

SECTION E SANITARY SEWER SYSTEM

E.1 GENERAL

E.1.1 The Developer and the Developer's Engineer are responsible to ensure that the sanitary sewer system is designed and constructed according to accepted engineering practice. These guidelines are intended as a guide only and shall not be considered as a substitute for a detailed material and construction specification to be prepared by the Developer's Engineer.

E.1.2 Organizations issuing standards:

ASTM – American Society for Testing and Materials

CSA – Canadian Standards Association

Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems

E.2 FLOW GENERATION RATES

E.2.1 The sanitary system shall be of sufficient capacity to carry peak flows plus an inflow and infiltration allowance. The flow and factors listed below shall be used as minimum requirements in the design of the sanitary sewer systems.

E.2.1.1 Average Sewage Flow - 320 L/person/day (residential)
- 6170 L/ha/day (non-residential, including infiltration)

E.2.1.2 Population Density - 3.5 persons/residence (residential)

E.2.1.3 Peak Sewage Flow - Average Flow x Peaking Factor

E.2.1.4 Peaking Factor

E.2.1.4.1 Residential (Harmon's Formula)

$$- 1 + 14/(4+P^{1/2})$$

where P = the contributing design population in thousands.

If P<1, a peaking factor of 4.5 shall be used.

E.2.1.4.2 Non-Residential - 3.0

E.2.1.5 Infiltration - 0.28 L/s/ha (residential)



E.2.1.6 Inflow at Sag Manholes - 0.4 L/s/manhole

For Preliminary Planning purposes 18.0 m³/ha/day may be used for Commercial Light Industrial.

E.2.2 The total design peak flow rates for the sanitary sewer shall be the sum of the peak flow rates plus all extraneous flow allowances.

E.3 GRAVITY SEWER PIPE SIZING

The following design factors shall be used in determining the sanitary sewer pipe sizes:

- E.3.1** Minimum pipe size - 200 mm diameter (residential)
250 mm diameter (commercial/
industrial/institutional)
- E.3.2** Manning's Formula "n" - 0.013
- E.3.3** Required sewer capacity - Estimated Peak Design Flow
0.86
- E.3.4** Minimum flow velocity - 0.6 m/sec (during average flow)
- E.3.5** Maximum flow velocity - 3.0 m/sec
- E.3.6** Minimum design slopes

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

E.3.7 Minimum slopes shall be increased by 50% on all curved sections.

E.3.8 The minimum grade of the first upstream leg shall not be less than 1.0%.

E.3.9 It is recommended that all sanitary sewers be designed with a slope of 0.4% or greater, wherever possible.

E.3.10 Weeping Tiles (Foundation Drains)

E.3.10.1 For any development (residential, commercial, industrial, etc.), weeping tiles, roof leaders (downspouts) and similar appurtenances that handle storm water or ground water are not permitted to discharge into sanitary sewers.

E.3.10.2 Weeping tiles must be connected to sumps with pumped discharge into a sump pump discharged collection service. The required general arrangement of the sump pump and discharge piping to the sump discharge collection services is depicted on the Typical Sump Pump Discharge Connection Detail Drawing E-10. The detailed arrangement must also comply with the Plumbing regulations.

The surface discharge piping shown on the Detail must be installed to provide a flow in the event that the storm drainage system cannot accommodate the flows due to capacity, freezing, or other problems. The storm sewer system shall be designed to handle weeping tile flow.

E.3.10.3 The Developer shall insure that the builders install sump pumps and make the required sump pump connections.

E.4 LOW PRESSURE SEWER SYSTEM SIZING

E.4.1 Minimum main pipe size - 50 mm diameter

E.4.2 Minimum service pipe size - 38 mm diameter

E.4.3 Minimum flow velocity - 0.6 m/sec

E.4.4 Hazen Williams flow coefficient (C) - 150

E.4.5 The low-pressure sewer main shall be sized according to the number of services. It is the responsibility of the Developer's Engineer to determine the maximum number of pumps that will be pumping simultaneously and to size the main accordingly.

E.4.6 A two-compartment septic tank is required with a minimum total volume of 3000 litres for a single-family dwelling.

E.4.7 Pumps may either be submersible sewage pumps installed in the second chamber (liquid chamber) of the septic tank or a centrifugal pump installed in the basement with a suction line to the second chamber. The use of a single chamber tank with a grinder pump is not permitted. All pump connections shall

incorporate double check valves downstream of the pump discharge to prevent backflow into the septic tank.

- E.4.8** The maximum head for a low-pressure system is 24 metres (35 psi). Pumps with a higher discharge head shall only be permitted if all pumps and mains within the system have been designed to accommodate the higher pressure.
- E.4.9** All pumps within the system should typically have the same maximum discharge head in order to avoid shutting out smaller pumps. In larger systems or systems with large elevation differences, pumps located further away from the system outlet or at a low elevation may require a higher discharge pressure in order to ensure proper system operation.
- E.4.10** A single pump intended to accommodate multiple services shall not be permitted unless the Developer's Engineer can demonstrate that the design will not be detrimental to the other system users. (See Section E.16, Rural Low - Pressure Sanitary Servicing)

E.5 SANITARY SEWER ALIGNMENT AND LOCATION

- E.5.1** Sewer mains shall be located within the road right-of-way and outside the carriageway in accordance with the typical roadway cross section.
- E.5.2** Sanitary sewers shall be located a minimum of 2.5 m o/c from any watermain and 1.8 m o/c from any gas line or as required by the utility company.
- E.5.3** Sanitary sewers shall be spaced at a minimum of 0.25 m between pipe walls from any adjacent storm sewer.
- E.5.4** Public Utility Lot (PUL) widths shall be at least 4.0 m for a single utility and 6.0 m for two utilities.
- E.5.5** Curved sewers shall be permitted with the following restrictions:
 - E.5.5.1** Curved sewers shall run parallel to the curb or road centreline
 - E.5.5.2** Minimum grade for sewers on a curve shall be 50% greater than the minimum grade required for a straight run of sewer.
 - E.5.5.3** Manholes shall be located at the beginning and end of each curve and intermediate locations as required.

