

Town of Millet - Policy #51

Minimum Design Standards

Prepared for
Town of Millet

Prepared by
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ADOPTED BY COUNCIL RESOLUTION 10th DAY OF MARCH, 2004

MAYOR _____

March 2004

TOWN OF MILLET
MUNICIPAL SERVICING STANDARDS

Dated: March 2004

TABLE OF CONTENTS

		<u>No. of Pages</u>
PART A	SUBMISSION STANDARDS	2
PART B	ROADS	7
PART C	SANITARY SEWERAGE SYSTEM	6
PART D	WATER DISTRIBUTION SYSTEM	7
PART E	STORM DRAINAGE SYSTEM	5
PART F	GAS, POWER AND TELEPHONE SERVICES	1

A SUBMISSION STANDARDS

A1 Design Drawings

A1.1 General

- .1 All detailed engineering plans submitted for review and approval must comply with the specifications stated herein.

A2 Required Engineering Drawings

The drawings identified shall clearly highlight the detail as indicated.

A2.1 Cover Sheet

- .1 This shall show the name of the subdivision, stage of development and names of the Developer, Planner and Consulting Engineer.

A2.2 Index Plan

- .1 This plan shall be prepared on a scale of 1:1000 or a reduction thereof to fit the standard size A-1 sheet (594 mm x 841 mm) and shall indicate that portion of the street which relates to a particular plan/profile sheet.
- .2 This sheet shall list each drawing included in that particular set of drawings. Each drawing name is to be listed sequentially along with its corresponding drawing number. Also included on this plan shall be a key plan in sufficient detail to show the location of the project with respect to major roads and built-up centres.

A2.3 Legal, Easement and Land Use Plan

- .1 This plan shall indicate proposed land uses in the project along with existing and/or proposed land use on adjacent properties.
- .2 All legal and easement information shall be shown on this plan.

A2.4 Road, Sidewalk and Storm Sewer Plan

- .1 This plan shall indicate all walks, lanes, road and right-of-way widths and alignments, catch basin locations, the storm sewer system, the direction of overland flow on the streets and local drainage areas which contribute to the storm sewer system.

A2.5 Lot Grading Plans

- .1 The plan shall highlight the following:
 - .1 the proposed finished lot corners, mid lot and house elevations, the direction of flow of surface drainage on the lot, proposed curb alignments, all required rear and side yard swales and sewer connection inverts at the property line,
 - .2 bench marks used in the construction of the project,
 - .3 existing contours shown at 0.5 metre intervals,
 - .4 the overland major drainage system including ponding areas and depths resulting from a 1:100 year storm, and
 - .5 elevation of services at the property line for each lot.

A2.6 Sanitary Sewer and Water Main Plan

- .1 This plan shall indicate the alignments and locations of mains, size of mains, grade and directions of flow, and location of appurtenances such as manholes, valves, cleanouts, etc.
- .2 Indicate location of sanitary and water services.

A2.7 Plan/Profile and Standard Detail Drawings

- .1 The Plan/Profile and Standard Detail Drawings shall be drawn to avoid clutter and promote clarity and legibility.

END OF SECTION

B ROADS**B1** Geometric Design Standards**B1.1** General

- .1 Road classification and designation shall be in accordance with the classification system outlined in the Transportation Association of Canada (TAC) Manual - Geometric Design Standards for Canadian Roads and Streets.
- .2 Individual street classification is to be based on functional use.
- .3 The Developer is responsible to make sure that the infrastructure is designed and constructed to achieve life expectations consistent with good design and construction practice.

B1.2 Road Right-of-Way

- .1 The right-of-way shall be adequate width to accommodate the road, sidewalks, boulevards, underground utilities, streetlighting, etc., in an acceptable manner.
- .2 Minimum right-of-way requirements are as follows:

Lanes	6 metres
Cul-de-Sacs	18 metres
Residential Streets	18 metres
Collector Streets.....	24 metres
Arterial Streets	30 metres

B1.3 Road Width

- .1 Road widths shall be designed to satisfy traffic requirements. Minimum requirements are as follows:

Lanes	5 metres
Cul-de-Sacs	10 metres
Residential Streets	10 metres
Collector Streets.....	13 metres
Arterial Streets	15 metres

The road width is measured from curb face to curb face.

B1.4 Vertical Alignment**.1 Grade**

- .1 The minimum grade shall be 0.5% along all gutters and around curb returns.
- .2 The maximum grade shall be 6.0%.
- .3 All roads shall be crowned at a minimum slope of 3.0% or 150 mm, whichever is greater, and a maximum of 4.0%.

.2 Vertical Curves

- .1 All vertical curves shall be designed to meet the minimum requirements as shown in Table B1.

