

SECTION 08

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 and 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 watermain is 150 m except in single family residential cul-de-sacs where the maximum watermain 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.

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

8.2 TRANSMISSION SYSTEM

As required to comply with Aquatera Water Distribution System Master Plan 2005.

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) 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.)
- d) 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 meter for pipes of a diameter of greater than 300 mm, measured from the outside walls of the pipes.
- e) 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.
- f) At crossings, a minimum vertical distance shall be maintained between a water main(s) and storm main(s) of 500 mm.
- g) 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.

- 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 a valve.

- 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 50 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.

- 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 BLOW-OFF VALVE DEVICE

Unless approved otherwise by Aquatera, all dead end mains shall have a blow-off device installed within 1.0 metre of the end of the line. Temporary blow-off valves will be required on dead end mains that will be extended to service future to accommodate proper flushing and testing of the line. These temporary blow-off valves are to be constructed to the same standard as permanent blow-off valves. Temporary blow-off valves are to be removed and disconnected when the water main is extended. Service saddles must be removed from the water main and either a repair clamp installed in its place or the pipe section removed.

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

8.3.11 WATER SAMPLING STATION

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

8.4 DISINFECTION

- a) All the watermains and appurtenances shall be disinfected by, or under supervision of, competent personnel in accordance with the latest version of AWWA C651, Disinfecting Water Mains.
- b) Aquatera shall be notified at least 16 business hours prior to testing so they may witness the residual chlorine test and the sampling for the bacteriological test. 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 (continuous feed, slug, tablet), initial concentration and residual following 24 hours.

- c) The minimum residual chlorine after 24 hours shall be 10 mg/L.
- d) 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*.
- e) 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.
- f) The Consulting Engineer will complete in full and submit to Aquatera, a copy of the Chlorine Residual and Bacterial Sampling Reports as appended to this Section, complete with a copy of the results from the Public Health Unit.

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 co-ordinate 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.

Adopted: March, 2005

Updated: January, 2009

Table 8.1 WATER DISTRIBUTION SYSTEM DESIGN STANDARDS

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)	275	275	Water Demand of County Residential to be 4 L/min/unit	275
	Maximum Day Peaking Factor	2.0	2.0		2.0
	Peak Hour Peaking Factor	3.0	3.0		3.0
	Non-Residential				
Commercial (L/ha/d)					
General Commercial (L/ha/d)	20,000	10,000		10,000	
Highway Commercial (L/ha/d)	26,000	26,000		26,000	
Industrial (L/ha/d)					
Light Industrial (L/ha/d)	10,000	10,000		10,000	
Heavy Industrial (L/ha/d)	20,000	20,000 *		20,000 *	
Institutional					
School	20,000	15,000		15,000	
Hospital	30,000				
Maximum Day Peaking Factor	1.5	1.4		1.5	
Peak Hour Peaking factor	2.0	2.0		2.0	
8.3.2	Population Density (person/ha)				
	RR = 3.2 * 11	RR = 35	RR1 = 36	RR1 = 36	
	RL = 3.2 * 11	RL = 35	RR2 = 45	RR2 = 45	
	RG = 3.2 * 12.5	RG = 40	RR3 = 45	RR3 = 45	
	RT = 1.6 * 52	RT = 83.2	RR4 = 51	RR4 = 51	
	RM = 1.6 * 74	RM = 118.4	RE = 27	RE = 27	
	RH = 1.6 * 124	RH = 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	690	690	690	690
8.3.6	Fire Flows		95	N/A	95
	Low Density Residential	95			
	Townhouse/Local Comm./MHC	150			
	Walk Up Apt./Med. Density Res./Transitional Res.	185			
	Industrial/High Density Res./Highway Comm. Institutional	225 225			
Hydrant Spacing (m)				N/A	
Residential (Radial Coverage)	150	150		150	
Multi Family (Linear Coverage)	90	120		120	
All other land uses (Linear Coverage)	90	90		90	
8.3.7.a	Minimum Pipe Size			50	
	Residential	150	150		150
	Multi Family	200	200		200
	Commercial	250	250		250
Industrial	250	250		250	
8.3.7.b	Hazen Williams Friction Coefficient "C"	140	140	140	140
8.3.7.c	Maximum Length of Unlooped Watermain	100	100		100
	Maximum Units for Unlooped Watermain	20	20	20	20
LEGEND	* denotes site specific when flows 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/ha = Litre per capita per day Ha = hectare	