CITY OF LETHBRIDGE – PARKS PLANNING AND DEVELOPMENT

January 8, 2016

IRRIGATION DESIGN STANDARD

This document shall be in effect from January 2016 until such time as it is superseded by a subsequent edition. Any reference to the Irrigation Design Standard shall be interpreted to mean the latest or most current edition, unless specifically stated otherwise. The City of Lethbridge will maintain this document and publish subsequent editions, as required. Copies of this document will be made available to Irrigation consultants for the sole purpose of designing irrigation systems for City of Lethbridge properties.

TABLE OF CONTENTS

1.0 APPLICATION OF THE STANDARD

This standard shall take precedence over all other documentation for the design of irrigation systems for all MR properties, joint use school sites, public utility lots, storm water management facilities, public buildings, cemeteries, road allowances; regardless of the agency, department, or private company that is providing funding for the irrigation system. Materials and equipment shall be selected from the ***City of Lethbridge Approved Irrigation Products*** list. Construction shall be in accordance with the City of Lethbridge Construction Specification for Open Space and Development.

2.0 DEFINITIONS

2.1 **Static Water Pressure** – The water pressure at the City's water main, at ground level, when there is no flow through the irrigation system.
2.2 **Dynamic Water Pressure** – The actual water pressure at any location in the system, when the irrigation system is operating as designed.
2.3 **System Rated Flow** – The system rated flow is the actual maximum flow at System Design Operating Pressure for the irrigation system.
2.4 **System Design Operating Pressure** – The minimum dynamic water pressure at the base of the sprinkler in the worst case location of sprinklers with the same design operating pressure

3.0 OTHER DOCUMENTS

The City of Lethbridge publishes standard drawings and specifications for the construction of irrigation water services, booster pump stations, controllers and irrigation systems. In addition the City of Lethbridge maintains a digital copy on their website. In case of discrepancy between the hard copy and digital versions, the hard copy shall take precedence.

4.0 DESIGN PHILOSOPHY

The design shall consider water efficiency, capital cost and operating and maintenance costs with the goal to reduce the total life cycle cost and reduce water consumption. The quantities of sprinklers and valves shall be kept to a reasonable minimum. The use of booster pumps on sites larger than 1.5 Hectares should be investigated and used where the total number of sprinklers can be reduced by more than 30%.

The design shall be consistent throughout; including sprinkler type, nozzle sizes, lateral piping configuration, valve size etc.

The basic premise for all design standards shall be for the ability of multiple North-American engineers, designers and supply companies to produce a uniform and consistent design and

product. Equipment on a project shall be of the same manufacturer, except for those materials that are not on the “Approved Equipment List”.

Multiple equipment suppliers shall only be used on project specific sites where options are limited. Unless otherwise specified or approved by the City, the sprinkler design shall be generic. More than one sprinkler product shall be allowed without significant modifications to the design.

5.0 WATER SUPPLY FLOW RATE

The water supply shall be sized based on the “potential” irrigated area. This includes all boulevards and medians that are adjacent to the property. In the case of wet ponds, the area shall include all MR and PUL property above the normal water level, regardless of the type of vegetation. There shall be no deduction for hard surfaced areas except for permanent buildings, playgrounds and parking lots. Sites that have been designated as dry land or native areas shall be provided water as if they were to be irrigated, unless directed otherwise by the City.

The water supply shall be sized for potential irrigated area as follows:

1. Up to 2.7 Ha — 75 US gpm per hectare
2. 2.7 Ha to 6.4 Ha — 70 US gpm per hectare
3. Larger than 6.4 Ha — 67 US gpm per hectare

6.0 TREATED WATER SUPPLY

Treated water supply for irrigation of sites smaller than 2.7 Ha shall only have one connection to the City’s water distribution, and if possible adjacent properties shall be irrigated from the same water services connection. The water service shall be located at the high point in elevation on the site provided that it is easily accessible and that the City water main can provide the necessary flow at that location.

