CITY OF SWIFT CURRENT

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PART A3

SANITARY SEWER SYSTEM

OCTOBER 2020

1 GENERAL

The design of the sanitary sewer system shall conform to the *Saskatchewan Environment Code – Sewage Main Chapter* and *Sewage Works Design Standard*, latest editions, as published by the Saskatchewan Ministry of Environment and used as a companion to the applicable Acts, regulations, and other provincial publications and as amended by these Guidelines and Standard Details.

These Development and Design Standards shall be used in conjunction with the related City Construction Specifications.

2 DEFINITIONS

The following definitions are intended to be specific to the Sanitary Sewage System Standards. For additional general definitions refer to Part A1 – General Requirements.

Manning's Equation: Is a common equation that applies to flow in open channels, taking into account velocity, flow area, and slope.

Hydraulic Analysis: An Engineering analysis determining the water systems minimums to meet city, provincial, or federal requirements.

3 SUBMISSIONS AND APPROVALS

3.1.1 All Drawing plans and Engineering documents must be submitted to the City for approval. All design drawings will follow the requirements stated in the drawings section of the General Requirements.

3.1.2 All calculations, schematic diagrams, computer printouts, etc. shall be submitted together with the design plans.

3.1.3 The certificate from a qualified person stating that the water main design plan satisfies the requirements of the *Saskatchewan Environmental Code – Sewage Main Chapter* shall be submitted together with the design plans.

4 DESIGN REQUIREMENTS

All sanitary sewer infrastructure (pipes, lift stations, manholes, and appurtenances) that is or will become City owned and operated shall be within and public right of way or easement.

4.1 CAPACITY ANALYSIS

4.1.1 The sanitary sewer system shall be of sufficient capacity to carry peak flows plus infiltration.

4.1.2 Foundation weeping tile shall be tied into storm sewer where possible. Roof leaders and foundation drain connections shall not be connected for discharge into the sanitary sewer system in new developments.

4.1.3 Wastewater flow shall be derived using the following formula:

$$Q = \frac{FDMA}{K} + I$$

Where:
Q = wastewater flow (L/s)
F = average daily per capita water consumption
D = population density (persons/hectare)
M = Harmon Peaking Formula
A = area (ha)
K = constant (86,400 metric)
I = Infiltration (L/s)

4.1.4 The peak wastewater flow is established by multiplying the average daily flow with a peaking factor. The peaking factor is established by using the Harmon formula as follows:

$$M = 1 + \frac{14}{4+\sqrt{P}}$$

Where:
P = population in thousands.

4.1.5 The following factors shall be used in design of sanitary sewerage systems for Residential Development:

Average Sewage Flow	-	380 liters per capita per day (where unknown)
Infiltration	-	0.20 L/s/ha

4.1.6 The following factors shall be used in design of sanitary sewerage systems for Commercial, Industrial, and Institutional Development:

Average Sewage Flow	-	Commercial: 40,000 L/ha/d
	-	Industrial: 20,000 L/ha/d
Peak Flow	-	3.0 x Average Flow
Infiltration	-	0.28 L/s/ha (24,000 L/ha/d)
Minimum Velocity	-	0.61 m/s

4.1.7 Population estimates for the purpose of system design shall be based upon the actual lot layout proposed for the development and a persons/dwelling estimate of not less than 3.5.

4.1.8 The City reserves the right to require additional system capacity to accommodate potential future subdividing of larger lots.

4.1.9 The minimum size for sanitary sewer mains shall be 200 mm diameter for residential and 250 mm for industrial/commercial areas.

4.1.10 Sanitary sewers may have to be oversized for future development if required by the City. Provision for this will be detailed in the Service Agreement for each specific development.

4.2 SEWER MAINS

4.2.1 Sewer mains shall not be less than 200mm inside diameter.

4.2.2 Pipe sizing shall be determined by using the Manning's Formula as follows:

$$Q = VA = A \frac{1}{K} R^{2/3} S^{1/2}$$

Where:
Q = wastewater flow (m^3/s)
n = Manning's roughness coefficient (use 0.013)
R = Hydraulic Radius (cross section area of flow/wetted perimeter)
S = slope (m/m)
A = cross sectional area (m^2)

4.2.3 Minimum pipe slopes shall be designed to maintain 0.60 m/s minimum velocity. The maximum flow velocity shall be 3.1m/s. Where velocities exceed this value, special engineering consideration shall be given to invert scouring and pipe anchoring.

4.2.4 Mains shall be installed to provide a minimum depth of 2.5 m (or equivalent with insulations) from top of pipe to final finished grade at the surface.

4.2.5 All sewer mains shall be installed with sufficient depth to provide a minimum 2.45 m depth of cover for the service connection at the property line.

4.2.6 Mains shall be located within the road right-of-way in accordance with the Roadway Cross-Section Standard Drawings.

4.2.7 Pipe bedding shall be provided for all mains in accordance with the Standard Drawings.

4.2.8 The following minimum pipe slopes must be used:

Minimum design slopes for sanitary sewer pipe

Sewer Diameter (mm)	Minimum Design Slope (%)
200	0.40
250	0.28
300	0.22
375	0.15
450	0.12
525	0.10
600	0.08

4.2.9 The minimum slope for curved sewers and dead-ends shall be 50% greater than the minimum slopes required for straight runs.