TABLE B1		
Design Speed (km/hr)	K Value	
	Crest (m)	Sag (m)
50	7	6
60	15	10

Where: $K = L/A$
 L = Length of Vertical Curve in metres
 A = Algebraic Difference in Grade Percent

- .2 The minimum length of a vertical curve shall be 30 metres.
- .3 Vertical curves are not required where the algebraic difference in the grades is less than 1.5.

B1.5 Horizontal Alignment**.1 Curves**

- .1 The minimum degree of curvature is dependent on the classification and its design speed.
- .2 All horizontal curves shall be designed to meet the minimum design requirements as shown in Table B2.

TABLE B2				
Classification	Minimum Radius of Curve (m)	Maximum Tangent Length (m)	Maximum Gradient (%)	Intersection Spacing (m)
Cul-de-Sac	90	30	6	60
Residential	90	60	6	60
Collector	130	60	6	60
Arterial	450	60	5	400

NOTES:

1. See TAC B-16 for superelevation requirements on arterials.
2. Design speeds are 60 km/h, except for arterials which are 70 km/h.

B1.6 Survey Control Markers and Legal Pins**.1** Existing Control

- .1 The Developer or their Consultant shall make every effort to protect existing markers.
- .2 Markers which are destroyed or disturbed shall be replaced by the Developer at his sole expense.

.2 Legal Posts

- .1 Front lot legal posts shall be clearly marked with a flexible marker post extending a minimum of 1.0 metre above grade at initial posting of the subdivision.
- .2 The Developer shall instruct the legal surveying consultant to replace any missing or disturbed posts as required by the Town of Millet. All costs are to be borne by the Developer.

B2 General Requirements**B2.1** Pavement Structure

- .1 The Geotechnical Report for the proposed project shall be submitted to the Town of Millet for review as part of the overall submission.
- .2 The Geotechnical Report must include specific recommendations for pavement structure construction based on in situ conditions and projected traffic volume. The stronger of the structure recommended by the Geotechnical Consultant and the structure shown in Table B3 shall be used.
- .3 Table B3 indicates the minimum thicknesses of granular and asphaltic concrete materials required for each street classification. Note that a minimum subgrade preparation of 150 mm is required in every case. The subgrade and base gravel must be compacted to 100% Standard Proctor Density.
- .4 Alternative pavement designs of equivalent strength along with supporting material, may be submitted to the Town of Millet for review and approval prior to construction.

TABLE B3				
Street Classification	Road Structure			
	Hot Mix Asphalt (mm)	Granular Base Course (mm)	Granular Subbase (mm)	Subgrade Preparation (mm)
Residential Lane	N/A	150	N/A	150
Residential Street	50 (initial) 35 (after 1 year)	250	N/A	150
Collector	50 (initial) 35 (after 1 year)	300	N/A	150
Arterial	75 (initial) 35 (after 1 year)	250	300	150

B2.2 Sidewalks and Walkways

- .1 Separate sidewalks shall be a minimum width of 1.2 metres. Separate sidewalks shall be constructed on all collector roadways and may also be used on local residential streets.
- .2 Paraplegic ramps are to be used at all curbed intersections and shall be constructed monolithically or securely dowelled.
- .3 All sidewalks shall be imprinted with the Contractor's stamp showing company name and year of construction. Frequency of stamps shall be one per residential block or every 200 metres, whichever is less.
- .4 Sidewalks shall be imprinted with a "CC" to identify all CC locations.
- .5 All concrete structures are to be adequately reinforced. All concrete structures require a minimum compressive strength of concrete at 28 days of 30 MPa. In all, concrete air entrainment by volume shall be a minimum of 5.5% and a maximum of 8%. The subgrade and base gravel under concrete structures must be compacted to 100% Standard Proctor Density.
- .6 The design of the subdivision should consider pedestrian needs and allow for walkways through cul-de-sacs and other appropriate locations, if necessary.

B2.3 Concrete Curb and Gutter

- .1 Concrete curb and gutter shall be constructed on all streets.
- .2 Vertical face curb and gutter is to be used on all arterial roads. All roads fronting parks, public utility lots (other than emergency accesses), and walkways shall also require vertical face curb and gutter unless another means of preventing vehicular access onto these public lands is provided.

- .3 Curb returns on residential street intersections shall be constructed with a minimum radius of 8.0 metres.
- .4 Curb returns in industrial/commercial areas shall be constructed with a minimum radius of 15.0 metres to accommodate truck turning movements.
- .5 Local residential streets, collectors and cul-de-sacs will be low profile curb.
- .6 All concrete curbs and monolithic curbs and walks shall be constructed with the same subgrade structure as the adjacent road. The structure is to extend 300 mm beyond the back of curb or walk.
- .7 Concrete curbs and gutters may not be required in developments designed as County Residential.

