6 Water Distribution Systems

6.1 GENERAL

These standards cover the requirements for water distribution systems. This section also covers the design and construction of watermains and accessories to be built in the Town of Lamont. Drawings relating to the construction of water distribution systems, trenching and backfilling are provided in the Municipal Development Standard Drawings.

This section provides the minimum acceptable standard for general construction requirements, construction materials, and construction procedures. These standards may be exceeded wherever appropriate. Good engineering practices and designs must prevail on all projects.

6.2 DESIGN FLOW

- The waterworks system shall be designed in accordance with the Alberta Environment guidelines as part of the overall municipal distribution system. The system shall be capable of delivering the peak day demand plus fire flow, or the peak hour flow - whichever is greater. Velocities at maximum flows shall not exceed 1.5 meter per second;
- The rate of water demand shall be determined by the land use density basis of either the ultimate subdivision design population in the Outline Plan or if population is unknown: 45 persons per hectare, or 3.5 persons per residential unit, whichever is greater. The minimum per capita water demands for the Town are as follows:

    - Average Daily Demand = 360 litres/capita/day (L/c/d)
    - Peak Daily Demand = 2.0 times average daily demand
    - Peak Hour Demand = 3.0 times average daily demand

- Commercial and industrial areas shall be designed on the basis of equivalent population subject to the peak daily demand and peak hourly demand multipliers.

  The equivalent populations are as described in section 4.2 Design Flow for sanitary systems

- Fire flows shall be in accordance with the recommended Standards of the Insurance Bureau of Canada. Typical requirements are:

Land Use	*Flow Rate (L/s)*	*Duration (Hours)*
Residential - Single Family	92	1.5
Residential - Multi-Family	303	2.0
Residential - High Density	303	4.0
Commercial	227	3.0
Industrial	227	3.0
Commercial Business District/Institutional	303	4.0

Confirm the required flows for these and other types of construction with the latest edition of Fire Underwriters Survey "Water Supply for Public Fire Protection."

In instances where automatic sprinkler systems are to be installed in residences, the distribution and/or storage systems must consider the additional demand resulting from these fixtures.

6.3 DESIGN COMPUTATIONS

Use the Hazen-Williams formula:

$$Q = CD^{2.63}S^{0.54} \times 278.5$$

Where
- Q = Rate of flow in L/s
- D = Internal pipe diameter in m
- S = Slope of hydraulic grade line in m/m
- C = Roughness coefficient 125 for all mains

Minimum pressure at peak demand	= 273 kPa
Minimum pressure with automatic sprinklers	= 350 kPa
Maximum allowable pressure	= 690 kPa
Minimum fire pressure at main	= 140 kPa

Network analysis shall be by the Hardy-Cross method or a suitable computer program.

6.4 MINIMUM MAIN PIPE DIAMETER

- Single Family Residential = 200 mm
- Multi-Family Development = 250 mm
- Industrial/Commercial = 250 mm

Main sizes may be increased as considered necessary by the Infrastructure Services Department to accommodate future development.

Temporary blow off valve may be required, dependent upon construction staging, at the discretion of the Town. See Standard Drawings.

6.5 DEAD ENDS

Except in cul-de-sacs of less than 300 m length, all watermains shall be looped. A Hydrant must be provided at the end of all cul-de-sacs and dead end watermains.

6.6 PIPE LOCATION

Minimum horizontal separation of watermains from sanitary or storm sewers shall be 3.0 m and from power, telephone, or gas services shall be 3.0 m; minimum vertical separation shall be 0.5 m from all sewer mains.

All watermains are to be installed 3.0 m from the centreline of the roadway.

6.7 MINIMUM DEPTH OF COVER

Minimum cover to be 3.0 m below finished grade to obvert and shall be of sufficient depth to:

- Prevent freezing;
- Clear other underground utilities.

6.8 VALVING

In general, valves shall be located as follows:

- In intersections at projected property lines:
    - Three (3) valves at cross intersection;
    - Two (2) valves at tee intersection;
- Not more than two (2) hydrants isolated;
- A maximum of four (4) valves will be closed to isolate any one section;
- A maximum of 30 lots cut off from the water supply in all areas.