E.5.6 Under normal conditions, water mains shall cross above sewers with a sufficient vertical separation to allow for proper bedding and structural support of the water and sewer mains.

E.5.7 Where it is necessary for the water main to cross below the sewer, the water main shall be protected by providing:

E.5.7.1 A vertical separation of at least 0.5 m from water main crown to sewer invert;

E.5.7.2 Structural support of the sewer to prevent excessive joint deflection and settling; and

E.5.7.3 A centering of the length of water of water main at the point of crossing so that the joints are equidistant from the sewer.

E.6 REQUIRED DEPTH FOR SANITARY SEWERS

Sanitary sewers shall be installed at a sufficient depth to meet the following requirements:

E.6.1 The main shall have a minimum depth of cover of 3.0 m measured from finished grade to invert.

E.6.2 The sanitary sewer shall have sufficient depth of cover to provide complete frost protection.

E.6.3 Gravity mains shall have sufficient depth to allow all buildings to drain by gravity to the sewer. Special consideration should be taken when building floor elevations are lower than the roadway. Service lines shall have a minimum cover of 2.6 m from the finished lot surface to the top of pipe at the property line.

E.6.4 Under normal conditions, sewer mains shall cross below water mains with sufficient clearance to allow for proper bedding and structural support of the pipes. Pipe clearance when passing under any watermain shall be a minimum of 300 mm separation between the top of the sewer pipe and the bottom of the watermain.

E.6.5 Pipe clearance when passing over any watermain shall be a minimum of 500 mm separation between the bottom of the sewer pipe and the top of the watermain. Efforts shall be made to pass under the watermain when possible.



E.7 MANHOLE DESIGN AND LOCATION (GRAVITY SYSTEM)

- E.7.1** Manholes shall be located at the end of each line, at all changes in pipe size, grade and alignment.
- E.7.2** The maximum distance between manholes shall not exceed 150 m.
- E.7.3** All manholes shall be 1200 mm minimum inside diameter.
- E.7.4** Manholes shall be located at the extension of property lines whenever possible in order to avoid conflicts with driveways.
- E.7.5** The drop across manholes should be of sufficient magnitude to account for any energy losses in the manhole.
 - E.7.5.1** pipe deflections of less than 45° require a drop of at least 30 mm
 - E.7.5.2** pipe deflections of 45° to 90° require a drop of at least 50 mm
- E.7.6** Invert drops for pipes larger than 600 mm or for high flow situations shall be assessed on an individual basis.
- E.7.7** The obvert elevation of a sewer entering a manhole shall not be lower than the obvert elevation of the outlet pipe.
- E.7.8** Pipe deflection in the manhole shall not be greater than 90°.

E.8 SANITARY SERVICES

- E.8.1** Separate sanitary sewer connections shall be provided for each separately titled lot.
- E.8.2** The minimum size of a residential gravity sanitary sewer service from the main to the property line shall be 150 mm diameter. The County may approve 100 mm diameter services under special circumstances where the total service length from main to proposed building site is less than 30 m., and at a minimum 2.0% grade.
- E.8.3** The minimum size of a residential low-pressure sanitary sewer service shall be 38 mm.
- E.8.4** Non-residential service connections shall be sized according to anticipated user requirements.

- E.8.5** Low-pressure service lines shall require a curb stop at the property line. Curb stops for low pressure services shall use caps identifying them as wastewater services. All wastewater caps shall be painted green. Curb Stops shall not be stop and drain.
- E.8.6** Connections for all proposed residential lots shall be installed at the time of initial subdivision development.
- E.8.7** The minimum grade for a gravity sanitary sewer service line shall be 2.0% for 100 mm diameter lines and 1% for 150 mm diameter lines and larger.
- E.8.8** Risers for service lines shall be required when sewer mains exceed 4 metres in depth.
- E.8.9** Services shall be located such that they do not conflict with driveway locations.
- E.8.10** The sanitary services shall be installed to the property line. In areas where natural gas distribution facilities require an easement along the front of the property, the service connections shall be extended to the edge of the easement furthest from the roadway.
- E.8.11** Sanitary services shall always be installed to the left of the water service when facing the property line from the roadway.
- E.8.12** Weeping tiles, roof leaders and other similar appurtenances handling storm or groundwater shall not be permitted to discharge into the sanitary sewer.

E.9 SANITARY SEWER MATERIALS

- E.9.1** The Developer shall supply only new materials. All materials found to be defective or damaged shall be replaced at the cost of the Developer.
- E.9.2** Where specific products are specified, it is intended that approved equals are also acceptable. Approval must be obtained by the Municipal Engineer prior to installation.
- E.9.3** PVC pipe and fittings shall conform to the following:

- E.9.3.1** CSA B182.2, ASTM D3034, ASTM F679, NQ 3624-130 and NQ 3624-135 standards with minimum stiffness of 320 kPE. Service lines shall a minimum stiffness of 625 kPE.
 - E.9.3.2** Standard Dimension Ratio (SDR) 35 unless otherwise indicated on the drawing.
 - E.9.3.3** Sealing gaskets shall meet requirements of CSA B182.2 and ASTM F477.
 - E.9.3.4** Injection moulded gasketed fittings for service connections shall conform to CSA B182.1 or CSA B182.2 and fabricated fittings shall conform to CSA B182.2 and ASTM F679.
 - E.9.3.5** Pipe shall be tested by the manufacturer and marked in accordance with CSA B182.2. Test results shall be recorded on a certification form signed by a qualified representative of the manufacturer.
 - E.9.3.6** Pipe and fittings shall be installed within two years from the production date indicated on the certification.
- E.9.4** Concrete pipe and fittings shall conform to the following:
- E.9.4.1** All concrete pipe shall be manufactured using Type V sulphate resistant cement CSA A3000.
 - E.9.4.2** Non reinforced concrete pipe shall conform to CSA A257.1, minimum Class 3 and ASTM C14.
 - E.9.4.3** Reinforced concrete pipe shall conform to CSA A257.2 and ASTM C76.
 - E.9.4.4** Flexible rubber gasket joints shall conform to CSA 257.3 and ASTM C443.
 - E.9.4.5** The manufacturer of the concrete pipe shall perform quality testing and control in accordance with CSA 257.0, 257.1, 257.2 and 257.3.
 - E.9.4.6** Each concrete pipe shall be marked with the manufacturer's name, date of casting and quality testing passing stamp.

E.9.5 Polyethylene pipe and fittings for low-pressure systems shall conform to the following:

E.9.5.1 Polyethylene pipe shall conform to CSA B137.1 and ASTM D3035, D3350

E.9.5.2 Minimum pressure rating of 690 kPa (Series 100)

E.9.5.3 Moulded fittings shall conform to ASTM D2683 or D3261

E.9.5.4 Fabricated fittings shall be manufactured from pipe of the same series as that used in the piping system.

E.9.5.5 Pipe shall be joined by thermal butt-fusion, flange assemblies or brass compression type fittings complete with stainless steel inserts.

E.9.5.6 Flanges shall be stainless steel or epoxy coated ductile iron conforming to ASTM A536-80 with stainless steel nuts, bolts and washers.

E.9.5.7 Compression couplings shall be used with stainless steel inserts.

E.9.5.8 Service tapping saddles shall be Robar type 2706 or approved equal with bronze body, 44 mm wide stainless steel straps with stainless steel nuts and bolts.

E.9.5.9 Valves shall be cast iron gates valves with flanged connections.

E.9.5.10 Each pipe length shall be marked with the manufacturer's name, nominal pipe size, dimension ratio, material grade, manufacturing standard, and a code indicating the date and place of manufacture.

E.10 MANHOLE MATERIALS

E.10.1 Manholes shall be manufactured using sulphate resistant Type V cement.

E.10.2 Manhole sections shall be pre-cast reinforced concrete conforming to ASTM C478 and CSA A257.4.

E.10.3 All manholes shall have an inside diameter of 1200 mm for pipe 900 mm and less. For pipe exceeding 900 mm or manhole having multiple inlets, manhole sizing shall be subject to review by the Engineer.

E.10.4 Manhole steps shall be standard safety type, hot dipped galvanized iron conforming to ASTM A615 and ASTM A123 or aluminium forged from 6061-T6, 6351-T6.



- E.10.5** All pipe penetrations shall be sealed with rubber gaskets conforming to ASTM C443 and grouted with non-shrink grout.
- E.10.6** Manhole frames and covers shall be cast iron conforming to Class 20 ASTM A48 and ASTM A536. Type NF80 covers shall be used for all streets and driveways, type NF90 covers with rubber gasket shall be used for manholes located in sags and low areas and type F39 covers shall be used for all other areas. Castings shall be marked with series designation, foundry identification and date of casting. Manhole covers with Lamont County identification will be encouraged. City of Edmonton or other municipal identification covers are not permitted.
- E.10.7** Pre-benched manhole bases shall be used wherever possible with pre-cored connection holes and watertight Duraseal or G-Loc joints or approved equal.
- E.10.8** Tee Riser manholes shall conform to CSA 257.2, ASTM C76 and CSA A257.4, ASTM C76.
- E.10.9** Safety platforms are required for all manholes greater than 7.0 m in depth.
- E.10.10** All pre-cast units shall be marked with manufacturer's identification, date of casting, type of cement and CSA standard.

E.11 TRENCHING, BEDDING AND BACKFILLING

- E.11.1** All trenching and backfilling shall be completed in strict accordance with Occupational Health and Safety Guidelines.
- E.11.2** If unsuitable soil conditions are encountered, proper measures for dealing with the conditions shall be identified either on the design drawings or as a brief report to the Municipal Engineer prior to construction.
- E.11.3** Class "B" pipe bedding shall be utilized in suitable soil conditions. Washed rock shall be used if water table is above the pipe zone. Bedding sand shall have minimum depth of 100 mm below the pipe, shall extend up both sides to the trench wall and provide a minimum cover of 300 mm above the pipe. The Developer's Engineer shall identify special pipe foundation measures for areas where unsuitable pipe foundation conditions exist.