More than one water service will be considered for sites larger than 2.7 Ha. On sites where more than one water service is used, the irrigation system for each water service shall be separate and not connected to the other water service. **Table 6.1** provides water service size information and **Table 6.2** shows sizing requirements for the backflow preventer and flow meter.

Table 6.1 – Water Service Size

Irrigated Area (Ha)	Maximum Rated Flow US gpm	Service Connection	Service pipe to property	Service pipe to backflow/meter
0 to 0.65 Ha	**50**	**50 mm**	**50 mm**	**50 mm**
0.65 to 1.3 Ha	**100**	**150 mm**	**150 mm**	**75 mm**
1.3 to 2.7 Ha	**200**	**150 mm**	**150 mm**	**100 mm**
2.7 to 6.4 Ha	**450**	**150 mm**	**150 mm**	**150 mm**
6.4 to 12.0 Ha	800	*200 mm	200 mm	200 mm
12.0 to 18.0 Ha	1200	*250 mm	250 mm	250 mm
18.0 to 25.4 Ha	1700	*300 mm	300 mm	300 mm

* In situations where the required water supply can't be obtained with a 150 mm water service, the designer shall contact the City of Lethbridge for further direction. Alternate water supplies, such as irrigation district, reclaimed, storm, well or river water should be investigated. If these are not viable and the City's water supply must be utilized, it must be determined if more than one 150 mm water service can be used and, if not, the most suitable location for installation of a larger water service.

Table 6.2 – Backflow Preventer Sizing

Irrigated Area	Flow Range US gpm	Backflow Preventer Size and Quantity
0 to 0.65 Ha	0 – 50	38 mm
0.65 to 1.3 Ha	50 to 100	50 mm
1.3 to 2.7 Ha	100 to 200	Two 50 mm
2.7 to 6.4 Ha	200 to 450	Two to four 50 mm
6.4 to 12.0 Ha	450 to 800	Review with City
12.0 to 18.0 Ha	800 to 1200	Review with City
18.0 to 25.4 Ha	1200 to 1700	Review with City

The Backflow Preventer shall meet the requirements of the City of Lethbridge Engineering Department standards and shall be sized for no more than 6.0 psi loss at **System Rated Flow**.

ARAD Hydrometer shall be sized for the **System Rated Flow** using the normal maximum flow of hydrometer as shown in **Table 6.3**. The maximum flow can be used if the designer can verify that there will be no negative impact on overall system design.

Table 6.3 – ARAD Hydrometer Sizing

Size	Normal Maximum Flow	Pressure loss at Normal Max Flow	Maximum Flow	Pressure loss at Maximum Flow
50 mm	80 US gpm	4.2 psi	100 US gpm	7.1 psi
75 mm	230 US gpm	4.2 psi	300 US gpm	7.1 psi
*100 mm	400 US gpm	4.2 psi	530 US gpm	7.1 psi
*150 mm	840 US gpm	4.2 psi	990 US gpm	7.1 psi
*200 mm	1320 US gpm	4.2 psi	1900 US gpm	7.1 psi

* The City of Lethbridge currently only uses 50 mm and 75 mm ARAD Hydrometers. On sites where the above chart indicates a different size from current practice, the designer shall contact the City of Lethbridge for further direction.

7.0 ALTERNATE WATER SUPPLIES

Alternate water supplies are typically investigated as part of new community development within subdivisions and must follow the procedures documented within the Open Space Agreement. They should be designed to provide for a minimum sprinkler operating pressure of 60 psi to reduce sprinkler quantities.

