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G1. SANITARY SYSTEM DESIGN OVERVIEW

The developer and developer's consultant shall provide a proposal to Lacombe County for initial treatment and/or containment of wastewater effluent clearly addressing

1. Initial treatment
2. Final treatment
3. Containment of wastewater and/or treated effluent
4. Environmental and public health risks of wastewater and/or treated effluent

Any sanitary must meet and conform with *Alberta Private Sewage Systems – Standards of Practice, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Safety Codes Act: Private Sewage Disposal Systems Regulation* and *Minister of Justice: Wastewater Systems Effluent Regulations*.

G2. ESTIMATING AVERAGE SEWAGE FLOWS

1. In determining residential flows, a minimum of 2.5 persons per household shall be used unless otherwise agreed to by the County.
2. For gravity collection systems, an infiltration allowance of 0.28 L/s/ha shall be add to the design flow rates based on a sewage generation rate of 320 L/person/day.
3. For a low pressure sewer system, sewage generation rate of 320 L/person/day with no infiltration rate shall be used, unless otherwise agreed to by the County. The generation rate peaking factor will be dependent upon the disposal system capacity.
4. Harmon's peaking factor shall be used to determine the peak flow rate for design, but must be a minimum of 2.5 times the average daily flow rate.

G3. GRAVITY SANITARY SEWER SYSTEMS

All utility installation shall conform to CSA S250 Mapping of Underground Utility Infrastructure standard

G3.1 Pipe Sizing

1. A report from the Developer's Consultant must be prepared to ensure that pipe sizing is calculated in consideration with the topography of the serviced lands and the population projections. A flow velocity of not less than 0.6m/s, at the average flow rate, shall be used to determine pipe sizing.

2. Irrespective of calculated flow velocity:
 - a) The minimum pipe diameter shall not be less than 200 mm without prior approval of the County.
 - b) Pipe size shall be large enough that the pipe does not run more than 80% full at peak flow.

G3.2 System Materials

1. General
 - a) The developer shall supply and install only new materials
 - b) All materials shall be transported, handled and stored in accordance with the manufacturer's recommendations.
 - c) All such materials which are defective in manufacture, damaged in transit, or have been damaged after delivery shall be replaced by the Developer at his expense.
 - d) All Standards referred to mean the latest edition of that Standard.
 - e) Where specific products are specified, it is intended that approved equals are also acceptable.
 - f) The "approved as equal" must be obtained from the County before the equal product is used.
2. Polyvinylchloride (PVC) pipe
 - a) PVC pipe, SDR 35, to ASTM3034, CSAB182.1 and B182.2 standards.
 - b) Gravity mains to be a minimum of 200 mm diameter.
 - c) All joints to use flexible elastomeric gaskets meeting ASTM standard 03212.
 - d) Pipe age not to exceed two years at time of installation.
3. High Density Polyethylene (HDPE) Pipe
 - a) The Engineer shall provide written certification that the properties of the selected pipe are suitable for the planned application and installation method and comply with all relevant standards, certifications and regulations. In particular: CGSB-41-GP-25M, CSA B137.0, CSA-B137.1, ASTM-D1248, ASTM-D2837; and ASTM F714.

- b) The Contractor shall be a Contractor who has been trained and approved by the pipe manufacturer to install the manufacturer's pipe. The Contractor must employ personnel who have been trained and approved by the pipe manufacturer to install the manufacturer's pipe.
- c) Shop only molded pipe fittings shall be used.
- d) All joints are to be butt-fused. Each heat fusion joint made shall be inspected by a person other than the person making the joint. The Contractor shall submit to the Engineer written acceptance for each heat fusion joint made.
- e) Mechanical service connections will not be allowed.
- f) All components shall be made of corrosion resistant materials.
- g) Pipe age not to exceed two years at time of installation.

G3.3 Fittings

1. PVC, SDR35, conforming to ASTM D3034 and CSA B182.1
2. High Density Polyethylene (HDPE), DR 15.5 conforming to ASTM F714 and CSA B137.1, shop molded fittings shall be used.
3. All HDPE molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electro-fusion type fittings.
4. Other fitting types only upon approval of the County.

G3.4 Alignment

1. In country residential subdivisions, the sewer main alignments shall be as approved by the County.
2. A minimum distance of 3.0m horizontal separation must be maintained between a sewer main and any water main unless otherwise approved by a Professional Engineer and Alberta Environment and the County.
3. A minimum distance of 2.0m horizontal separation must be maintained between a sewer main and any gas line.

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4. A minimum vertical separation of 0.5m is required between a sewer main and a potable water main where a crossing of the two lines occurs.
5. Public Utility Lot (PUL) widths shall be a minimum of 5.0m. A minimum 1.0m easement is required on the lots on each side of a PUL.

