



2020 - SECTION 8

WATER DISTRIBUTION SYSTEM

8.1 GENERAL

The design of this municipal improvement shall be undertaken in such a manner as to conform to the approved Water distribution design report for the development area, the Aquatera Design and Construction Manuals and Master Plans.

Where the size of the area to be developed warrants, or if required by Aquatera, a network analysis shall be carried out and all relevant information shall be submitted with the design documents for examination by Aquatera.

New subdivisions shall be designed such that the water distribution and transmission systems through the area are looped and have two water feeds. The maximum length of un-looped water main is 150 m except in single family residential cul-de-sacs where the maximum water main length is 100 m and shall not serve more than 20 residences. For the initial, purely residential stages of a large development area the Aquatera Engineer, at his sole discretion, may temporarily waive the second water feed requirement for up to one hundred (100) units. For condos and apartments, a maximum of 80 units will be allowed before a lot requires an additional service c/w isolation valve and check valves on all services.

Aquatera and Alberta Environmental Protection Services must approve the water distribution system.

For any tie-ins to existing Aquatera infrastructure, the consultant should fully evaluate the operation of the

8.2 TRANSMISSION SYSTEM

As required to comply with the latest version of Aquatera's Water Distribution System Master Plans for the appropriate municipality as follows:

- Water Distribution & Wastewater Collection System Master Plan 2013 Servicing Strategy for The City Of Grande Prairie & The Hamlet of Clairmont.
- Town of Sexsmith 2007 Water and Wastewater Master Plans

8.3 DISTRIBUTION SYSTEM

8.3.1 PER CAPITA CONSUMPTION

See Table 8.1

8.3.2 DESIGN POPULATION

See Table 8.1

8.3.3 PEAK HOUR DEMAND

See Table 8.1

8.3.4 MAXIMUM DEMAND

See Table 8.1

8.3.5 MAXIMUM/MINIMUM PRESSURE

See Table 8.1

8.3.6 FIRE FLOW

See Table 8.1

8.3.7 MAIN DETAIL AND LOCATION

- a) See Table 8.1
- b) Mains shall be installed to provide a minimum cover depth of 2.75 m to top of pipe from final finished surface grade.
- c) Shallow pipes are to be avoided, in situations where pipes are shallower than 2.75 meters, pipes will require a minimum of 50mm insulation.
- d) Mains shall be located within the road or utility right-of-way or in accordance with the applicable municipal standard. (Contact the City of Grande Prairie, The County of Grande Prairie or Town of Sexsmith as applicable.)
- e) A minimum horizontal separation shall be maintained between a watermain(s) and any sewer main(s) as follows:
 - 2.50 meters for pipes of a diameter of 300 mm or less, as measured center to center of the pipes.
 - 2.20 meters for pipes of a diameter of greater than 300 mm, measured from the outside walls of the pipes.
- f) At crossings, a minimum vertical distance shall be maintained between a water main(s) and sanitary main(s) of 500 mm with the alignment such that the water main is over the sanitary main whenever possible.
- g) At crossings, a minimum vertical distance shall be maintained between a water main(s) and storm main(s) of 500 mm.
- h) The minimum requirement for pipe bedding shall be Class B1 sand bedding.

8.3.8 HYDRANT DETAIL AND LOCATION

- a) The maximum allowable spacing between fire hydrants as measured shall be the more stringent of either:
 - (i) 150 m radial in single family/duplex residential areas,
 - (ii) 90 m along the face of curb in multiple-family residential, school and industrial/ commercial areas; or

- (iii) as per the maximum area outlined in Water Supply for Public Fire Protection, 1999, Fire Underwriter's Survey or latest update thereof.
 - (iv) Drawings shall show hydrant coverage from adjacent or proposed developments.
- b) Hydrants on the distribution mains shall be installed:
- i) At the projection of property lines,
 - ii) Beginning of curb returns,
 - iii) Where the hydrants are installed on a residential cul-de-sac of 75 m in length or less, they shall be installed at the intersection of the cul-de-sac and adjacent collector roadway,
 - iv) All hydrants must be separated from the distribution system by an isolation valve.
 - v) Where the water table is above the bottom of the hydrant and will not allow for satisfactory drainage, the hydrant drain shall be plugged. The consultant shall identify on the drawings which hydrants are to be plugged, based on geotechnical design and field conditions.
- c) Hydrants shall be located to conform with curb and sidewalk design and shall be located in accordance with the appropriate municipal design standard. (Contact the City of Grande Prairie, The County of Grande Prairie or Town of Sexsmith as applicable.) Generally, the hydrant shall be a minimum of 1.0 m clear of curbs, driveways, and sidewalks.
- d) Additional hydrants shall be installed at high value properties if deemed necessary by Aquatera.
- e) Hydrant flanges are to be designed at between 75 mm and 150 mm above the finished ground elevation.
- f) Hydrants are to be located a minimum of 0.6 m from any property line where the potential exists for the construction of a fence, retaining wall, entry feature or any other structure that may interfere with the operation of the hydrant.