B2.4 Driveways

- .1 Residential subdivision lot layout shall be such that driveways shall not access directly onto arterial roadways.
- .2 All driveways shall be constructed to provide a minimum clearance of 1.5 metres from any structure including hydrants, light standards, service pedestals, curb cocks and transformers.
- .3 No driveways or any portion thereof shall be permitted to access an abutting road through a curb return area.
- .4 For corner lots, the driveway zone must be indicated for the street of lesser traffic only.

B2.5 Utility Trenches

- .1 In all new subdivisions, it shall be the Developer's responsibility to make sure that utility trenches are adequately compacted. In existing subdivisions, the utility companies shall be responsible to ensure adequate compaction in utility trenches for any new installations or modification of existing lines.

Required Compaction	Backfill Zone
A. Under proposed road, lane, walk, streetlight or similar structure and within a distance from such structure equal to trench depth:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.
B. Under existing improved road, lane, walk or similar structure or proposed widening thereof:	
95% of standard	From existing subgrade elevation to 1.5 m below.
97% of one-mould	More than 1.5 m below.
C. Adjacent to existing improved road, lane, walk, streetlight or similar structure and within a distance from the improvement equal to trench depth:	
92% of standard	Through full depth of trench.
D. Under existing or proposed underground sewer, water, gas or pressure pipeline or other utilities:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.

Moisture Content Requirements

The maximum permitted moisture contents for compacting backfill, based on one mold proctor test, are shown below:

Maximum Moisture Content	Backfill Zone
A. Conventional Trenching Techniques:	
Plastic Limit + $\frac{(\text{Plasticity Index})}{3}$ to a maximum of 8% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + $\frac{(\text{Plasticity Index})}{3}$ to a maximum of 10% above Plastic Limit	More than 1.5 m below.
B. Uniform Backfill:	
Plastic Limit + $\frac{(\text{Plasticity Index})}{2}$ to a maximum of 10% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + $\frac{(\text{Plasticity Index})}{2}$ to a maximum of 10% above Plastic Limit	More than 1.5 m below.

- 2 The Developer is responsible to coordinate locations of shallow utility crossings of roadways with the respective utility company. All shallow utilities are to be contained in conduit of appropriate size and number for all roadway crossings.

B2.6 Street Signs

- .1 High intensity reflective material is required for the lettering and background for all signage.
 - .1 Lettering sizes shall be as follows:
 - 100 mm collector roadways
 - 75 mm collector and local roadways.
 - .2 All street name signs shall be of theme design approved by the Town of Millet.
- .2 Traffic control signage will be required at all intersections.

END OF SECTION

C SANITARY SEWERAGE SYSTEM

C1 Design Factors

C1.1 General

- .1 The sanitary sewerage system shall be of sufficient capacity to carry peak flows plus infiltration. The factors outlined in the following sections shall be used in the design of sanitary sewerage systems.
- .2 The Developer and the Developer's Consultant are responsible to make sure that the infrastructure is designed and constructed to achieve design life expectations consistent with good design and construction practice.

C1.2 Average Flows

- .1 Residential - 320 litres/day/capita.
- .2 Commercial/Industrial - 6.0 m³/ha/day.
- .3 In determining residential flows, a minimum of 3.5 persons per household shall be used.

C1.3 Peaking Factor

- .1 The peaking factor shall be calculated on the Harmon Formula. The minimum peaking factor shall be 3.0.
- .2 The peaking factor must reflect the projected population of the subdivision being designed.

C1.4 Velocities

- .1 Minimum flow velocity - 0.60 m/s.
- .2 Maximum flow velocity - 3.0 m/s.

C1.5 Manning's "n" Value

- .1 Pipe sizing shall be determined by utilizing Manning's Formula using a minimum "n" value of 0.013.

C1.6 Weeping Tiles

- .1 Weeping tiles and similar appurtenances shall not be permitted to discharge into sanitary sewers.

C1.7 Infiltration Allowance

- .1 The design of the sanitary sewer system must provide for peak extraneous flow. A minimum allowance of 0.28 L/s/ha must be incorporated into the design.

C2 Materials

C2.1 Sewer Mains

- .1 The minimum pipe size shall be 200 mm inside diameter.
- .2 Pipe for sewer mains shall conform to one of the following:

Material	Class
PVC Pipe	ASTM D3034 Minimum Class DR35.
PVC Pipe Fittings	To comply with the Alberta Labour Plumbing and Gas Safety Standards for fabricated PVC DWV fittings 200 mm through 600 mm minimum Class DR35.