4.3 MANHOLES

4.3.1 Manholes shall be located at the end of each line, at all changes in pipe size, grade, or alignment, at all changes in direction except in the cases of curved sewers, and at the intersection of sanitary sewer mains.

4.3.2 Manholes in cul-de-sacs shall not be located in the gutter.

4.3.3 The distance between manholes cannot be greater than 120 m for sewers 300 mm diameter or less. The distance cannot be greater than 150 m for sewers over 300 mm.

4.3.4 The downstream invert in a manhole shall be a minimum of 30 mm lower than the lowest upstream invert. At a change in direction, the drop shall be at least 50 mm.

4.3.5 In the case that the downstream pipe is larger than upstream then obvert elevation of the lowest upstream pipe should be equal to, or higher than, the obvert of the downstream pipe.

4.3.6 Manholes shall be installed as shown on the Standard Drawings. Manhole bases shall be pre-cast slabs, concrete poured bases, vaults, or pre-cast tees. Pre-benched manholes shall be used when possible.

4.3.7 All manholes shall be 1200 mm inside diameter for all pipe 900 mm diameter and less. For pipe exceeding 900 mm diameter, manhole diameter shall be pipe diameter plus 600 mm, or a Tee-Riser shall be used, or use a special type of MH, same as tee-riser.

4.3.8 All joints shall be watertight.

4.3.9 An interior drop manhole shall be used where invert levels of inlet and outlet pipes differ by more than 1 m.

4.3.10 Any manhole over 3.0m deep needs Fall Restraint (Slide Anchor) and safety platforms are required for manholes 5.0 m or deeper.

4.3.11 Manholes, frames, and covers shall conform to construction specifications and Standard Drawings.

4.3.12 All manhole covers are to be clearly stamped “Sanitary Sewer”.

4.4 CURVED SEWERS

Curved sewers will be permitted, with the following requirements:

4.4.1 The sewer shall be laid as a simple curve, with a radius equal to or greater than 90 m or the manufacturer’s minimum recommended radius, whichever is larger.

4.4.2 Manholes shall be located at the beginning and end of the curve.

4.4.3 Manholes shall be located at intervals not greater than 90 m along the curve.

4.4.4 The main shall run parallel to the curb or street centreline.

4.4.5 The minimum grade for sewers on curve shall be 50% greater than the minimum grade required for straight runs of sewers.

4.5 LIFT STATIONS

Lift stations shall be designed in accordance with Saskatchewan Ministry of Environment Guidelines. Lift stations shall be duplex ITT Systems, with the following minimum standard items:

4.5.1 Must be designed to be consistent with the area requirements.

4.5.2 Logimatic duplex pump controller.

4.5.3 Interior lighting and exterior street lighting.

4.5.4 Dexon heater.

4.5.5 Milltronics level controller with float backups.

4.5.6 Automatic telephone alarm.

4.5.7 Breaker and plug to match the City's portable generator.

4.5.8 Flight Pumps or approved equivalent.

4.6 SERVICES

4.6.1 The minimum size of service connections to a single-family dwelling shall be 100 mm diameter.

4.6.2 The minimum grade on a 100 mm sewer service shall be 2.0% and on a 150 mm service shall be 1.0%.

4.6.3 Where bends are utilized, the long radius type or a combination of 22½ degree bends and straight pipe shall be used.

4.6.4 Service fittings shall be either in-line tees or service saddle, complete with gasket and stainless steel straps and nuts.

4.6.5 Services which are less than 150mm may be directly tapped into the main without a manhole using a service saddle. Where the service is unusually long or has a diameter of 150mm or more, a manhole is required.

4.6.6 The services shall be installed so that, when facing the lot being served, the water service is on the right of the sanitary service.

4.6.7 The minimum depth of cover over the water and sanitary services at the property line shall be 2.45 m, per the Standard Drawing.

4.6.8 Corporation main stops and curb stops shall be installed in accordance with locations specified in the Standard Drawings.

4.6.9 Sewer services shall be installed at property or easement lines as shown on the Standard Drawing and shall be properly capped or plugged to prevent the entry of earth, water or deleterious material into the pipe.

4.6.10 The Developer's Engineer shall provide detailed as-built drawings for all installed service connections, with such drawings providing information related to pipe dimensions, invert elevations, depth of service lines, location of services relative to property line(s), manholes, and/or watermain valves.

4.7 CONSTRUCTION

4.7.1 Prior to commencement of work on construction of a sanitary sewer main a notification number from the minister shall be provided to the City.

4.7.2 Prior to commissioning a sanitary sewer main, the certificate from a qualified person stating that the constructed sanitary sewer main meets the requirements of the *Saskatchewan Environmental Code* shall be submitted to the City.

5 LIST OF DRAWINGS

B-100 Typical 5A Pre-Cast Manhole Detail
B-101 Exterior Drop Manhole Detail
B-102 Interior Drop Manhole Detail
B-103 Pre-Benched Manhole Base
B-106 Typical Perched Manhole for 600 – 1500mm diameter pipes
B-107 T-Riser Manhole for Pipe Diameter 1200mm and Larger
B-108 Manhole Safety Platform
B-109 Trash Grate Inlet

C-100 Pipe Bedding Details
C-101 Single and Double Service Layout
C-101A Sewer and Water Service Locations
C-103 Typical Sanitary Service Connection
C-104 Residential Sanitary Sewer Service Riser Connection
C-106 Sanitary Service Connection Manufactured Home

END OF SECTION