a Certified Backflow Prevention Tester to ensure that it is working properly. The person testing the backflow preventer must be a registered Cross Connection Control (CCC) and Backflow

Prevention Tester and registered with the City of Medicine Hat, Environmental Utilities Department. The testing of the backflow preventer shall be the responsibility of the Contractor. Prior to the approval to issue water into the irrigation system, the backflow prevention device must be installed. Once water is available to the BFP,

The Dual Check Valve Assembly (DCVA) must be tested to ensure it is functioning properly.

- .2 The Certified Tester shall test the device and complete the City of Medicine Hat Cross Connection Control Testing and Inspection Report. The CCC Testing and Inspection Report must confirm that the backflow prevention device has successfully passed the test.
- .3 The report is completed in triplicate and all copies are to be forwarded to the Consultant for signature, and then will be forwarded as follows:
 - .1 Environmental Utilities Department (Attention: Cross Connection Control Officer) Top white copy
 - .2 Certified Tester - Yellow copy
 - .3 Owner of the property or department - Pink copy.
- .4 Once the device is tested, the certified tester is responsible for attaching a Backflow Prevention Assembly Tag to the device and indicating the results of the test on the tag. The tester shall install the brass plugs on each test cock.
- .9 Irrigation Installation and Pressure Test
 - .1 The Consultant shall be given at minimum 2 business days' notice when an open trench and/or pressure test inspection is required. The trench inspection and pressure test must take place between Monday to Friday and during typical City hours of operation.
 - .2 The following procedures shall be followed when pressure testing an irrigation system:
 - .1 All irrigation systems to be tested from downstream of the DCVA.
 - .2 The Contractor shall **NOT** operate the main service valve. Before pressure test is to take place, the Contractor shall contact the Environmental Utilities

Department (EUD) to confirm that the main service valve is in the off position. The Contractor shall request to the EUD that the main service valve be operated to the open position. The Consultant should be notified of this activity.

- .3 Items, which must be in place and complete for the open trench and/or pressure test inspection include:
 - .1 Confirm trench depth and alignment: depth verification may be required for a pipe installed by means of ploughing. If this is the case, the inspector can uncover sections of the pipe with his own capacity while a contractor's representative is present. If depth deficiencies arise, the inspector can require the contractor to uncover multiple additional locations to prove proper depth at the contractor's expense.
 - .4 A hydro-static pressure test of the mainline will be conducted in the presence of the Consultant to ensure compliance. The pressure test will be conducted utilizing a minimum of 1-hour duration at a minimum pressure of 100psi. If at any time the pressure drops greater than 5psi, the test will be started over. Additionally, if any repairs to the system are required, the test will be started over.
 - .5 At the discretion of the Consultant a pressure gauge shall be placed on any point in the system and a reading shall be taken to confirm expected pressure loss in the system. The City shall provide the pressure gauge. Prior to sprinkler head installation, the Contractor shall supply all the connections and requirements to conduct the test.
 - .6 The Contractor shall receive in writing from the Consultant, approval of the open trench inspection and pressure test.
- .10 Irrigation Wiring Inspection
 - .1 The Consultant shall be given one (1) working day notice when an irrigation wiring inspection is required. The wiring inspection must take place between Monday to Friday and during typical City hours of operation.
 - .2 Items, which must be in place and complete for the irrigation wiring inspection include:
 - .1 irrigation wire properly positioned beside the pipe in the trench

- .2 any wire splices must be visible for inspection prior to backfill
 - .3 wire splices must utilize a 3M DBR/y splice kit
 - .4 wire connections at the controller
 - .5 for open trench installations, all wiring should be bound with electrical tape at intervals not exceeding 10m
 - .6 The Contractor shall receive in writing from the Consultant, approval of the wiring inspection before proceeding with backfill.
- .11 Irrigation System Inspection (after installation is complete)
- .1 Items, which must be in place and complete for the irrigation system include:
 - .1 backfilling and compaction
 - .2 irrigation head adjustment
 - .3 valve boxes in place, granular base installed, and clear of debris
 - .4 water pressure on and flowing freely through the system
 - .5 all heads activated and operating as per manufacturer's recommendations and the irrigation design
 - .6 cabinet and controller installed
 - .2 The Contractor shall receive in writing from the Consultant, approval of the irrigation system before proceeding with final landscape development.
- .12 Substantial Completion Inspection
- .1 Items, which must be in place and complete for the Total Completion Inspection include:
 - .1 Activation of each individual zone.
 - .2 Adjustment of any irrigation heads that are improperly adjusted. No spraying onto fence or other vertical structures will be accepted.

.3 The Contractor shall receive in writing from the Consultant, approval of the total completion and acceptance of the irrigation project.

4.4 Backfilling

- .1 After Open Trench inspection and written approval by the Consultant, backfill with approved fill.
- .2 Place backfill in 6in (150mm) lifts, placing and compacting all lifts until 6in (150mm) below finished grade. Moisture conditioning and mechanical compaction may be require to achieve 95% Standard Proctor Density +/- 3% optimum moisture. Place topsoil, seed or sod as required.
- .3 The Contractor shall level off any trenches that have slumped; open trench should be sodded, and ploughed trenches should be seeded unless specified otherwise within this document.

4.5 Site Restoration

- .1 Remove all debris and excess excavated material left over from installation and dispose of off-site as required.
- .2 All disturbance to the site and staging area, shall be returned to the original condition by the Contractor prior to leaving the site after the work is completed.
- .3 All plow lines to be levelled off to prevent tripping hazards. All excess dirt along the plow alignment to be raked our and levelled off.
- .4 Restoration work is to be completed as incidental to the Contract.

END OF SECTION