C2.2 Materials

- .1 Manhole sections shall be precast reinforced concrete sections conforming to ASTM C478, latest revision thereof.
- .2 All manholes shall normally be 1,200 mm inside diameter.
- .3 Manhole steps shall be standard safety type, hot dipped galvanized iron or aluminum.
- .4 All joints shall be sealed with rubber gaskets and grouted outside.
- .5 Manhole frames and covers shall be cast iron conforming to Class 20 ASTM A48, latest revision thereof.
- .6 Manhole bases shall be precast slabs, concrete poured bases, vaults or precast tees.
- .7 Concrete for manholes and appurtenances shall be sulphate resistant with a maximum slump of 75 mm and minimum 28 day strength of 25 MPa.
- .8 Safety platforms shall be required in all manholes with a depth greater than 6.0 metres.

C3 Installation

C3.1 Sewer Mains

- .1 Mains shall be installed to provide a minimum depth of cover to obviate of 3.00 metres below the final finished surface grade.
- .2 Class "B" pipe bedding shall be provided for all mains.
- .3 Minimum gradients on straight runs shall conform to Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, latest edition.

C3.2 Manholes

- .1 Manholes shall be located at the end of each line, at all changes in pipe size, grade, alignment, and at all junctions.
- .2 The maximum distance between manholes shall not exceed 120 metres.
- .3 Inverts in manholes shall have a minimum 25 mm drop for straight run sewer manholes. At changes in direction, manholes shall have at least 40 mm fall across the manhole in the direction of flow from inlet to outlet elevation.
- .4 Backfill around manholes shall be compacted with mechanical tampers to a minimum of 98% Standard Proctor Density.
- .5 Internal drops are required for invert grade differences greater than 1.0 metre in sanitary sewer manholes.

C3.3 Curved Sewers

- .1 Curved sewers shall be in accordance with manufacturer's guidelines.
- .2 The curve shall run parallel to the curb or street centreline.
- .3 The minimum grade for sewers on a curve shall be 50% greater than the minimum grade required for a straight run of sewer.
- .4 Manholes shall be located at the beginning and end of each curve and intermediate locations as required.

C3.4 Compaction in Trench

- .1 In all new subdivisions, it shall be the Developer's responsibility to make sure that utility trenches are adequately compacted. In existing subdivisions, the utility companies shall be responsible to ensure adequate compaction in utility trenches for any new installations or modification of existing lines.

Required Compaction	Backfill Zone
A. Under proposed road, lane, walk, streetlight or similar structure and within a distance from such structure equal to trench depth:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.
B. Under existing improved road, lane, walk or similar structure or proposed widening thereof:	
95% of standard	From existing subgrade elevation to 1.5 m below.
97% of one-mould	More than 1.5 m below.
C. Adjacent to existing improved road, lane, walk, streetlight or similar structure and within a distance from the improvement equal to trench depth:	
92% of standard	Through full depth of trench.
D. Under existing or proposed underground sewer, water, gas or pressure pipeline or other utilities:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.

Moisture Content Requirements

The maximum permitted moisture contents for compacting backfill, based on one mold proctor test, are shown below:

Maximum Moisture Content	Backfill Zone
A. Conventional Trenching Techniques:	
Plastic Limit + $\frac{(\text{Plasticity Index})}{3}$ to a maximum of 8% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + $\frac{(\text{Plasticity Index})}{3}$ to a maximum of 10% above Plastic Limit	More than 1.5 m below.
B. Uniform Backfill:	
Plastic Limit + $\frac{(\text{Plasticity Index})}{2}$ to a maximum of 10% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + $\frac{(\text{Plasticity Index})}{2}$ to a maximum of 10% above Plastic Limit	More than 1.5 m below.

C3.5 Inspection and Testing

- .1 Video camera inspection reports shall be conducted on each sewer line and tapes shall be provided to the Town of Millet. Tapes used in the video reports shall be in colour and compatible with VHS viewing equipment.

C3.6 Service Connections

- .1 The minimum size of a sanitary sewer service connection to a single family dwelling shall be 100 mm inside diameter. Each lot shall have its own separate sanitary service connection. The minimum grade on the service line shall be 2.00%. The maximum length shall be limited to 15.0 metres from the main to the property line.
- .2 The minimum size of a sanitary sewer service connection to a multi-family dwelling shall be 150 mm inside diameter. Each lot shall have its own separate sanitary service connection. The minimum grade on the service line shall be 1.00%. The maximum length shall be limited to 15.0 metres from the main to the property line.
- .3 Connection to a main sewer line shall be by means of a wye fitting. Saddles are allowed only for service connections to existing mains. T-fitting service connections for sanitary sewer will be allowed provided they discharge into the top half of the main.
- .4 Service pipe shall be PVC DR28 building service pipe conforming to CSA Specification B 182.1, latest revision thereof.
- .5 Minimum depth of cover shall be 2.70 metres to the obvert at the property line.
- .6 Where sewer services are required to connect to mains in excess of 4.50 metres deep, risers shall be installed.
- .7 Sewer services shall be extended beyond the property line and terminate 3.0 metres inside the lot. All services shall be properly capped.
- .8 All sewer services shall be installed using Class "B" bedding.
- .9 Red painted stakes of 50 mm x 100 mm size shall be extended from the end of the service connection to a minimum of 0.50 metres above ground level.