Irrigation pump stations shall include the following:

- Cinder block wall construction with no windows and insulated steel doors
- Lockable roof hatches for pump removal
- Thermostatically controlled ventilation systems
- Auxiliary heat system
- Water filtration system
- Variable Frequency Drive pump systems. Pumps shall be either submersible turbine or vertical turbine style. Only one pump is required for pump stations with a requirement of 20 horsepower or less. Where horsepower requirements exceed 20 horsepower, two or more pumps shall be used
- All pump motors shall be rated for inverter duty and shall be premium efficiency
- No third party software control systems
- Wet wells to be concrete and sized for 125% of design flow
- Intake pipes to be sized for maximum inflow velocity of 0.15 m/s at 125% of pump station design flow and to be equipped with shutoff valve into wet well. Intake shall be concrete, PVC or HDPE pipe.
- Water fall and stream supply pumps to be trash pumps with roof mounted hoist
- Two hard copies of operating and maintenance manuals in binders and one digital copy in PDF format

8.0 WATER APPLICATION AND WATER WINDOW

Irrigation systems shall be designed to meet the peak weekly evapo-transpiration (ET) requirement of 38 mm within a water window of 25 hours per week (5 hours per day/5days per week). The Scheduling Chart shall provide information based on the average weekly E/T rate of 25 mm within a maximum water window of 20 hours per week (5 hours per day/4days per week)

Where site access is controlled or secured, the City will consider a longer water window; however this must be pre-approved by the City. This will be considered for golf courses, cemeteries and fenced sports fields.

9.0 BOOSTER PUMP STATIONS

Booster pump stations are normally cost effective for sites larger than 1.5 Hectares. If the available sprinkler operating pressure is less than 50 psi, the designer shall undertake two conceptual designs, one at available pressure and the other at a sprinkler operating pressure of 60 psi. The results of the two designs including preliminary cost estimate for each, shall be submitted to the City for review. Booster pumps shall be used when the higher operating pressure results in a sprinkler reduction of 30% or more.

Booster pumps shall be equipped with a Variable Frequency Drive and pressure transducer to prevent over pressure. Where a programmable logic controller (PLC) is required for control, it shall be pre-programmed by a City approved controls and automation specialist. Third party programming is not permitted. Vertical in Line centrifugal pumps operating at 1750 RPM shall be used.

The ARAD Hydrometer shall be installed as an integral part of the pump station. The contractor can utilize the manual over-ride on projects where operation and maintenance is being provided.

10.0 CONTROL SYSTEM PHILOSOPHY

The control system shall be designed for integration into the City's central irrigation control system. Where the provision of central control and the costs associated with electric service are not warranted, as directed by the City, the designer shall utilize an alternate control system, such as solar powered or battery operated controllers.

Two wire decoder control systems can only be used on sites where their specific use had been pre-approved by the City of Lethbridge. They shall include the following requirements:

- One decoder per electric valve
- Minimum 3 metres of extra wire per valve
- Use of manufacturer's recommended wire and wire connectors
- Rainbird, Hunter or pre-approved equivalent two wire decoder controller

11.0 SPRINKLER DESIGN

The basic premise for design of sprinklers is to keep the number of sprinklers to a practical minimum. The design shall consider the size and shape of site, constraints, available pressure and type of vegetation to be irrigated. **Sprinklers shall be selected from the City of Lethbridge Approved Irrigation Products list.**

In high pressure areas, or for low pressure sprays/bubblers etc, pressure compensating nozzles should be used in place of pressure regulating valves.

Sprinklers shall be designed with a square pattern and shall be spaced at no more than 50% of rated diameter for both heads and rows. Triangular sprinkler design can be used for spray heads on medians and boulevards. Sprinklers in a triangular pattern shall be spaced with heads at 50% of diameter and rows at 43% of diameter.

Part circle sprinklers shall be used on the perimeter of all hard surface areas and overspray shall be kept to an absolute minimum. This requirement does not include pathways in the middle of grassed areas unless they are used as a boundary between irrigated and natural grassed areas. Where the Park or PUL boundary is parallel to a roadway with grass boulevard, part circle sprinklers shall be installed at back of curb, unless the boundary is secured with a fence that would interfere with sprinkler uniformity. Post and chain fence, low (1.0 meter) chain link and many ornamental iron fences do not impact the spray pattern significantly.