8.3.9 VALVE DETAIL AND LOCATION

- a) Valves on the distribution mains shall be installed at the projection of property lines at mid-block location and intersections. Under no circumstances will valves be permitted in driveways unless approved in writing by Aquatera.
- b) Distribution main valves shall be located such that during a shutdown:
 - i) No more than one hydrant is taken out of service.
 - ii) No more than three valves are required to affect a shutdown.
 - iii) No more than one standard City block is taken out of service by a shutdown and in any case no more than 20 dwelling units.
 - iv) For commercial sites, the minor feeder shall be looped with at least one valve in the loop.

8.3.10 FLUSH POINT / BLOW-OFF VALVE

- a) All dead end water mains/services (services greater than 75mm) shall have a flush point device dependent on the size of the pipe, at minimum shall have a blow-off device installed within 1.0 m of the end of the line. Temporary flush point/blow-off valves will be required on dead end mains that will be extended to service future development to accommodate proper flushing and testing of the line. These temporary flush point/blow-off valves are to be constructed to the same standard as permanent blow-off valves. Temporary flush points/blow-off valves are to be removed and disconnected when the water main is extended with future development.

In locations where a hydrant has not been provided at the end of a dead-end length of main, a flush point device type and valve shall be provided to permit flushing.

b) FLUSH POINT DEVICE

Based on the latest version of AWWA 651 standards, pipe of increased size shall require alternate flush point devices to achieve velocities for proper flushing.

8.3.11 WATER SAMPLING STATION

Water Sampling Stations shall be installed at locations as directed by Aquatera in order facilitate the sampling and analysis of the water distribution system.

8.3.12 WATER CHAMBERS

Shall be designed with min of 50mm insulation to a depth of 2.75m.

All Chambers shall be water tight.

Chambers shall not be designed in ponding areas.

8.4 **DISINFECTION**

- a) All the watermains and appurtenances shall be disinfected by, or under supervision of the Consulting Engineer in accordance with the latest version of AWWA C651, Disinfecting Water Mains.
- b) Aquatera shall be contacted to schedule an appointment to witness the turbidity, super chlorination, post super chlorination tests and the sampling for the bacteriological tests. Documentation is to be provided to Aquatera covering specific details of the chlorinating procedure including but not limited to the following: date, time, those present, method used, initial concentration and residual concentration.
- c) The line shall be flushed and the chlorine residual of the water being disposed shall be neutralized prior to discharge. Water samples for bacteriological testing shall be taken in accordance with the latest version of AWWA Standard C651. Bacteriological testing shall be in accordance with the latest version of *Standard Methods for the Examination of Water and Wastewater*.

- d) Disinfection records and bacterial test results must be reviewed and approved by Aquatera prior to the water lines being put into service. Test results that are received and dated more than sixty (60) days shall be considered stale dated, and as such will not be accepted by Aquatera, and will require retesting of the turbidity, chlorine and the bacteria tests.
- e) The Consulting Engineer will complete in full and submit to Aquatera, a copy of the Chlorine Residual and Bacterial Sampling Reports, complete with a copy of the results from the certified testing lab (standard council of Canada ISO 17025).
- f) Water lines 50mm and greater (including rink hydrants and MR services) shall at a minimum, have a flush point device to test for 5ntu turbidity, pressure test, chlorination, 2ntu turbidity and bacterial test day 1 & 2 over 24 hours apart.