SANITARY
SEWERAGE SYSTEM

- .10 Services shall be placed so that when facing the lot from the street the water service shall be on the right side of the sewer service.
- .11 Services shall be located in a position such that they do not conflict with driveway locations.

END OF SECTION

D WATER DISTRIBUTION SYSTEM

D1 Network Analysis

- .1 The Developer shall perform a hydraulic network analysis for the proposed development unless the Town of Millet approves otherwise.
- .2 The criteria for network analysis shall be as follows:
 - .1 The maximum value of "C" in the Hazen-Williams Formula shall be 120, regardless of pipe material, for diameters less than 250 mm.
 - .2 The minimum diameter for distribution mains shall be 150 mm for residential development unless one or more hydrants are located on the line, in which case the minimum diameter shall be 200 mm. For commercial/industrial development, the minimum water main size shall be 250 mm.
 - .3 Per capita design consumption:
 - .1 Average Day Demand - 350 litres/day
 - .2 Maximum Day Demand - 1.8 x Average Demand
 - .3 Peak Hour Demand - 3.0 x Average Demand.
 - .4 Design population shall be the ultimate population for the area under construction.
 - .5 An analysis shall be made for peak hour demand and the mains shall be sized such that there shall be a minimum residual pressure of 280 kPa at ground level at any node in the network.
 - .6 A separate analysis shall also be made for maximum day demand plus a fire flow of 12,000 litres per minute at a node adjacent to a high value property, e.g. school or shopping centre. The minimum residual pressure at any node in the system shall be 140 kPa at ground level under this situation.
 - .7 Fire flow conditions within a residential area shall be analyzed using the criteria contained in the most recent edition of Fire Underwriters Survey. The Developer must take into consideration the architectural control features (i.e. house size and shake roofs) which may impact on the fire flow requirements.
 - .8 All calculations, schematic diagrams, computer printouts, etc., shall be submitted together with the design plans.

- .9 New subdivisions shall be designed and constructed such that the water distribution and transmission systems through the area shall be looped.
- .10 Distribution lines must all be looped except those serving single residence cul-de-sacs of less than 120 metres.

D2 Materials

D2.1 Water Mains

- .1 Minimum Size - 150 mm for Residential Cul-de-sacs, 200 mm for Residential and 250 mm for Commercial.
- .2 Pipe materials for use in the water main system shall conform to applicable CSA, AWWA and ASTM recommendations. Pressure ratings for the water main pipe shall be determined by the applications and conditions the pipe shall be subjected to.
- .3 Pipe material shall be polyvinyl chloride C-900 Class 150 DR-18.

D2.2 Hydrants

- .1 Hydrants shall be of a style and make acceptable to the Town of Millet and shall:
 - .1 be compression type conforming to AWWA Specification C502, latest revision, for dry barrel fire hydrants,
 - .2 include two 63 mm hose nozzles with AMA thread connection,
 - .3 include one pumper connection with 100 mm "Storz" connection,
 - .4 have hydrant body painted fire red in colour,
 - .5 hydrants shall be Canada Valve Century Model,
 - .6 hydrant buried components to be asphaltic coated,
 - .7 all hydrants shall be cathodically protected with a 5.5 kilogram zinc anode.
 - .8 All bolts shall be stainless steel.

D2.3 Valves

- .1 Gate Valves
 - .1 Valves shall be iron body resilient seated gate valves with a non-rising spindle, which opens by turning in a counter clockwise direction. All valves shall conform with AWWA Specification C509, latest revision, for operation and materials.
 - .2 Cast iron, asphalt or epoxy coated valve boxes shall be required on all valves.

- .3 Extension stem to be 25 mm square mild steel with 50 mm operating nut and flange suitable for 3.0 metre bury.
- .4 All valves shall be cathodically protected with a 2.3 kilogram zinc anode.
- .5 Valve boxes shall be Type "A" sliding.
- .6 All bolts to be stainless steel.