G3.5 Slope

Maintain the following grades for Sanitary Mains.

Pipe Diameter (mm)	Minimum Grade
200	0.4%
250	0.28%
300	0.22%
375	0.15%
450	0.12%

G3.6 Installation

1. Mains shall be at a depth adequate to provide a minimum of 2.70m depth of cover from finished grade to top of pipe.
2. Auguring or directional drilling is required under all existing roads (see Roads Section C20).
3. **Trenches**
 - a) Trench walls shall be vertical to 300 mm above the top of the pipe and the width at this location shall not exceed the maximum.
 - b) Widths of trenches shall be such that pipes can be laid and joined properly and backfill placed and compacted properly.
 - Trench Width - Single Pipe (see drawing G-7)
 - Pipe Diameter 200-500mm, minimum trench width OD + 500mm
 - Pipe Diameter 600mm and larger, minimum trench width OD x 1.5
 - Trench Width - More than 1 Pipe in accordance with drawings.
 - c) Pipe Bedding- Prepare the pipe bedding in accordance with the drawings and the following specifications:
 - Class B - Sand or approved gravel bedding material placed the full width of the trench and compacted to 98% of the maximum density as determined by the Standard Proctor Compaction Test.
 - Class C - removal of rocks and debris from the trench bottom and shaping the trench bottom to provide support throughout the length of the pipe.
 - Provide bell or coupling holes and support the pipe uniformly and continuously throughout its length.

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- d) Compaction of any trenches and auger pits within the road right-of-way is required to 98% Standard Proctor Density. The Developer is required to repair any settlement that occurs within two years.

4. **Pipe laying**

Pipe laying procedures including cutting, jointing and laying in the trench, as well as the tools and equipment used. All pipe laying procedures shall comply with manufacturer's recommendations. Any deviation from the manufacturer's recommendations shall require prior written approval of the Engineer.

Every precaution shall be taken to prevent foreign material from entering the pipe. When pipe laying is not in progress, the open end of the pipe must be closed to the satisfaction of the engineer.

5. **Jointing Methods**

All jointing methods must comply with manufacturer approved procedures. Any deviation must have prior written approval from the Engineer and County.

Approved jointing methods are as follows:

- Pipe to pipe joints must always be butt-fused
- Service connections between the main and the curb stop: electro fusion or butt fusion methods can only be used
- Service connections between the curb stop and the house, storage unit or treatment unit: electro fusion, butt fusion or mechanical connections can be used

6. **Backfilling in the Pipe Zone**

The pipe zone is defined as that part of the trench from the pipe bedding to 300 mm above the top of the pipe, or above the top of the highest pipe in a combined trench. Backfill with sand or with selected native soil deposited uniformly in the trench at both sides of the pipe for the full width of the trench. Compact in layers to 98% of the maximum density, as determined by the Standard Proctor Compaction Test, until the compacted backfill is 300 mm above the top of the pipe. Compact under and around pipe joints.

Frozen material shall not be used for backfill in the pipe zone.

7. **Hydrostatic Testing**

Hydrostatic tests shall be performed on the installed pipe to demonstrate the pipe is installed in accordance with the specifications. Testing shall be carried out in accordance with regulations of the Occupational Health and Safety Act, and in

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accordance with Alberta Environment regulations. Test procedures shall comply with manufacturer's recommendations.

Testing shall not be done under winter conditions unless the line can be safely drained or immediately placed in operation.

8. Flushing

Following installation and testing thoroughly flush all lines until clear of dirt and debris.

G3.7 Manholes

1. Precast concrete, 1200mm diameter, to ASTM C478M.
2. Manholes to be installed at:
 - a) End of each line
 - b) Any grade change, size change, or direction change
 - c) All junctions
 - d) Pipe lengths of not more than 120m between manholes
3. Use drop manholes where invert elevation difference of inlet and outlet is greater than 600 mm.

G4. LIFT STATIONS

1. Shall provide two (2) pumps each capable of passing particles 75mm in diameter with a minimum suction and discharge of 100mm. Pumps shall be the same specification. Each pump shall be capable of conveying the peak design flow.
2. Lift stations shall have backup power supply to pumps or emergency/standby engine and pump capable of conveying the peak design flow.
3. Lift stations shall have vehicle accessibility.
4. Design shall provide means to allow flushing of the force main (such as cam-lock and valve assembly).
5. Adequate ventilation shall be provided, where ventilation of lift station may result in odour complaints, steps to control odours shall be in place.