The sprinkler selection shall be based on size of site, available pressure and quantity of obstructions. The sprinkler types should be considered in the following situations:

1. *Type 1 Bubblers* – Trees and shrubs located in non-irrigated areas, shrub beds on medians and boulevards.
2. *Type 2 Spray Heads* – Narrow, linear landscaped areas, shrub beds
3. *Type 3 Sprinklers* – Specialty areas that can't be effectively irrigated with other sprinklers
4. *Type 4 Sprinklers* – Parks up to 1.3 Ha, boulevards, medians, tot lots
5. *Type 5 Sprinklers* – Any Park or open space larger than 1.3 Ha, excluding linear parks, tot lots and roadways
6. *Type 6 Sprinklers* – Very large open spaces such as regional parks, golf courses and major sports field complex. Prior to using this type of sprinkler, the designer shall meet with the City and obtain their approval.

11.1 Type 1 – Bubbler

Bubblers shall be used for trees and shrub beds within dry land areas. Bubblers shall consist of a 100 mm minimum pop up spray body and shall be pressure compensating type with a fixed flow rate and shall be equipped with a drain check valve. One bubbler shall be installed per individual tree. Bubblers shall be placed on the uphill side of the tree. Where bubblers are placed within shrub beds, they shall be spaced at intervals not exceeding 2.4 meters. Operating times shall be calculated based on the following:

- 15 gallons per week for individual tree or
- 38 mm per week application within shrub beds

11.2 Type 2- Spray Heads

Spray heads are typically rated for 30 psi or less and spacing can be from 1.5 to 5.5 meters and will be used for narrow grass areas and also within shrub/flower beds. Spray heads shall be pop up style with a minimum 100 mm pop up. 300 mm high pop up spray bodies shall be used in shrub beds. Sprinklers shall be equipped with a pressure compensating nozzle and a drain check valve.

Spray heads with a radius less than 3.0 meters (10 feet) typically have a much higher precipitation rate than those spraying 3.0 meters and larger and should, where possible, be zoned separately. Matched precipitation rate nozzles eliminate that problem; however can't be used in all situations due to their fixed radius.

Fixed radius arcs with matched precipitation rate should be used for regular shaped area. Variable arc nozzles are to be used where boundaries are not regular and where future adjustment is anticipated.

11.3 Type 3 – Specialty Heads

Special sprinklers are constantly being developed to provide solutions for difficult areas. The most recent developments have been in the stream rotor, developed to provide more suitable coverage for the 5.0 to 9.0 meter range. Once approved for use in the City of Lethbridge, these heads can be used; however their use should be limited only to cover the areas that require this specific head. They shall not be used where either spray heads or rotary heads will provide a reasonable design.

11.4 Type 4 – Low Pressure Rotary Head

Low volume/pressure rotary gear drive sprinklers typically operate between 1.5 and 8 US gpm, at pressures from 30 to 50 psi and spacing between 9 and 13 meters. Several manufacturers have developed a short radius version of this sprinkler to allow coverage down to 5.5 meters and the use of this sprinkler in lieu of spray heads is preferred. Type 4 sprinklers shall be equipped with drain check valve and stainless steel riser for use along roadways, sidewalks, playgrounds and within or adjacent to baseball infield areas.

11.5 Type 5 – Medium Pressure Rotary Head

Medium volume/pressure rotary gear drive sprinklers operate between 8 and 20 US gpm at pressures from 50 to 70 psi and spacing between 14 and 20 meters. Type 5 sprinklers shall be equipped with drain check valve and stainless steel riser for use along roadways, sidewalks, playgrounds and within or adjacent to baseball infield areas.

11.6 Type 6 – High Pressure Rotary Head

High volume/pressure rotary gear drive sprinklers operate between 20 and 50 US gpm at pressures from 70 to 90 psi and spacing between 20 and 26 meters. The designer shall obtain the City's approval prior to using this type of sprinkler on any design. Sprinklers shall be equipped with drain check valve and stainless steel riser (if available) for sprinklers along roadways, sidewalks, playgrounds and within or adjacent to baseball infield areas.

