

**SECTION 3.0  
SANITARY SEWER SYSTEM**

**3.1 Design Criteria**

- 3.1.1 The sewage system shall be designed in accordance to the “Alberta Environmental Protection Standards and Guidelines”.
- 3.1.2 All calculations for sewage flows must be based on the total contributory area intended to be served by the sewer main at any particular point. A typical “Sanitary Sewer Design Sheet” is attached in Appendix B for these calculations.
- 3.1.3 The sewer main capacity shall be designed to convey the peak hourly sewage contribution and infiltration based on the contributory area served.

3.1.4 Residential Contribution:

- .1 Sewage contribution is to be designed on the density basis of either the subdivision design population density or 40 persons per hectare (16 persons per acre); whichever is greater.
- .2 Minimum average contribution of 360 litres per capita per day.
- .3 Peak hourly flow for each contribution area calculated at average flow multiplied by a peaking factor. The Peaking Factor shall be the larger of 2.5 or Harmon’s Peaking Factor where:

$$\text{Peaking Factor (P}_f\text{)} = 1 + \frac{14}{4 + \sqrt{P}}$$

$$\text{Peak Hourly Flow} = \text{Average Daily Flow} \times P_f$$

Where P = equivalent population to be served in 1,000’s.

3.1.5 Industrial and Commercial Flows:

Sewage contribution is to be designed on a per gross hectare contribution for industrial and commercial.

- .1 Industrial Flows - minimum contribution of 22.5 m<sup>3</sup> per gross hectare (2000 imperial gallons per acre) per day.
- .2 Commercial Flows - commercial flows minimum contribution of 17 m<sup>3</sup> per gross hectare (1500 imperial gallons per acre) per day.
- .3 Peaking factor shall be a minimum of 3.0.

3.1.6 Infiltration:

An infiltration allowance of .28 litres per second per gross hectare per day to be included in the sewage contribution calculation. A further allowance of 0.4 litres per second shall be included in the sewage contribution calculation for each manhole located within a roadway sag or low area. All sanitary manholes in sag locations are to be “waterproofed”.

3.2 **Mains**

3.2.1 Minimum main size of 200 mm (8 inch) diameter.

3.2.2 Minimum depth of 3.0 m measured from crown to elevation unless otherwise approved.

3.2.3 Minimum grades for pipe shall be as recommended by the “Alberta Environmental Protection Standards and Guidelines”.

3.2.4 All pipe shall be PVC gravity sewer pipe certified as conforming to CSA Standards B182.1 or B182.2 (DR 35).

3.2.5 Concrete for pipe and manhole material shall be sulphate resistant.

3.2.6 Mains shall generally be located in the center line of the streets as indicated on the drawings.

3.3 **Manholes**

3.3.1 Manholes shall be a sulphate resistant concrete and a minimum of 1200 mm (48 inch) inside diameter in the main portion of the structure.

3.3.2 Frames and covers shall be of cast iron, asphalt dipped and capable of withstanding H-20 loading.

3.3.3 Spacing of manholes shall not exceed the “Alberta Environment Standards and Guidelines”.

3.3.4 All joints shall be watertight.

3.3.5 In areas where any manhole pipe invert is located below the high groundwater table, precast manholes utilizing pipe seals, conforming to ASTM C443, shall be used unless otherwise specified.

3.3.6 Drop Manholes shall be used where invert levels of inlet and outlet sewers differ by 1.0 m or more, as per standard drawing.

3.4 **Service Connections**

- 3.4.1 Minimum service size
- 100 mm (4 inch) for single family residential
  - 100 mm (4 inch) for commercial and multiple family
  - 150 mm (6 inch) for industrial
- 3.4.2 Minimum slope on service lines shall be 2.0% (1/4 inch per foot) for 100 mm pipe and 1.0 % (1/8 inch per foot) for 150 mm pipe.
- 3.4.3 Under no circumstances will weeping tile, roof or surface drainage from buildings be permitted to discharge into the service connection of the sanitary sewer system in accordance to the local by-law.
- 3.4.4 All main connections must be watertight. The use of in-line wyes, tees or saddles is recommended.
- 3.4.5 The sewer service pipe shall be installed on the downstream side of the water service pipe relative to the direction of flow of the sewer main.
- 3.4.6 Proper sewer service curb stops or valves are required for each service connection on a low pressure sewage force main system. These shall be placed at 0.3 m off property line, installed to the centerline of all lots and shall have the word "Sewer" stamped on the cap or lid to differentiate these from water curbstops.
- 3.4.7 Service risers are required where sewer main depths exceed 3.5 m.

3.5 **Materials**

- 3.5.1 All materials shall be of the manufacturers stated in the "Approved List" in Appendix A, unless otherwise approved in writing by the Town.

3.6 **Concrete for Manholes and Appurtenances**

- 3.6.1 Concrete shall be made using Type 50 Sulphate Resistant Cement, with a maximum slump not exceeding 75 mm and a minimum 28 day strength of 25 map (3600 psi).