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6. Suitable and safe means of access to dry and wet wells shall be provided for inspection and cleaning.
7. Lift station shall be designed to facilitate removing pumps, motors and other mechanical or electrical equipment.
8. Lift station suction lines shall not exceed 7.6m in total length.
9. Lift station structures, electrical components and mechanical equipment shall be protected from physical damage by a 1 in 100 year flood event.
10. There shall be no physical connection between any potable water supply and a wastewater lift station without a break tank, pressure pump and pressure tank provided. Water shall be discharged to the break tank through a 150mm air gap with signs posted at every outlet on the water system indicating water is not safe for drinking.
11. Lift stations shall have an alarm system that dials out:
 - a. High and low levels
 - b. Power failure
 - c. Sump pump failure
 - d. Unauthorized entry
 - e. Any case of pump station malfunction that leads to risk of public health or environment

G5. FORCE MAINS

1. Force main lines should be sized to maintain at least 0.6 m/s in-line velocity at design flow rates.
2. Provide air relief valves at high points.
3. Where force main enters an existing gravity system, maintain the drop into the gravity main to no more than 600 mm.

G6. LOW PRESSURE SANITARY SYSTEMS

G6.1 General

1. The developer shall supply and install only new materials.

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2. All such materials which are defective in manufacture, damaged in transit, or have been damaged after delivery shall be replaced by the Developer at his expense.
3. All Standards referred to mean the latest edition of that Standards Manual.
4. Where specific products are specified, it is intended that approved equals are also acceptable.
5. The “approved as equal” must be obtained from the County before the equal product is used.

G6.2 High Density Polyethylene (HDPE) Pipe

In addition to the requirements stated at G3.2(3), the following standards shall apply:

1. A report from the Developer’s Consultant must be prepared to ensure that pipe sizing is calculated in consideration with the topography of the serviced lands and the population projections. A flow velocity of not less than 0.8 m/s, at the average flow rate shall be used to determine pipe sizing.
2. High Density Polyethylene (HDPE) pressure pipe suitable for low pressure sewer systems shall be conforming to CSA B137.1 and ASTM F714 Series 100 (DR 17) standard iron sized pipe.
3. Pipe sizes 150 mm or less shall meet HDPE Grade PE compound 3408.

G6.3 Fittings

1. High Density Polyethylene (HDPE), DR 15.5 conforming to ASTM F714 and CSA B137.1, shop molded fittings shall be used.
2. All HDPE molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electro-fusion type fittings.

G6.4 Alignment

1. In Country Residential Subdivisions, the sewer main alignments shall be as approved by the County.
2. A minimum distance of 3.0m horizontal separation must be maintained between a sewer main and any water main unless otherwise approved by a Professional Engineer, Alberta Environment and the County.
3. A minimum distance of 2.0m horizontal separation must be maintained between a sewer main and any gas line.

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4. Public Utility Lot (PUL) widths shall be a minimum of 5.0m. A minimum 1.0m easement is required on the lots on each side of a PUL.
5. Marker posts shall be installed perpendicular to all valves, air release and flushing standpipe locations, adjacent to the property line. Warning signs and painted fence posts shall be installed at the edge of the road right-of-way where low pressure sewers cross roadways.

G6.5 Installation

In addition to the requirements stated at G3.6, the following standards apply:

1. A separate service line with a curb stop, marked "SEWER" at the property line is required for each lot.
2. Flushing pipes are required at the start of each collection main to facilitate removal of main line blockages.
3. Automatic air/vacuum relief valves are required at all high points for removal of hydrogen sulfide gases from anaerobic decomposition of organics.

G6.6 Valves

1. Gate valves for 75mm and larger shall be iron body, bronze mounted gate valves with a non-rising spindle, which open by turning in a counter clockwise direction. All valves shall conform to AWWA C500 for bronze mounted solid wedge gate valves or AWWA C509 for resilient seated gate valves. Interior to be factory coated with epoxy coating conforming to AWWA C550. Exterior to be factory applied epoxy coated. Corrosion reduction to be provided by installation of zinc sacrificial anode. Valves to be flanged for polyethylene pipe.
2. Brass inverted key-type curb stops shall be used for valves 50 mm and smaller conforming to ASTM B62 compression type. Curb stops to have adjustable bituminous or epoxy coated cast iron service base with stem to suit 3.0m depth of bury. Top of cast iron box to be marked "SEWER". All curb stops shall incorporate 75mm long stainless steel sleeves for connections to polyethylene pipe.
3. Valve ends compatible with pipe joint type (Cast Iron Outside Diameter) to be used.
4. Cast iron valve boxes conforming to ASTM A48, Class 25 of the screw or sliding type shall be required on all valves. Coating inside and outside shall be an asphaltic coating or fusion bonded epoxy conforming to AWWA C213. Set screws to be galvanized. Top of box to be marked "SEWER".

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5. Extension stem to be 25mm square mild steel with 50 mm operating nut and flange suitable for 3.0m bury. A rock disk nut is required on all valves.
6. Schedule 40 PVC valve boxes for the bottom boot of Norwood Foundry Type A siding type valve boxes or approved equal are permitted in areas not exposed to vehicle loading.