12.0 ZONING DESIGN

Sprinkler zoning design includes the placement of sprinklers on the appropriate electric valves to accomplish the following:

- Simplicity of piping layout
- Consistency of piping design throughout
- Reduction of pathway, mainline and lateral pipe crossings
- Sprinklers of same type and precipitation rate zoned together
- No sprinklers designed for back to back installation
- Part circle sprinklers on west boundaries zoned together
- Part circle sprinklers on east boundaries zoned together
- Part circle sprinklers around playgrounds zoned together
- Sprinklers on hills and slopes zoned together
- Sprinklers in low or drainage areas zoned together
- Nominal zone size of 50 US gpm for 38 mm electric valves
- Nominal zone size of 100 US gpm for 50 mm electric valves
- Nominal zone size of 200 US gpm for 75 mm electric valves
- For rotary gear drive sprinklers, part and full circle sprinklers zoned separately

On larger sites where more than one valve will operate at the same time, the designer shall provide a controller Scheduling Information Chart to identify which zones operate on each controller station. Although each zone can be programmed separately, the designer should assume that they will be programmed together.

As such, the following basic principles shall be applied to the **Scheduling Information Chart**

- Zones of similar precipitation rates to be grouped together
- Zones of similar site conditions to be grouped together
- Zones spread out to reduce mainline losses and balance operating pressure
- Zones to be selected to reduce impact on site usage such as pathways, playgrounds and sports fields
- Zone flows to be grouped to maintain consistent station total flows

13.0 LATERAL PIPE DESIGN

Lateral pipe shall be sized so that velocity does not exceed 1.5 m/s and to minimize zone pressure loss. Table 13.1 provides the maximum flow allowable in any lateral pipe. The minimum pipe size for Type 4, Type 5 and Type 6 sprinklers is 38 mm. The minimum pipe size for Type 1 sprinklers is 25 mm. Minimum pipe sizes for Type 2 and Type 3 sprinklers is normally 38 mm; however the City will consider the use of 25 mm pipe in special circumstances.

Lateral pipe pressure loss in any zone shall not exceed 5.0 psi, unless it can be demonstrated that there will be no negative impact on overall system performance.

Pipe layout shall be designed primarily with standard available fittings including elbows. Bending or curving of the pipe is only permitted in special circumstances. Pipe misalignment during construction shall be corrected using additional fittings.

Lateral pipes shall be ploughed in existing grass areas, unless otherwise approved by the City. On new construction sites, the pipes may be either ploughed or trenched. All lateral pipes shall be installed in separate trenches with a minimum separation between lateral pipes of 1.0 meters. The minimum separation for lateral pipes from a main line pipe shall be 1.5 meters. Separation distances in narrow linear properties can be reduced at the City's discretion.

Lateral pipes for spray heads and rotary sprinklers (Type 2 to Type 6) shall be Series 160 (SDR 26) PVC with solvent weld schedule 40 fittings and joints.

Lateral pipes for bubblers shall be Series 160 PVC (DR26) within grassed areas and low density Series 75 Polyethylene pipe within shrub beds.

Table 13.1 – Allowable Flows in Lateral Pipes

	25mm	38mm	50mm	63mm	75mm
Maximum Flow in US gpm	15	30	55	85	125

14.0 MAINLINE PIPE DESIGN

The main line pipe shall be designed to provide the required flow to electric zone valves with minimal pressure loss. The basic premise for design is to minimize the total length of all pipes within the system. Grouping of valves may reduce mainline length; however the total pipe length usually increases and this philosophy is discouraged. Mainline pipe shall be designed to pass near special landscape features where supplemental water during the day may be required for maintenance purposes. These include playgrounds, water parks, hard surface play areas, shale areas on ball fields etc. The mainline pipe hydraulic design shall consider the impact of elevation variances on the site.