3.7 **Curved Sewers**

- 3.7.1 Refer to Section 4.6 as for Storm Sewers.

3.8 **Testing of Sewers**

- 3.8.1 The Town may require infiltration or exfiltration testing be performed prior to acceptance of sanitary sewers. The method of testing shall be submitted to and approved by the Town. The maximum allowable leakage is 2.8 litres per day per millimetre of pipe diameter per kilometre of pipe while subjected to a 0.6 metre hydrostatic head.

- 3.8.2 Television Camera Test:

- .1 All sanitary sewer installations shall be inspected prior to application for a Construction Completion Certificate with a closed circuit television camera with the inspection recorded on video tape. The system must be flushed and cleaned prior to inspection
- .2 A copy of the video tape and log shall be supplied to the Town of Whitecourt as a permanent record.
- .3 Video equipment used shall be standard VHS format.
- .4 Deficiencies noted shall be corrected by the Developer and the deficient location re-inspected as verification to the Town (as requested )

3.9 **Sewage Lift Stations and Force Mains**

- 3.9.1 Sewage lift stations and force mains shall be designed in accordance to Alberta Environmental Protection Standards and Guidelines.
- 3.9.2 Extension of the gravity sewer systems to the maximum extent possible is preferred, and utilization of pumping systems will be permitted only when insurmountable constraints cannot be resolved otherwise. Economic analysis, long term costs, maintenance provisions, orderly development and temporary servicing schemes will all be deciding factors.
- 3.9.3 The forcemain and lift station shall be properly designed to service the ultimate capacity of the contributing development areas.
- 3.9.4 Typical design criteria as required by the Town, but not limited to the following items:
  - .1 Wet/dry well designs are preferred with a suitable concrete structure or steel structure to withstand 50 years service.
  - .2 An above grade building with adequate heating, ventilation, lighting, access, maintenance and safety provisions in all relevant areas. The exterior appearance of the building and grounds must be aesthetically compatible with the surrounding area.
  - .3 Proper level controls for wet well, warning and other signs, sump pump in the dry well, alarm systems, telemetry lines and water service for cleaning purposes.
  - .4 Pumps to be of proper capacity, capable of pumping 75 mm solids, easily removed for servicing, equipped with pressure gauges/taps, standby pump, back-up power connection as necessary, proper discharge and suction velocities, maximum of 4 start-stops per hour.
  - .5 Force mains shall be a minimum of 100 mm diameter, polyethylene, butt-fused pipe of proper pressure rating. Valves, air and vacuum release valves, and cleanout manholes must be installed for operating and maintenance purposes.
  - .6 Three copies of maintenance and service manuals shall be provided to the Town for the facility before a Construction Completion Certificate is issued by the Town.

- .7 System to be designed to accommodate emergency pumping.
- 3.9.5 The pumping station shall be properly commissioned with test results and calibration of all major equipment; a checklist and verification of operability of valves, gates, air releases, lifting equipment, ventilation, lighting, heating, plumbing, electrical and other systems as required.
- 3.9.6 Based on proper soils testing and type of material, cathodic protection is to be installed by way of impressed current to prolong the service life of the structure and related appurtenances, along with a proposed program of ongoing maintenance monitoring and surveys.
- 3.9.7 Field testing of polyethylene pipe shall be performed per the following:
  - .1 Testing of forcemain to be carried out under supervision of Engineer.
  - .2 Before testing, bed and cover pipe between joints to prevent movement of forcemain when test pressure is applied.
  - .3 Expel air from forcemain, by slowly filling main with water. High points to be drilled and tapped and suitable cocks installed to vent air and to be shut when pressure is applied. Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.
  - .4 Apply a hydrostatic test pressure of 1.5 times the rated pressure of the pipe (1.5 x series number) at the lowest point in the line.
  - .5 Pressurize pipe to required test pressure over a period of three hours and hold required test pressure for an additional hour to allow for pipe stretch prior to starting leakage test. A high-volume high-pressure pump may be required to raise the pressure within the allowable time.
  - .6 Test period shall be of two hours duration. The amount of make-up water (leakage) required to return the pipe to the test pressure shall not exceed the allowance given in the following table.

Nominal Pipe Size	Allowance for Expansion (Leakage) (litres/100 m of pipe)	
	1 Hour Test	2 Hour Test
mm		
75	1.2	1.7
100	1.5	2.9
150	3.5	6.9
200	5.8	11.5
250	8.6	15
300	13	26
350	16	32
400	19	38
450	25	50
500	32	63
550	40	81
600	52	103
700	63	128
800	81	165
900	104	208
1050	138	276
1200	173	310

- .7 Total time under test must not exceed 8 hours. If the test is not completed because of leakage or equipment failure, the test section must be permitted to “relax” for 8 hours prior to the next testing sequence.
- .8 Locate and repair defects if leakage is greater than amount specified in 3.6.2.6.
- .9 Repeat test until leakage is within specified allowance for full length of forcemain.
- .10 If the forcemain-liftstation connection is to be made by others, drain line upon successful completion of the leakage test.