- E.11.4** The minimum trench width measured at the pipe springline shall be the pipe outside diameter plus 450 mm. The maximum trench measured at the pipe springline shall be the pipe outside diameter plus 600 mm. The Municipal Engineer must be notified if the trench must be excavated deeper or wider than specified.
- E.11.5** Excavated material shall be stockpiled at a safe distance from the edge of the trench.
- E.11.6** The Developer's Engineer shall identify areas where the trench excavation requires sheathing, shoring or bracing in order to protect workers, property or adjacent structures.
- E.11.7** Trench excavations shall be kept free of water.
- E.11.8** It shall be the Developer's responsibility to ensure that the utility trenches are adequately compacted.
- E.11.8.1** Native backfill under existing or proposed roads or laneways shall be compacted throughout the entire right-of-way width to:
- E.11.8.1.1** 98% standard proctor density from subgrade to 1.5 m below subgrade or original ground, whichever is lower;
- E.11.8.1.2** 95% standard proctor density greater than 1.5 m from the subgrade or original ground, whichever is lower;
- E.11.8.2** Granular backfill under existing or proposed roads or laneways shall be compacted to 95% of standard proctor density throughout the entire trench depth below subgrade and the entire right-of-way width.
- E.11.8.3** Backfill in all other areas shall be compacted to 95% standard proctor density.
- E.11.8.4** Subgrade and base course compaction for roadway construction shall be as specified in Section G.
- E.11.8.5** If the above standards cannot be achieved due to a large variation in soil types throughout the development, the Municipal Engineer may at his sole discretion, establish a more appropriate standard on an individual case basis. One-mould proctor density testing may be

permitted if the Developer submits an acceptable proposal prepared by the Developer's Engineer, justifying the required changes to the compaction standards.

- E.11.9** If the minimum compaction standards cannot be met due to abnormal weather or wet ground conditions, the Municipal Engineer may establish a more suitable standard on a site specific basis provided adequate justification is presented by the Developer. One-mould proctor density testing will not be permitted as an alternate testing procedure due to wet soil conditions. The Developer's engineer will be required to suggest appropriate measures such as drying in-situ material or importing suitable material in order to meet the required Standard Proctor Densities.
- E.11.10** All landscaping, pavement structures, sidewalks, curb and gutter damaged or removed during trenching shall be restored or replaced unless otherwise directed by the Municipal Engineer.
- E.11.11** All debris, surplus fill and unused materials must be removed from the site.

E.12 SEWER INSTALLATION

- E.12.1** The pipe and gasket installation shall be conducted in compliance with the pipe manufacturer's specifications. Installation of PVC pipe and fittings shall conform to CSA-B182.11.
- E.12.2** Pipe installation shall start at the outlet and work upstream.
- E.12.3** Align pipes carefully when jointing. Keep joints free of mud, gravel and foreign material and apply sufficient pressure to ensure that the joint is complete as outlined in the manufacturer's specifications. Complete each joint before laying the next length of pipe. Deflections shall not exceed those permitted by the manufacturer.
- E.12.4** The pipe must be thoroughly flushed of all dirt, stones and pipe lubricant when complete.
- E.12.5** The horizontal alignment of pipes less than 900 mm in diameter shall not be more than 150 mm off the designated alignment. The alignment for pipes larger than 900 mm shall not deviate by more than 50 mm per 300 mm of diameter.

E.12.6 The invert of the pipe shall not deviate from the design grade by more than 6 mm plus 20 mm per metre of diameter of sewer pipe.

E.13 MANHOLE INSTALLATION

E.13.1 Manholes shall be installed as depicted on the detail drawings and in accordance with manufacturer's recommendations.

E.13.2 Backfill around manholes shall be compacted to a minimum of 98% Standard Proctor Density.

E.13.3 Tee Riser manholes shall require Class A bedding to the elevation of the springline.

E.13.4 Pre-cast manhole bases shall be installed on a base of 100 mm to 300 mm washed gravel.

E.13.5 Cast in place manhole bases approved by the Engineer shall be placed directly on undisturbed ground.

E.13.6 Safety steps shall be aligned on centreline perpendicular to the main flow channel. Wherever possible the steps shall be aligned so that a person exiting the manhole would face oncoming traffic if not conflicting with the previous requirement. The distance from the top of the rim to the first step shall not be greater than 300 mm. Steps shall be evenly spaced at a maximum of 410 mm to within 600 mm of the base of the manhole. Refer to Drawing E-08 for details.

E.13.7 The frame and cover shall be installed following manufacturer's recommendations.

E.14 INSPECTION AND TESTING

E.14.1 All sewer installations shall be subject to inspections by the Municipal Engineer prior to issuance of the Construction Completion Certificate (C.C.C.) and Final Acceptance Certificate (F.E.C.).

E.14.2 Video inspections by qualified personnel are required prior to C.C.C. Two written reports including still photographs and two (2) video tape recordings of the entire inspection shall be submitted to the Municipal Engineer for review. The report shall indicate the location and severity of all leaks, cracks, breaks,



collapses, deflections, sags, obstructions and any other defects affecting the performance of the line. Sections requiring repair will be subject to re-inspection when complete.

E.14.3 Re-inspection by camera may be required on suspect areas prior to F.A.C. at the discretion of the Municipal Engineer. All video inspection costs shall be borne by the Developer.

E.14.4 All material testing (backfill densities and concrete testing) shall be performed by an accredited agency and certified by a Professional Engineer. All test results shall be submitted to the Municipal Engineer with a report indicating any deficiencies and remediation.

E.14.5 An infiltration and/or exfiltration test may be required at the Municipal Engineer's sole discretion for any section showing deficiencies during the camera test.

E.14.5.1 The test section shall be filled with water allowing displacement of air in the line and will be allowed to stand for 24 hours to ensure absorption in the pipe wall. Prior to the test, add enough water to ensure a head of 1 m to 3 m over the pipe crown in the upstream manhole. The test duration shall be 2 hours. The water level should be measured at the beginning and end of the test in order to calculate the infiltration/exfiltration.

E.14.5.2 The allowable leakages are as follows:

E.14.5.2.1 Infiltration Test: Performed when the groundwater is above the pipe crown for the entire test length. Allowable infiltration is 5.0 L/day/mm dia./km for PVC pipe and 20.0 L/day/mm dia./km for concrete pipe.