Mainline pipe shall be designed for a maximum velocity of 1.5 m/s at System Rated Flow. Mainline pipe shall be sized for a maximum velocity of 2.15 m/s at 150% of System Rated Flow. Mainline pipe shall be sized for a maximum pressure loss of 5.0 psi; unless it can be proven that there will be no detrimental effect on the system design. Main line and lateral pipes shall be designed using the actual nominal inside diameter and a Hazen-Williams co-efficient of 140. **Table 14.1** can be used for less complex sites using Series 160 PVC pipe.

Main Line Pipe shall meet the following material specifications:

1. If the maximum pipeline pressure will not exceed 80 psi, the pipes shall be:
   a. Series 160 (DR 26), PVC Pipe with Schedule 40 fittings.
   b. Main line pipes 63 mm and smaller shall be solvent weld joints and pipes 75 mm and larger shall have bell and gasket joints.
2. If the maximum pipeline pressure exceeds 80 psi, main line pipes shall be:
   a. Series 160 (DR 26) PVC Pipe with Schedule 80 fittings.
   b. Main line pipes 63 mm and smaller shall be solvent weld joints and pipes 75 mm and larger shall have bell and gasket joints.

Table 14.1 – Main Line Pipe Sizing Chart

Main Line Pipe Size	Rated Flow @ 1.5 m/s	150% rated flow at 2.15 m/s	Maximum Pipe Rated Flow	Headloss – psi per 100 meters at Max Allowable Flow
38 mm	37	52	**35**	7.90
50 mm	58	83	**55**	5.88
63 mm	85	121	**80**	4.66
75mm	125	180	**120**	3.80
100mm	193	276	**185**	2.92
150mm	450	640	**425**	1.77
200mm	760	1090	**1125**	1.02
250mm	1180	1690	**1125**	1.02
300mm	1660	2370	**1580**	0.83

- Sites larger than 2.0 hectares may be conducive to looping the mainline pipe. Pressure drop for looped mainlines shall be calculated using 50% of the System Rated Flow over one half of the total looped length. Where looped mainlines are used, three isolation valves shall be used to spilt the mainline in approximate half.

15.0 VALVES AND ACCESSORIES

Mainline connections for valves and other connections shall be installed at minimum 1.5 meter spacing along the mainline. Four way cross fittings are not permitted. Valves and accessories shall not be installed in low areas prone to water ponding, in shrub beds or areas that create obstacles to maintenance and repair. Isolation valves shall be limited to very large sites and those with looped mainlines. An isolation valve shall be installed on the upstream side of all main line pipe road crossings.

Quick coupling valves shall be installed at the end of all bubbler lateral lines, near playgrounds etc.

Drain valves shall only be used on main line pipe in the following locations:

- On road crossings where the pipe under the road is more than 1.0 meters deeper than the mainline pipe
- Where the mainline pipe has trapped lows that can't readily be blown out
- On systems where long mainlines drain back to the water service point

Isolation valves and drain valves shall be installed a minimum distance of 10.0 meters from any road surface. If this is not possible, the designer shall review with the City. Isolation and drain valves shall be a minimum distance of 2.0 meters from any hard surfaced area and 5.0 meters from the playing surface of any sports field.

16.0 CROSSINGS

16.1 General

All mainline and lateral pipe that crosses a hard surfaced area shall be installed in a casing (sleeve), which shall be SDR 35 PVC gasketed sewer pipe, IPEX Ring-Tite or approved equal. Only one irrigation pipe per casing shall be used except for special circumstances and only with the prior approval of the City. Where the installation of two pipes in one casing is approved, the size of the casing pipe shall be increased from that shown in **Table 16.1**. Low voltage (24 Volt) valve control wiring may be installed together with a lateral or mainline pipe, provided that the wires are installed in a separate conduit within the casing. The conduit for control wires shall be

50% larger than that necessary for installation of the wires. The size of the casing pipe may need to be increased, depending on the number of wires included.