G7. SERVICE CONNECTIONS

G7.1 General

1. Each lot must have a separate service
2. Install sanitary line in same trench as and to the left of water service (when facing the lot from the street/lane).
3. Minimum depth of cover shall be 2.70m from finished grade over top of pipe.
4. Mark locations of wastewater valves and other underground appurtenances with a stake painted green, 50 mm x 100 mm stakes 0.9 m long driven 0.6 m into the ground

G7.2 Gravity System Details

1. Minimum size of service is 150 mm diameter
2. Install a 150 mm x 100 mm diameter reducer at the property line.

G7.3 Low Pressure Systems

1. On low pressure systems: each lot shall utilize a positive displacement pump complete with an hour meter; and curb stops marked "SEWER" shall be installed 0.3m inside the utility right-of-way.
2. Sanitary sewer service pipe shall be 40 mm, DR 17 polyethylene pipe copper pipe size, Series 100 Municipal tubing.
3. Main connections shall be made by means of fused in-line tees or saddles. All fittings and joints must be assembled by electro fusion or butt fusion for HDPE piping. Services to be in one piece. No mechanical connections are permitted between main connection and the curb stop.
4. Curb stops shall be located such that they do not conflict with driveway locations.

G8. WASTEWATER STORAGE AND HANDLING

1. Reservoirs shall be designed to prevent damage from freezing, infiltration, exfiltration, anti-flotation measures required and ability of the tank to withstand structural stresses caused by hydrostatic pressure and buoyancy.
2. The total waste water storage requirements for a waste water collection system shall be calculated utilizing a sewage generation rate of 320 L/person/day with an average of 2.5 persons per residential unit, plus an infiltration allowance of 0.28 L/s/ha to be included for gravity systems.
3. An economical site selection will depend on the type of storage facility, but in general the major factors to consider are soils conditions, compatibility with future expansion requirements, site access and susceptibility of site flooding.
4. When planning the type of storage tank, the designer shall ensure that waste water is not stored or conveyed in a compartment adjacent to raw water supply or treated potable water. Storage tanks must be a minimum of 100m from any domestic water well, 1m from property line and 1m from a building.
5. Only concrete and fiberglass materials approved for use with waste water shall be used for storage tank facilities. All storage tanks shall be CSA approved and meet or exceed the CAN/CSA-B66. Design material and manufacturing requirements of prefabricated septic tanks and sewage holding tanks.
6. Storage tanks shall be sized to accommodate a minimum of three (3) day storage unless otherwise approved by the County. Tank shall include the capacity to store accumulating sludge and scum for a period of at least 3 years without reducing the hydraulic retention capacity to less than the designed daily peak flow.
7. Storage tanks shall be equipped with cam-loc fittings to allow for easy connections to the disposal vehicle. Perimeter fence (chain Link) and protective barriers shall be installed around the tanks. The cam-loc system shall be designed to facilitate easy vehicle access for the septage removal, service and maintenance.
8. Storage tanks shall be equipped with a level alarm and emergency dial-out.
9. Elevated tanks and standpipes shall be insulated and hot water re-circulated, or heat traced, to prevent problems associated with ice formation. Generally, they should be maintained at a temperature of 4° C or greater.

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10. Proposed storage tank locations shall be located and graded so as to limit possible contamination in the event leakage occurs. All access opening extensions shall be installed to ensure a water tight connection into the septic tank.
11. Access roads to the storage facility shall be designed to accommodate the turning movements of the disposal vehicles utilized for the site. For facilities handling less than 5000 lgal/day a SU-9 vehicle shall be accommodated. For facilities handling more than 5000 lgal/day, a WB-15 vehicle shall be accommodated. Where possible a drive-through system shall be utilized.
12. Access to the storage facility shall be constructed to at least a “Residential Subdivision – Main Access Road” standard, according to County guidelines Typical Drawings – Roads.
13. Wastewater system and/or containment tank shall be designed to not be fed by:
 - a. Storm water
 - b. Surface water
 - c. Abattiot waste
 - d. Sub-surface seepage water from weeping tile systems, foundation drains or subsoil foundations drainage pipes
 - e. Clear water waste from a hot tub, spa or hydro massage bath that is not of the fill-and-drain design
 - f. Clear water from a swimming pool
 - g. Commercial or industrial process wastes
 - h. Waste from water filter or other water treatment device where the on-site design has not been designed to handle discharge
 - i. Wastes from an iron filter
 - j. Other wastes not considered in the design of the system

G9. WASTEWATER TREATMENT

Waste water treatment will be reviewed on an individual project basis and will require the approval of the County and Alberta Environment.