D2.4 Service Connections

- .1 Service pipe shall be of Type K copper or Kie-Tec AWWA 800.
- .2 Residential services shall be 20 mm diameter unless the length of the service, measured from the main to the property line, is greater than 20.0 metres in which case 25 mm diameter shall be used. Non-residential service connections shall be sized according to anticipated user requirements.
- .3 Corporation main stop shall be compression type conforming to ASTM C800. Stainless steel service clamps with double stainless steel straps shall be used with all main stops for services larger than 25 mm. Corporation main stops shall be left in an open position.
- .4 Curb stop shall be copper to copper curb ball valve with stop and drain.
- .5 Curb stop boxes shall be epoxy coated or galvanized and the rod shall be stainless steel.

D3 Installation

D3.1 Water Mains

- .1 Minimum depth of cover shall be 2.7 metres to the obvert below finished ground elevation.
- .2 Class "B" granular sand bedding shall be used for all water mains except where otherwise approved by the Town of Millet.

D3.2 Compaction in Trench

- .1 In all new subdivisions, it shall be the Developer's responsibility to make sure that utility trenches are adequately compacted. In existing subdivisions, the utility companies shall be responsible to ensure adequate compaction in utility trenches for any new installations or modifications of existing lines.

Required Compaction	Backfill Zone
A. Under proposed road, lane, walk, streetlight or similar structure and within a distance from such structure equal to trench depth:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.
B. Under existing improved road, lane, walk or similar structure or proposed widening thereof:	
95% of standard	From existing subgrade elevation to 1.5 m below.
97% of one-mould	More than 1.5 m below.
C. Adjacent to existing improved road, lane, walk, streetlight or similar structure and within a distance from the improvement equal to trench depth:	
92% of standard	Through full depth of trench.
D. Under existing or proposed underground sewer, water, gas or pressure pipeline or other utilities:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.

Moisture Content Requirements

The maximum permitted moisture contents for compacting backfill, based on one mold proctor test, are shown below:

Maximum Moisture Content	Backfill Zone
A. Conventional Trenching Techniques:	
Plastic Limit + (Plasticity Index) 3 to a maximum of 8% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + (Plasticity Index) 3 to a maximum of 10% above Plastic Limit	More than 1.5 m below.
B. Uniform Backfill:	
Plastic Limit + (Plasticity Index) 2 to a maximum of 10% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + (Plasticity Index) 2 to a maximum of 10% above Plastic Limit	More than 1.5 m below.

D3.3 Inspection and Testing

- .1 Prior to the initial acceptance of the project, all water mains shall be tested for leakage in accordance with AWWA C603, latest revision.

- .2 Prior to the initial acceptance of the projects, water mains are to be disinfected in accordance with AWWA C651, continuous feed method. Procedural method of disinfection includes chlorine concentration calculations and contact times to be submitted to the Town of Millet for acceptance. Upon completion of the disinfection, one bacteria sample is to be submitted for each 200 linear metres of water main installed unless otherwise approved by the Town.
- .3 Prior to initial acceptance of the project, bacteriological testing shall be carried out on all water mains.

D3.4 Hydrants

- .1 Maximum allowable spacing between fire hydrants shall be 140 metres in single family residential areas and 90 metres in multiple family residential, school or industrial/commercial areas.
- .2 Hydrants shall be set so that the bottom flange is approximately 50 mm above final ground elevation at the hydrant.
- .3 Hydrants must have breakaway flanges installed at the base of the body and must not extend below the ground grade line.
- .4 Installation shall be at the beginning of the curve of the curb return at the corners of intersections or at the extension of property lines.
- .5 Hydrants are to be 0.6 metres clear of curb lines and 0.15 metres clear of back of sidewalk.
- .6 In cul-de-sacs of 75 metres in length or less, the hydrant shall be installed at or near the intersection of the intersecting street.
- .7 In cul-de-sacs of more than 75 m in length, a hydrant shall be installed at the end of the cul-de-sac.

D3.5 Valves

- .1 Distribution main valves shall be located as follows:
 - .1 on the projection of property lines.
- .2 Distribution main valves shall be located such that in the event of a shutdown:
 - .1 no more than two hydrants are taken out of service,
 - .2 no more than four valves are required to affect a shutdown,
 - .3 maximum length of a dead end line is 120 metres,

-
- .4 no more than 25 single family units are involved in the shutdown, and
 - .5 commercial sites loop the main feeder with at least one valve on the loop.
 - .3 Valves on hydrant leads are to be located in the boulevard area. All hydrants must be separated from the distribution system by a valve located 1.0 metre from the hydrant. In areas where the water main is located in the back lane, the hydrant valves shall be located at the lane.
 - .4 Valve boxes, complete with operating extension stems and rock disk nut, are required on all valves.
 - .5 The top of the valve box is to be set 100 mm below final grade elevation on gravel areas and between 5 to 15 mm below finished grade on paved areas.
 - .6 The rock disk nut shall not be more than 600 mm below finished grade.
 - .7 Valves shall be of the same size as the main.
 - .8 Sliding type cast iron valve casing shall be installed over each valve.
 - .9 A water main in a cul-de-sac which exceeds 120 metres in length must be looped to an adjacent water main through a Public Utility Lot (PUL). The PUL should be a minimum of 4.0 metres wide with provision for a 1.0 metre easement on each side of the PUL.