E.14.5.2.2 Exfiltration Test: Performed when the groundwater is below the pipe invert for the entire test length. Allowable exfiltration is 5.0 L/day/mm dia./km and 20.0 L/day/mm dia./km for concrete pipe.

E.14.6 The maximum acceptable long-term deflection for any PVC or other flexible pipe is $7\frac{1}{2}$ % of the normal internal diameter.



E.15 SANITARY WASTEWATER PUMPING SYSTEMS

E.15.1 General

Wastewater pumping systems shall only be installed where site constraints restrict the gravity collection system from tying to an existing sanitary trunk line. The requirement must be justified in an initial subdivision design report taking the development plans for the surrounding area into account.

E.15.2 Standards and Approvals

The design and construction of the pumping system must meet the requirements of other governmental authorities and regulations including Alberta Environment and Water, Alberta Occupational Health and Safety and the Alberta Building Code. The Developer is responsible for all submissions and applications required for approval.

E.15.3 Location

E.15.3.1 The pumping station shall be located in such a manner as to minimize the impact to adjacent development in terms of visibility, odour and noise.

E.15.3.2 Pumping stations shall not be located in areas subject to flooding during a major rainfall event.

E.15.3.3 Pumping stations shall always be accessible by road.

E.15.4 Configuration

E.15.4.1 A wet well configuration with submersible pump or above ground suction head pump is preferred.

E.15.4.2 A wet well / dry well configuration may be considered for larger facilities.

E.15.4.3 A building may be required for the wet well / dry well pumping stations.

- E.15.4.4** A collection manhole shall intercept flow from all incoming sewers before discharge to the pumping station. The station shall receive flow from one inlet only.
- E.15.4.5** Provision shall be made to shut off flow from the collection manhole if required.
- E.15.4.6** Any stations without a building shall be fenced with a lockable gate to prevent unauthorized access.
- E.15.4.7** The Developer shall be responsible for any necessary landscaping required to enhance the appearance of the facility when located close to a residential area. Landscaping plans are subject to approval by the County.

E.15.5 Pumping Station Design

- E.15.5.1** The pumps shall be sized to accommodate the maximum expected flow as determined by accepted engineering practice and according to the requirement specified in Section E.2 Flow Generation Rates.
- E.15.5.2** Pumping stations shall be equipped with two or more pumps sized such that if one pump is out of service, the remaining pump(s) is/are capable of pumping the design capacity flow rate. Pumps shall be identical and interchangeable for a duplex pumping station. Pumps starts shall alternate between pumps.
- E.15.5.3** Pumps shall be provided by a well-recognized manufacturer with a local repair service depot.
- E.15.5.4** Submersible pumps shall have a non-clog impeller design and/or flush valves.
- E.15.5.5** Pump motors shall operate on 3-phase power wherever possible. This requirement may be relaxed by the County if 3-phase power cannot be supplied at a reasonable cost.
- E.15.5.6** Dead storage shall be minimized while meeting minimum depth requirements specified by the pump manufacturer.

E.15.5.7 Wet wells shall be sized based on accepted engineering practice. Storage shall be provided to minimize the frequency of pump starts but the maximum retention time in the wet well should not exceed 30 minutes. The design shall meet pump manufacturer's specifications.

E.15.5.8 Wet wells shall be sized and equipped to accommodate operator access, maintenance and safety requirements.

E.15.6 Valves and Piping

E.15.6.1 The minimum diameter for all pump suction and discharge piping shall be 100 mm.

E.15.6.2 Pipe sizing shall allow for minimum and maximum flow velocities of 0.75 m/s to 3.5 m/s respectively within the station.

E.15.6.3 The minimum pressure rating of piping within the station shall be determined based on calculated operating pressures but shall not be less than 900 kPa.

E.15.6.4 Pumps shall be connected in parallel to a common discharge header located within the station. Check valves and isolation valves shall be installed on the discharge line between each pump and the discharge header.

E.15.6.5 A forcemain isolation valve shall be installed on the main discharge pipe outside the wet well.

E.15.7 Water Supply

E.15.7.1 Water supply must be provided to the facility for washing/cleaning purposes.

E.15.7.2 The design shall ensure that the connection between the potable water supply and the wastewater pumping station does not cause contamination of the potable water supply. The design shall comply with the conditions stipulated in the Alberta Environment and Water "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems" for Water Supply and Wastewater Facilities.

E.15.7.3 Where a potable water supply is to be used for washing/cleaning purposes, a break tank, pressure pump and pressure tank shall be provided. In-line backflow preventers are not acceptable. The potable water shall be discharged to the break tank through an air gap at least 150 mm above the maximum flood line or the spill line of the tank.

E.15.8 Alarms and Emergency Backup

E.15.8.1 The Developer shall make provisions to mitigate environmental or property damage caused by facility failure.

E.15.8.2 Stations shall be equipped with or provided with the feature for future connection of remote sensing and telemetry equipment enabling operators to monitor the alarms.

E.15.8.3 Power must be supplied from an independent source. In the event of a power failure, secondary power must automatically engage through a diesel generator or direct-coupled motor. Secondary power system must not be fuelled by natural gas unless a supply tank is provided on site.

E.15.8.4 Special consideration shall be made to control any possible overflow in a manner acceptable to the County and Alberta Environment and Water.

E.15.9 Access and Maintenance

E.15.9.1 Permanent hoist equipment and access hatches of sufficient size and capacity shall be provided for removal of station equipment.

E.15.9.2 All access points shall have locking devices.

E.15.9.3 Ladders shall be non-skid and shall comply with Occupational Health and Safety requirements.

E.15.9.4 Stations shall have adequate interior and exterior lighting.