8.5 TESTING

- a) All watermains shall be tested in accordance with Aquatera's Construction Manual. For P.V.C. pipe, the overall leakage for the section of line tested shall not exceed the rate of leakage specified in Aquatera's Construction Manual.
- b) Prior to issuance of the Initial Construction Completion Certificate (CCC), the Developer's Engineer shall request tests of designated hydrants to be conducted by Aquatera to verify that the flows and pressures identified in the design calculations are being provided in the field. The Developer's Engineer shall coordinate the flow testing with Aquatera and ensure that a representative is present for all testing. Results of the testing shall be compiled by Aquatera and submitted to the Developer's Engineer for a comparison of the actual flows and design flows for the same hydrant. Where the actual flows do not meet the minimum fire and service requirements, all hydrants in the project must be tested and the Developer must advise the corrective actions he shall be taking to provide the necessary service level. The location and extent of initial testing shall be as required by Aquatera.
- c) All water main tests results required by this Design Manual and/or the Construction manual must be received and approved by Aquatera prior to placing the water lines into service. All test results are to be submitted together along with a letter from the Developer's Engineer to the effect that all test results required of Aquatera have been conducted satisfactorily, that the water mains are suitable for connection to the existing system and a recommendation that Aquatera do so. The letter must be stamped by the engineer. Following this request, Aquatera will put the water mains into service within 7 working days and notify the Chief Building Inspector and Fire department of such. The City of Grande Prairie will not issue building permits until they have received such notification from Aquatera.

Table 8.1 WATER DISTRIBUTION SYSTEM DESIGN STANDARDS 2020

Section	Parameters	City of Grande Prairie	County of Grande Prairie Urban/Rural	County of Grande Prairie Trickle Feed System	Town of Sexsmith
8.3.1	Water Demand				
	Residential Average Day (L/cap/d)				
	Maximum Day Peaking Factor	275	275	Water Demand of Country Residential to be 2 L/min/unit	275
	Peak Hour Peaking Factor	2.0	2.0		2.0
		3.0	3.0		3.0
	Non-Residential				
	Commercial (L/ha/d) General Commercial (L/ha/day) Highway commercial (L/ha/day)	20,000 26,000	10,000 26,000		10,000
	Industrial (L/ha/d) Light Industrial (L/ha/day) Heavy Industrial (L/ha/day)	10,000 20,000	10,000 20,000 *		10,000
	Institutional School (L/ha/day) Hospital (L/ha/day)	20,000 30,000	15,000		15,000
	Maximum Day Peaking Factor	1.5	1.4		1.4
	Peak Hour Peaking Factor	2.0	2.0		2.0
8.3.2	Population Density (persons/Gross ha)				
	RR = 3.2 * 11	35	RR1 = 36	RR1 = 36	25
	RL = 3.2 * 11	35	RR2 = 45	RR2 = 45	
	RG = 3.2 * 12.5	40	RR3 = 45	RR3 = 45	
	RT = 1.6 * 52	83.2	RR4 = 51	RR4 = 51	
	RM = 1.6 * 74	118.4	RE = 27	RE = 27	
	RH = 1.6 * 124	198.4	MHC = 51	MHC = 51	
8.3.3 - 5	Minimum pressure (kPa)				
	Peak Hour	280	280	140	280
	Max. Day + Fire Flow	140	140		140
	Maximum pressure (kPa)	690	690	690	690
8.3.6	Fire Flows (L/s)		95	n/a	95
	Low Density Res	95			
	Townhouse/ Row Housing/ Mobile Home Park	130			
	Med Density Res., Duplex	130			
	High Density Res.	180			
	Commercial and Institutional	180			
	Industrial	225			
	Hydrant Spacing (m) Residential [Radial Coverage] Multi-Family All Other Land Use	150 90 90	150 120 90		150 100 90
8.3.7.a	Minimum pipe size (mm)			50	
	Residential Multi-family	150	150		150
	Commercial Industrial	200	200		200
		250	250		250
		250	250		250
8.3.7.b	Hazen Williams Friction Coefficient "C"	140	140	140	140
8.3.7.c	Maximum length unlooped Watermain (m)	100	100		100
	Maximum Number of Units	20	20	20	20
LEGEND	* * * denotes site specific when flow exceed 20,000 L/ha/d MHC = Manufactured Home Community	Res = residential Apt = apartment	L/ha/d = Litre per hectare per day L/s = Litre per second	L/cap/d = Litre per capita per day Ha = hectare	