D3.6 Water Service Connections

- .1 Tapping for service connections shall be done with full operating pressure in the main unless otherwise approved by the Town of Millet.
- .2 Each service connection shall be tapped into the upper portion of the water main at least 45 degrees from the vertical and utilize a corporation stop.
- .3 Service pipe from the main to the curb cock shall be installed to provide a minimum depth of cover 2.7 metres below finished road grade.
- .4 Curb cocks shall be located such that they do not conflict with driveway locations. Curb cocks are not to be placed in concrete driveways or sidewalks. Curb cocks shall be located 0.15 metres from the property line within the right-of-way.

WATER
DISTRIBUTION SYSTEM

PART D
Page D7

- .5 Each residential dwelling unit must have a separate service.
- .6 Services shall be placed so that when facing the lot from the street, the water service shall be on the right side of the sewer service.
- .7 The symbol CC shall be stamped in the sidewalk opposite the location of the curb cock.
- .8 Water services shall be extended beyond the property line and terminate 3.0 metres inside the lot. All water service ends shall be wrapped with an approved filter fabric.
- .9 A horizontal "goose neck" in the copper service shall be made at the corporation main stop.

END OF SECTION

E STORM DRAINAGE SYSTEM

E1 Minor System

E1.1 Design Criteria

- .1 The Rational Method shall be used in the design of storm sewers as follows:

$$Q = CIA/360$$

Where Q = the quantity of runoff in cubic metres per second.
 I = the intensity of rainfall in millimetres per hour.
 A = the contributing area in hectares.
 C = the runoff coefficient.

- .2 Rainfall data shall be taken from the most current intensity-duration-frequency curves for the City of Edmonton Municipal Airport.
- .3 The following runoff coefficients shall be used:

Land Use	Runoff Coefficient, C
Parks, Reserves and School Grounds	0.20
Residential Single Family	0.40
Residential Multiple Family	0.60
Residential High Density	0.70
Commercial	0.70
Industrial	0.70

- .4 Maximum inlet time of 15 minutes shall be used. The use of longer inlet times requires the prior approval of the Town of Millet.
- .5 The storm sewer shall be designed to accommodate the 5 year return storm without sewer surcharging.
- .6 The minimum and maximum flow velocities in any sewer shall be 0.60 m/s and 3.0 m/s, respectively. Designs containing velocities in excess of 3.0 m/s shall require special provisions and the approval of the Town of Millet.
- .7 Pipe sizing shall be determined by utilizing Manning's Formula using an "n" value of 0.013.
- .8 Where groundwater levels are high, the Town may require separate storm sewer connections to each approved lot.

- .9 Weeping tiles shall be connected to sumps, with pumped discharge directly to ground surface (splash pads are required to ensure positive drainage away from the house for a distance of 1.5 metres). Sump pump discharge lines to the ground surface shall be limited to 1.5 metres from the face of the building at the point of discharge to the rear of the lot. Other alternatives may be submitted to the Town of Millet for acceptance.
- .10 The geotechnical report shall address weeping tile flows associated with a high groundwater table or other subsurface anomalies.

E2 Materials

E2.1 Sewer Mains and Leads

- .1 Pipe for storm sewer mains shall be concrete pipe (sulphate resistant cement) conforming to ASTM C76 reinforced concrete pipe.
- .2 Pipe for catch basin leads shall be PVC DR35 conforming to CAN B182.2 and ASTM D3034.

E2.2 Catch Basins

- .1 Catch basin frames and covers shall be sized to provide sufficient inlet capacity.

E2.3 Manholes

- .1 Manhole sections shall be precast reinforced concrete sections conforming to ASTM C478, latest revision thereof.
- .2 Manhole frames and covers shall be cast iron conforming to Class 20 ASTM A48, latest revision thereof.
- .3 Manhole steps shall be standard safety type, of hot dipped galvanized iron or aluminum.

E3 Installation

E3.1 Sewer Mains

- .1 The minimum size for storm sewer mains shall be 300 mm inside diameter.
- .2 Minimum depth of cover shall be 1.2 metres to obvert.