6.9 HYDRANT LOCATION

Fire hydrants shall be located at street intersections and spaced as follows:

- In accordance with "Water Supply for Public Fire Protection - A Guide to Recommended Practice" published by Public Fire Protection Survey Services;
- Location to be 2.0 m back from curb, 0.5 m from property line, no closer than 1.0 m to back of walk, and 3.0 m from franchise utilities (pedestals, transformers, street lights, etc);
- No more than 180 m apart in residential areas;
- No more than 100m from a dwelling;
- No more than 90 m apart in a commercial/industrial area.

6.10 SERVICE CONNECTION

See Standard Drawings for service connection installation details.

- Water and sanitary services in a common service trench shall have the following minimum horizontal separation from other services:
    - 50 mm diameter or less = 0.2 m
    - Greater than 50 mm diameter = 2.0 m
    - Separate trenches required for services 100 mm diameter or larger

- Water service connection pipes shall have minimum 2.85 m cover at the property line. Services shall extend 4.0 m past property line, or 2.0 m past the shallow utility easement;
- Locate water service curb stops as per Standard Drawings, outside of hard surface areas (driveways, concrete pads, etc).

6.11 THRUST BLOCKING

Concrete thrust blocking (Type HS Cement) shall be provided at bends, tees, wyes, reducers, plugs, caps, hydrants and valves as per the Standard Details.

6.12 CHAMBER DRAINAGE

Chambers or manholes containing valves, blow-offs, meters or other appurtenances shall not be connected directly to a storm drain or sanitary sewer, nor shall blow-offs or air release valves be connected to any sewer. Such chambers or manholes shall be drained to the surface by gravity where they are not subjected to flooding by surface water or to absorption pits underground where it is above the groundwater table or pumped to a storm or sanitary sewer. They shall be insulated to prevent freezing where necessary and shall also be sealed to prevent groundwater infiltration.

6.13 DISINFECTION AND FLUSHING

All disinfection and flushing of new water mains will be the responsibility of the Developer. Test procedure reports and approved sample results shall be forwarded to the Town of Lamont for review. For test procedure requirements see 9.6.2.

6.14 HYDRO STATIC PRESSURE TESTING – SEE SECTION 9.6

6.15 MATERIALS

6.15.1 Pipe

Table 6.1 lists specifications for acceptable pipe materials and approved PVC materials are listed in Section 6.16:

Table 6.1
Acceptable Water Pipe Materials

Material	*General Size Range (mm)*	*Specification*
Polyvinyl Chloride (PVC)	150 to 300 400 to 900	AWWA C900, DR 18 AWWA C905, DR25

6.15.2 Fittings and Hardware

Cast Iron Fittings	-	AWWA C110 1.03 MPa (Class 150) working pressure
PVC Fittings	-	150 to 300 mm CSA B137.2 (Class 150), AWWA C907
	-	400 to 900 mm: CSA 137.3 (Class 150), AWWA C905
Flanged Joints	-	Class 125, ANSI B16.6, B16.5 flat-faced
Bolts and Nuts	-	Stainless Steel, Type 304, wrapped with Denso paste and tape

6.15.3 Cathodic Protection

- Cathodic protection for buried non-steel metallic fittings, valves and hydrants:
  - All buried non-steel metallic fittings and valves shall be cathodically protected with 2.3 kg zinc anodes;
  - All hydrants shall be cathodically protected with 5.5 kg zinc anodes. See Standard Drawings;
  - Zinc anodes shall conform to ASTM B418-73;
- All copper services 50 mm diameter and smaller shall have a 5.5 kg zinc anode attached to the copper service pipe. See Standard Drawings.

6.15.4 Bedding

Bedding material for pipes shall be Class B sand, conforming to the Standard Drawings and the gradation specified under Item 4.14.4.

6.15.5 Trench Section

See Standard Drawings for trenching.

6.15.6 Fire Hydrant

- Approved materials are listed in Section 6.16. Hydrants are to be complete with a breakaway flange and a 300 mm minimum spool piece. See Standard Drawings;
- The minimum hydrant connection size shall be a 150 mm hub end;
- The minimum cover shall be 3.0 m;
- Drain outlets shall be plugged when ground water is encountered during construction;
- Hydrants shall have two (2) 65 mm hose connections and one (1) 100 mm Storz pumper connection as presently used in the community;
- Hydrant will have threads conforming to the Alberta specifications;
- Hydrant main spindles shall turn to the left (counter clockwise) to open;
- A gate valve shall be provided on each connection between a hydrant and main;
- Hydrants shall be enamel painted to CAN/CGSB-1.59. Town of Lamont hydrants are to be all red in colour;
- All bolts and nuts must be stainless steel, type 304;
- Hydrants shall be cathodically protected. See Standard Drawings;
- Hydrant ground flange shall be 50 mm above design grade.