E.15.9.5 The Developer is responsible for the supply of an Operating and Maintenance manual for the facility. The manual shall include a complete parts list for all mechanical and electrical components

including control diagrams, schematics and manufacturer's operation, maintenance, service and repair specifications. The Developer shall submit five (5) copies to the County along with all commissioning and testing results prior to issuance of the CCC.

E.15.10 Heating and Ventilation

- E.15.10.1** Forced mechanical ventilation is required for dry wells below ground level and for wet wells containing screens or mechanical equipment requiring maintenance or inspection.
- E.15.10.2** Equipment shall be able to provide at least six air changes per hour. Provision shall be made for ventilation of the wells with portable equipment in case of system failure. Ventilation failure alarms are required.
- E.15.10.3** There shall be no interconnection between wet well and dry well ventilation systems.
- E.15.10.4** Multiple air inlets and outlets are recommended for dry wells over 5 m deep. Air intakes and outlets shall be designed to function year round and screen openings should be sized to avoid frost build-up or clogging.
- E.15.10.5** Air shall be forced into the dry well at a point 150 mm above the pump floor and into the wet well at a point 150 mm above the high water level.
- E.15.10.6** Automatic heating and dehumidification equipment shall be provided in all dry wells.

E.15.11 Lift Station Requirements

- E.15.11.1** Service area shall be of an adequate size to allow for the required access hatches, hoist equipment, ventilation and control equipment while allowing for an appropriate workspace for pump maintenance.
- E.15.11.2** Access to the wet well shall be of adequate size.

- E.15.11.3** Facility layout and access shall be designed to facilitate the removal of any equipment that may require off-site maintenance.
- E.15.11.4** The design shall incorporate measures to reduce the noise and odour impact on the surrounding development.
- E.15.11.5** Lift station area shall be designed to blend architecturally with the surrounding development.
- E.15.11.8** Chain link fence 1.8 m (6 ft) in height to be constructed around lift station and work area or something similar.

E.15.12 Forcemains

- E.15.12.1** System head curves shall be developed for each forcemain to be submitted to the Municipal Engineer upon request.
- E.15.12.2** The minimum forcemain diameter shall be 100 mm.
- E.15.12.3** The pressure rating of the pipe shall be twice the operating pressure or 690 kPa, whichever is greater.
- E.15.12.4** The velocity shall be within 0.9 m/sec to 3.5 m/sec. The minimum velocity for pipes larger than 300 mm shall be 1.1 m/sec. Special design provisions in order to stabilize the line shall be incorporated when design velocities exceed 3.0 m/sec.
- E.15.12.5** The forcemain design pressure shall allow for the normal static and dynamic operating pressures including water hammer effects.
- E.15.12.6** A series of 45° bends shall be used in lieu of 90° bends.
- E.15.12.7** Air release valves shall be installed in concrete access chambers at all relative high points. Forcemain grades should be designed in order to minimize the requirement for an air release valve wherever possible.
- E.15.12.8** Blow-off valves shall be provided at all low points.
- E.15.12.9** Vacuum relief valves shall be installed wherever necessary in lines designed to drain by gravity between pumping cycles.

- E.15.12.10** Provide stainless steel bolts on all valves.
- E.15.12.11** Provide operating nuts located between 2.0 m and 3.0 m below ground surface without rock shields on all valves.
- E.15.12.12** The forcemain invert at the receiving manhole shall be a maximum of 300 mm above the highest invert. The outlet invert of a lagoon inlet manhole shall always be above the high water level.
- E.15.12.13** When forcemain length exceeds 1000 metres, cleanouts should be installed in concrete access chambers complete with isolation valves and adaptor coupling for line flushing.
- E.15.12.14** A 2 hour pressure test shall be conducted for all new forcemains in accordance with the specifications listed under Section D.27.1 Pressure Testing.

E.16 RURAL LOW-PRESSURE SANITARY SERVICING

E.16.1 General

The sanitary sewer system shall be of sufficient capacity to service the ultimate population projection of the development area. The flows and factors outlined in the following sections shall be used in the design of a low pressure sanitary sewer systems.

The Developer and the Developer's Consultant are responsible to ensure that the infrastructure is designed and constructed to achieve manufacturers' design life expectations consistent with good design and construction practice. System proposals must identify disposal means in accordance with Alberta Environment and Water Regulations and Guidelines. Plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to the County and Alberta Environmental Protection for review and approval prior to construction.

E.16.2 Estimating Average Sewage Flows

- E.16.2.1** A sewage generation rate of 250 L/person/day for a low pressure sewer system with no infiltration rate shall be used, unless otherwise determined by the Manager, Engineering & Environmental Planning

department. Any sewage generation rate than the above will be dependant upon the disposal system capacity.

E.16.2.2 In determining residential flows a minimum of 3.5 persons per household shall be used unless otherwise determined by the Manager, Engineering & Environmental Planning Department.

E.16.2.3 Recommended pump rate and head will need to be provided. This information will be included in any plumbing permit issued by the county and will endure that all residents are aware of this requirement.

E.16.3 Pipe Sizing

E.16.3.1 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.

E.16.4 System Materials

E.16.4.1 General

E.16.4.1.1 The Developer shall supply and install only new materials.

E.16.4.1.2 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/her expense.

E.16.4.1.3 All standards referred to mean the latest edition of that Standard.

E.16.4.1.4 Where specific products are specified, it is intended that approved equals are also acceptable.

E.16.4.1.5 The "approved as equal" must be obtained from the Manager, Engineering & Environmental Planning Department before the equal product is used.