E3.2 Catch Basin Leads

- .1 The minimum size of catch basin leads shall be 250 mm inside diameter.
- .2 A catch basin manhole shall be required at the upper end of a catch basin lead if the lead exceeds 30 metres.
- .3 The minimum grade on a catch basin lead shall be 1.00%.
- .4 Minimum depth of cover shall be 1.2 metres to obvert.
- .5 All leads shall be connected to a main line manhole or a catch basin manhole.

E3.3 Catch Basins

- .1 The maximum distance between catch basins shall be 200 metres.
- .2 Spacing and capacity of catch basins shall be such that ponding shall not occur during a 1:5 year storm. Road gutter flows shall not exceed 0.04 cubic metres per second per gutter between catch basins during a 1:5 year storm.
- .3 The minimum inside diameter for a catch basin barrel shall be 600 mm.
- .4 The minimum sump depth in a catch basin shall be 600 mm.

E3.4 Manholes

- .1 The minimum size of storm manholes shall be 1,200 mm inside diameter.
- .2 Manhole bases shall be precast slabs, concrete poured bases, vaults or precast tees.
- .3 Tee riser manholes shall be used when the mains are over 1,050 mm inside diameter unless otherwise approved by the Town of Millet.

E3.5 Compaction in Trench

- .1 Class "B" bedding material shall be compacted to a minimum 95% Standard Proctor Density.

- .2 In all new subdivisions, it shall be the Developer's responsibility to make sure that utility trenches are adequately compacted. In existing subdivisions, the utility companies shall be responsible to ensure adequate compaction in utility trenches for any new installations or modification of existing lines.

Required Compaction	Backfill Zone
A. Under proposed road, lane, walk, streetlight or similar structure and within a distance from such structure equal to trench depth:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.
B. Under existing improved road, lane, walk or similar structure or proposed widening thereof:	
95% of standard	From existing subgrade elevation to 1.5 m below.
97% of one-mould	More than 1.5 m below.
C. Adjacent to existing improved road, lane, walk, streetlight or similar structure and within a distance from the improvement equal to trench depth:	
92% of standard	Through full depth of trench.
D. Under existing or proposed underground sewer, water, gas or pressure pipeline or other utilities:	
100% of one-mould	From designated subgrade elevation or existing ground level, whichever is lower, to 1.5 m below.
97% of one-mould	More than 1.5 m below.

Moisture Content Requirements

The maximum permitted moisture contents for compacting backfill, based on one mold proctor test, are shown below:

Maximum Moisture Content	Backfill Zone
A. Conventional Trenching Techniques:	
Plastic Limit + $\frac{(\text{Plasticity Index})}{3}$ to a maximum of 8% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + $\frac{(\text{Plasticity Index})}{3}$ to a maximum of 10% above Plastic Limit	More than 1.5 m below.
B. Uniform Backfill:	
Plastic Limit + $\frac{(\text{Plasticity Index})}{2}$ to a maximum of 10% above Plastic Limit	From designated subgrade elevation, or existing ground level, whichever is lower, to 1.5 m below.
Plastic Limit + $\frac{(\text{Plasticity Index})}{2}$ to a maximum of 10% above Plastic Limit	More than 1.5 m below.

- .3 Backfilling shall be carried out using selected material compacted in 150 mm layers.

E3.6 Inspection and Testing

- .1 Refer to Section C3.5.

END OF SECTION

F GAS, POWER AND TELEPHONE SERVICES

F1 Gas, Power and Telephone

- .1 The gas, power, cable TV and telephone services to be installed shall be arranged between the Developer and respective utility companies and shall be installed underground. Any cost for these services by the respective utility companies shall be paid by the Developer.
- .2 Each utility company shall submit plans of the proposed works to the Town of Millet for approval prior to construction. All gas, power, cable TV and telephone utilities shall conform to the same standards for trench compaction and clean up as sewer and water utilities.

F2 Streetlighting

- .1 Streetlighting shall be arranged by the Developer to a standard of lighting comparable to existing standards within the Town of Millet and specifications currently used by the local power franchise company within the Town of Millet.
- .2 Streetlight cables shall be installed underground and an acceptable type of steel post with fixture shall be used.
- .3 The Town of Millet will pay rental charges to the utility company for the operation of streetlights after the development construction has been accepted by the Town.
- .4 The Town of Millet shall approve the streetlighting layout and fixture type prior to installation.
- .5 Streetlights shall be placed at locations not interfering with the proposed driveways and in general shall be located in line with the extension of the common property line between two lots.
- .6 The face of the posts shall be at least 0.6 metres clear of the face of the curb or the back of sidewalk.
- .7 Streetlights shall be provided for each internal park area that does not abut onto a lighted street. Additional streetlights may be required, depending on the size of the park. A streetlight shall be located at the point where each walkway opens onto the park area.

END OF SECTION