6.15.7 Gate Valves

- Gate valves shall be in accordance with AWWA C509 and the following supplementary data:
- Gate valves shall have an iron body, bronze mounted, and are to be cathodically protected;
- Valves shall be resilient seat gates with non-rising stem, to open by turning in a counter-clockwise direction;
- Valve ends shall be provided to fit the pipe. Where flanged valves are used, they must be accompanied by flexible couplings;
- The position of the valve in line shall be vertical;
- Stem seals shall be o-ring;
- Valve boxes with operating stem and nut are required on all valves. All valve boxes shall be sliding Norwood Foundry Type A. PVC lower section of valve boxes are acceptable;
- Dresser style 450 mm diameter butterfly valves suitable for buried installation may be considered as an approved alternative, subject to written approval of the General Manager, Engineering Services on main sizes >400 mm;
- All bolts and nuts will be stainless steel, type 304;
- All gate valves larger than 350 mm shall have a bypass built into the body of the valve;
- All valve boxes are to be adjusted such that the top of the valve box is 10-15 mm below the finished design grade at the proposed roadway or flush with any concrete work.
- Valve boxes are to include a 150 mm cast iron or PVC Type 'A' sliding sleeve, complete with operating extension stem to provide for 600mm adjustment flexibility, rock disc and 25mm square steel valve spindle. Cast iron to be asphaltic coated.

6.15.8 Service Connections

- Water Service Pipe:
  - Approved Materials are listed in Section 6.16;
  - Service connections shall be copper pipe, Type K;
  - Couplings shall be Standard Brass, compression type;
  - Unsprinklered dwelling: 19 mm or 25 mm for services less than 30 m in length
    Sprinklered dwelling: 50 mm
    Multi-family/commercial: sized accordingly

- Water Service Fittings:
  - Approved materials are listed in Section 6.16;
  - Curb stop will be copper to copper invert and key stop and drain;

- Service Connection Reports:

- The Developer's Consultant shall provide detailed record drawings for all installed service connections with such drawings providing pipe diameter, elevation, and location relative to property line(s) and lot number;

- Water service connections in new subdivisions shall be installed from the water main to 4.0 m inside the property line or 2.0 m past the shallow utility easement.

6.16 APPROVED MATERIALS

Polyvinyl Chloride (PVC) Water Pipe			
Manufacturer	***Model/Type***	***Size (mm)***	***Remarks***
Ipex	Blue Brute	100 to 300	AWWA C900, DR18
Ipex	Centurion	450 to 900	AWWA C905, DR25

Fire Hydrants			
Manufacturer	***Model/Type***	***Lead Size***	***Remarks***
Canada Valve Darling	Century	150	AWWA C502

Service Saddles			
Manufacturer	***Model/Type***	***Size (mm)***	***Remarks***
Robar	2616, 2626, 2706	100 to 600	AWWA C800

Main Stops			
Manufacturer	***Model/Type***	***Size (mm)***	***Remarks***
Cambridge Brass	301 Series	20 to 50	AWWA C800
Mueller	B2500 Series	20 to 50	AWWA C800

Water Service Unions			
Manufacturer	***Model/Type***	***size (mm)***	***Remarks***
Cambridge Brass	118 Series	20 to 50	AWWA C800 Compression Ends
Mueller	300 Series	20 to 50	AWWA C800 Compression Ends

Curb Stops – Select Connections to Suit Service Tubing Material			
Manufacturer	***Model/Type***	***size (mm)***	***Remarks***
Cambridge Brass	202 Series	20 to 50	AWWA C800 Compression Ends
Mueller	B-25209 Series	20 to 50	AWWA C800 Compression Ends

Service Pipe			
Manufacturer	***Model/Type***	***Size (mm)***	***Remarks***
Wolverine/Cerro/Halstead	Type K Copper	20 to 50	Third Party Certified to ASTM B88

Service Boxes Including Chairs and Rods			
Manufacturer	***Model/Type***	***Size (mm)***	***Remarks***
Norwood Foundary	Complete Service	20, 25	See Standard Drawings
Norwood Foundary	Complete Service	40, 50	See Standard Drawings