16.2 Pathway Crossings

Irrigation main or lateral pipe for pathway and other crossings within the park or utility lot shall be of the same type and pressure rating as the pipe within the park or public utility lot. The top of the casing shall be a minimum 300 mm below the finished surface and the casing shall extend 0.5 meters beyond the hard surface.

16.3 Road Crossings

Irrigation main and lateral pipe for all road and parking lot crossings shall be PE 3408 or PE 4710 pipe. The casing shall extend a minimum of 1.0 meter beyond the road surface. Kor-N-Seal pipe ends seals shall be installed on all road crossings. The top of the casing shall be a minimum 300 mm below the lowest point in the road section. The irrigation pipe shall extend beyond the casing to a point where the grade of the pipe matches the nominal pipe grade of the irrigation system. This transition shall be smooth and bending radius shall not exceed the manufacturer's recommendations.

The size of the casing pipe shall be determined from the following **Table 16.1**:

Table 16.1 – Casing Pipe Size Chart

Nominal Irrigation Pipe Size	Casing Pipe Type	Pathway crossings with PVC Pipe	Road Crossings with HDPE Pipe
38 mm	PVC – DR 35	100 mm	100 mm
50 mm	PVC – DR 35	150 mm	100 mm
63 mm	PVC – DR 35	150 mm	150 mm
75 mm	PVC – DR 35	200 mm	150 mm
100 mm	PVC – DR 35	250 mm	200 mm
150 mm	PVC – DR 35	300 mm	250 mm
200 mm	PVC – DR 35	375 mm	375 mm
250 mm	PVC – DR 35	450 mm	375 mm
300 mm	PVC – DR 35	525 mm	450 mm

17.0 PRESSURE BALANCING

Upon completion of the preliminary design, the system shall be adjusted to provide optimal pressure balance so that the sprinkler operating pressure is as consistent as possible throughout the site. Where actual sprinkler operating pressure varies by more than 15 psi from the design operating pressure the designer shall review with the city to determine if or what corrective measures should be considered.

Potential measures may include changing of main and lateral pipe size to increase or decrease pressure loss, change nozzles to reflect the actual zone operating pressure, local re-design or sprinkler spacing to reflect the actual sprinkler operating pressure anticipated in that area or simply identifying the actual sprinkler operating pressure to be expected within the sprinkler, zoning and schedule information charts.

18.0 CADD STANDARDS

The City of Lethbridge maintains CADD standards for irrigation drawings. These standards must be strictly adhered to for the final record drawings. Drawings issued for approval and construction do not need to follow the standards.

The City currently uses a variety of CAD and GIS software including Autodesk AutoCAD and ESRI ArcGIS. To ensure compatibility and interoperability between this software, the following requirements must be observed with all digital file submissions.

1. Digital files must be submitted in either Micro station DGN or AutoCAD DWG format.
2. Data must conform to NAD'83 3TM coordinates, geo-referenced to the City's cadastral base.
3. The working units for all digital files must be set as – Master Units to meters and Sub Units to millimeters,
4. All elements must be part of the original drawing file, and must not have any referenced file or attachments associated with them.
5. Text must be clear and legible and must not be placed over important drawing elements; multi-line text must not be used.
6. Only the drawing base elements are allowed in Paper Space. This includes elements such as title blocks, borders, north arrows, logos, etc. All other elements must be drawn in model space.
7. The final product in its finished state must be provided in Paper Space so that the City can generate its own hard copy prints. For this reason, drawings must not contain yellow, white or other hard to read colors.
8. Standards are based on Micro Station "Level" and AutoCAD "Layer" formats. Drawing features must be isolated by levels or layers, so that only one feature class is drawn on any one level. (E.g. Water mains on one level, sidewalks on another etc.). Consultants should also check with the business unit issuing the tender to determine if there are any additional requirements with respect to the assignment of levels, layers, line weights, line styles, colors etc.
9. **TEXT:** Style to be continuous throughout. For the active work, i.e. Work relevant to the project, the weight is to be 0.30. Non-active text, i.e. for background information, the weight is to be 0.18. The text weight for the legend as well as technical description tables is to be 0.30.