E.16.4.2 High Density Polyethylene (HDPE) Pipe

E.16.4.2.1 High Density Polyethylene pressure (HDPE) pipe shall be DR11 or DR13.5, PE 3408 iron pipe sized (IPS) and shall conform to CSA B137.1, ASTM F714 and ASTM D3350 Standards. Pipe sized from 13 mm through 76 mm shall



conform to ANSI/AWWA C901-02 Standard. Pipe sized from 100 mm through 1575 mm shall conform to ANSI/AWWA C906-00 Standard.

- E.16.4.2.2** Shop only moulded pipe fittings shall be used. If unavailable other alternatives must meet County approval first.
- E.16.4.2.3** All joints are to be thermal heat fused. Mechanical service connections are not approved.
- E.16.4.2.4** All components shall be made of corrosion resistant materials.
- E.16.4.2.5** Pipe age not to exceed two years at time of installation.

E.16.4.3 Low Pressure Sewer Mains

- E.16.4.3.1** In country residential subdivisions the sewer main alignments shall be as depicted on the Typical Country Residential Right-of-Way Roadway cross section drawing E-11.
- E.16.4.3.2** Mains shall be at a depth adequate to provide a minimum of 2.75 m depth of cover from finished grade to top of pipe.
- E.16.4.3.3** Auguring or directional drilling is required under all roads.
- E.16.4.3.4** Compaction of any trenches and auger pits and repair of any settlements that occur within two years is required.
- E.16.4.3.5** A separate service line with a curb stop, marked “sewer” at the property line is required for each lot.
- E.16.4.3.6** Flushing pipes are required at the start each collection main to facilitate removal of main line blockage.
- E.16.4.3.7** Manual air/vacuum relief valves are required at all high points for removal of hydrogen sulphide gases from anaerobic decomposition of organics.
- E.16.4.3.8** A minimum distance of 2.5 m horizontal separation must be maintained between a sewer main and any water main.
- E.16.4.3.9** A minimum distance of 3.0 m horizontal separation must be maintained between a sewer main and any gas line.
- E.16.4.3.10** Public Utility Lot (PUL) widths shall be a minimum of 4.0 m for a single utility and 6.0 m for one containing two utilities. A 1.0 m easement is required on the lots on each side of a PUL.
- E.16.4.3.11** Tracer Wire of a gauge copper shall be installed simultaneously with the pipe on all mains and services.

Splicing the tracer wire can be done by soldering, and mechanical connections, the following shall apply:

E.16.4.3.11.1 Tracer wire shall not be connected to the steel pipe or transition couplings.

E.16.4.3.11.2 Tracer wire shall be brought flush to the ground at every valve box riser at every road crossing, at every facility location and at end of every plastic pipe section. It shall be brought flush to the ground inside a rigid PVC conduit and looped inside a PVC junction box, within a type A valve box marked "Sewer". An electrical continuity test shall be performed prior to acceptance.

E.16.4.3.12 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.

E.16.4.3.13 Posts shall be GlasForms Inc., Fiberglass Composite Markers, Dual-Flex, Part number DF66-00 (1676 mm or 66 inches long in White) with Orange reflective stickers applied to both sides, or approved alternate.

E.16.4.3.13.1 Posts shall include one composite post anchor and shall be installed 457 mm (18 inches) in depth, thereby leaving 1.2 m (4ft) visible above ground.

E.16.4.3.13.2 Refer to drawing *B-12*.

E.16.4.4 Fittings

E.16.4.4.1 High Density Polyethylene (HDPE), DR11 conforming to ASTM FT714 and /CAN B137.1, shop molded fittings shall be used.

E.16.4.4.2 All HDPE molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electrofusion-type fittings.

E.16.4.5 Valves

E.16.4.5.1 Gate valves for 75 mm and larger shall be iron body, bronze mounted gate valves with a non-rising spindle, which open



by turning in 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 a zinc sacrificial anode. Valves to be flanged for polyethylene pipe.

E.16.4.5.2 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 3.0 m depth of bury. Top of cast iron box to be marked "SEWER". All curb stops shall incorporate 75 mm long stainless steel sleeves for connections to polyethylene pipe.

E.16.4.5.3 Valve ends compatible with pipe joint type (Cast Iron Outside Diameter) to be used.

E.16.4.5.4 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 screw to be galvanized. Top of box to be marked "SEWER".

E.16.4.5.5 Extension stem to be 25 mm square mild steel with 50 mm operating nut and flange suitable for 3.0 m bury. A rock disk nut is required on all valves.

E.16.4.5.6 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.

E.16.4.6 Service Connections

E.16.4.6.1 General

E.16.4.6.1.1 Each lot must have a separate service.

E.16.4.6.1.2 Curb stops marked "SEWER" shall be installed at the private property line, located within the 3.5 m utility easement.

E.16.4.6.2 Details



E.16.4.6.2.1 Sanitary sewer service pipe shall be 40 mm, DR11 polyethylene pipe, Series 110 Municipal tubing.

E.16.4.6.2.2 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 curb stop.

E.16.4.6.2.3 Curb Stops shall be non-draining type located adjacent to driveway locations.

E.16.4.6.2.4 Minimum depth of cover shall be 2.75 m from finished grade over top of pipe.

E.16.4.6.3 Septic Tank/Pump

E.16.4.6.3.1 Use two-compartment tank or a single-compartment tank with a pump vault, sized and constructed in accordance with Alberta plumbing codes.

E.16.4.6.3.2 Extend tank access risers at least 150 mm above finished ground surface, provide watertight manhole covers and divert surface runoff away from the manhole cover.