10. **LINE WORK:** Style to be continuous throughout, with the exception of the limit of work boundary line which is to have the 'hidden' style and a weight of 0.70 (for the main and lateral lines see Mainline & Lateral).

IRRIGATION						
Elements	**Micro-station Level**	**AutoCAD Layer**	**Color**	**Color Number**	**Line Style**	**Line Width**
Border	30	IR-border	Black	7	Continuous	0.30
Text (Legend & Schedule)	31	IR-text_leg_sched	Black	7	Continuous	0.30
Text (Active Work)	32	IR-text_active	Black	7	Continuous	0.30
Text (Non-Active Work)	33	IR-text_nonactive	Black	7	Continuous	0.18
General Line Work	34	IR_background	Black	7	Continuous	0.18
Limit of Construction	35	IR-limit_const	Grey	252	Hidden	0.70
Non Active Phase	36	IR-non_act_phase	Black	7	Continuous	0.30
Sprinkler Heads (Full)	37	IR-sphead_full	Dark Green	3	Solid Fill	0.30
Sprinkler Heads (Part)	38	IR-sphead_part	Dark Green	3	Open	0.30
Irrigation Mainlines	39	IR-main_pipe	Dark Blue	5	Continuous	0.85
Irrigation Lateral Lines	40	IR-lateral_pipe	Light Blue	4	Continuous	0.50
Electronic Control Wire	41	IR-control_wire	Red	1	Continuous	0.25
Component Symbols	42	IR-comp_symbols	Black	7	Continuous	0.30
Zone designations	43	IR-zone_des	Black	7	Continuous	0.30
Irrigation Controller	44	IR-controller	Black	7	Continuous	0.30
Pump House	45	IR-pump_house	Black	7	Continuous	0.30
Water Service	46	IR-water_service	Black	7	Continuous	0.30

Detail Sheets

Where information is clustered and or difficult to read on the site plan, additional detail sheets will be required. These sheets should be produced at a sufficient scale to ensure that all details related to the design are clearly visible.

The maximum scale for an irrigation drawing is 1:500. On large or linear sites, where more than one drawing is required to portray all required information, an overall site plan at an appropriate scale shall be included. This drawing shall clearly show the mainline pipe, mainline pipe size, electric valves, isolation valves and quick coupling valves. The size of symbols shall be increased to clearly show this information. Sprinklers and lateral pipe shall also be shown; however the size of symbols does not need to be increased.

Drawing Information

Each irrigation drawing shall include a legend which shows all the pertinent symbols.

Each irrigation design shall include a chart listing specific sprinkler and zone information. At a minimum, the chart should identify zone number, sprinkler make and model, nozzle, number of sprinklers in zone, zone operating pressure, sprinkler flow rate (US gpm), zone flow rate (US gpm), valve size, precipitation rate, and daily run times.

Where the site design requires the operation of more than one zone valve at a time, the drawings shall also include a chart which lists the controller scheduling information. At a minimum, the chart should identify each zone on the controller station, flow rate (US gpm) per zone, and total flow (US gpm) operating at one time.

19.0 RECORD DRAWINGS

At the completion of construction, the contractor is responsible to undertake an accurate survey using GPS or total station equipment. Survey method and equipment shall attain an accuracy of 5cm or less. This survey shall include the location of all sprinklers, valves, mainline pipe, lateral pipe, crossings, controllers, wire routes, water services and pump stations. This information, supplemented with contractors' measurements and markups with all changes from the design, shall be provided to the Irrigation Consultant for preparation and submission of Final Record Drawings.

The irrigation consultant shall verify sprinkler types and nozzles used and revise the drawings accordingly. Sprinkler/Zone Information charts and Scheduling chart shall be updated to reflect the actual installation.

Construction Completion Certificates (CCC) will not be issued until the City of Lethbridge Parks Development Manager receives the Record Drawings in CAD and pdf formats.