E.16.4.6.3.3 Tank must be large enough to provide:

- 450 mm for pump submergence, minimum,
- Full day of emergency storage capacity above the high water alarm level, utilizing the septic tank freeboard capacity below ground and/or below building drain outlet invert,
- Minimum 12-hour retention time below high water alarm level for proper treatment of the sewage flow,
- Storage of sludge and scum accumulation,
- Typically 3800 L (1000 gal) minimum total storage for an average 3 bedroom dwelling, and
- Reference "Alberta Private Sewage System Standard of Practice 1999", Section 5 Septic Tanks, Sewage Holding Tanks and Sewage Effluent Tanks.

- E.16.4.6.3.4** Tank must be sealed watertight tank (fibreglass, or one piece precast pump tank) or special provisions for assuring watertight tank.
- E.16.4.6.3.5** Anti-buoyancy provisions must be adequate.
- E.16.4.6.3.6** All pipe and wire conduits into tank must be through hubs or fittings made during the construction of the tank and installed in a watertight and gastight fashion.
- E.16.4.6.3.7** No drainage or any water other than sanitary wastewater shall be allowed to enter the tank.
- E.16.4.6.3.8** The effluent shall enter the pump compartment or pump vault from the clear zone of the tank between the scum and sludge layers.
- E.16.4.6.3.9** Pump must be:
- Submersible,
 - Capable of 3 minute minimum pump run time 1L/s pumping rate, and
 - Must be a CSA approved effluent pump capable of delivering 0.3 L/s at 70 m of total dynamic head or at a pressure established by the County. Pump must be readily removable for the ground surface.
- E.16.4.6.3.10** Pump discharge pipe must be of DR11 HDPE or stronger and include a check valve, disconnect union and valve within the pump tank.
- E.16.4.6.3.11** The pump screens shall be no larger than 3 mm in size and occupy a surface area of 1.44 square metres or equivalent product approved by the County.
- E.16.4.6.3.12** Pumps must be activated by either mechanical level controllers or Mercury level control switches.
- E.16.4.6.3.13** When any pump is located at a higher than the elevation of the terminal end a siphon-break valve must be provided for that pump.
- E.16.4.6.3.14** Provision for ventilation should be provided.

E.16.4.6.4 System Installation

E.16.4.6.4.1 General



E.16.4.6.4.1.1 The system installation standards are intended to address key points only and are not be considered as a suitable for a detail construction specification to be prepared by the Developer's Engineer.

E.16.4.6.4.2 Trenching, Bedding and Backfilling

E.16.4.6.4.2.1 All trenching and backfilling shall be completed in strict conformation with Occupational Health and Safety and any other application regulations and directions of the County Safety Officer.

E.16.4.6.4.2.2 It is the Developer's responsibility to ensure that his Consultants and Contractors are familiar with the "Safety Procedures for Pipeline and Utility Crossings" document produced by the Edmonton Area Pipeline and Utility Operators Committee. This document is in it's entirety from the Alberta One Call. The following excerpts from the 1991 publication of the referenced document are located in Appendix I.

E.16.4.6.4.2.2.1 Section 1.4 Contractor Responsibilities

E.16.4.6.4.2.2.2 Section 1.5 Pipeline Owner Responsibilities

E.16.4.6.4.2.2.3 The Developer shall, as a minimum, include the most recent version of the appended sections in their Contractor Documents for Construction.

E.16.4.6.4.2.3 If unsuitable soil conditions (i.e. organics, high moisture content, rock, etc.) are encountered, the method for dealing with these conditions shall be assessed by the qualified Professional Engineer commissioned by the Developer, and a letter report submitted to the Manager,

Engineering and Environmental Planning department.

E.16.4.6.4.2.4 For open trench construction Class “B” bedding as depicted on the Detail Drawing shall be used for all sewer mains in suitable soil conditions. If unsuitable pipe foundations exist, the design for a special pipe foundation and bedding shall be prepared by a qualified Professional Engineer and submitted to the Manager, Engineering and Environmental Planning department.

E.16.4.6.4.2.5 In all new subdivisions it shall be the Developer’s responsibility to ensure that utility trenches are adequately compacted. In the road ditch or ditch slope the road right-of-way 95% on Standard Proctor Density shall be required. 98% shall be requires if in the slope of the road.

E.16.4.6.4.2.6 A two year warranty on trench settlement shall be required in all areas of work performed by trencher machine excavation.

E.16.4.6.4.2.7 If the above compaction standards cannot be achieved because of abnormal weather or wet ground conditions the Manager, Engineering & Environmental Planning department may at his sole discretion establish amore appropriate standard for the individual case on receipt of an acceptable proposal from the Developer’s engineer.

E.16.4.6.4.3 Augering of All Services Connection

E.16.4.6.4.3.1 All service connections shall be installed by augering under proposed or existing streets except where augering is not feasible due to adverse soil conditions. Open trenching may be permitted subject to the Manager,

Engineering and Environmental Planning department's acceptance of the need and acceptance of the backfill material.

E.16.4.6.4.3.2 All auger pit excavations shall be backfill with granular bedding material and mechanically compacted, in lifts not to exceed 150 mm in depth, to a minimum of 98% Standard Proctor Density to 300 mm above the pipe.

E.16.4.6.4.3.3 Backfill of auger pit excavation over 300 mm above the pipe shall be compacted in lifts not to exceed 150 mm in depth, to a minimum of 95% in the road ditch or ditch slope or a minimum of 98% if in the side slope of the road.

E.16.4.6.5 Inspection and Testing

E.16.4.6.5.1 Before acceptance of the work, the entire system shall be subjected to a hydrostatic pressure of the presence test in the presence of the County representative. The Developer shall provide all necessary labour. Materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plug, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and expansion-leakage losses. The Developer shall provide evidence that the gauges used are accurate.

E.16.4.6.5.2 Expel air from collection system, slowly filling main with water. High points must have automatic air/vacuum relief valves to vent air when filling and be closed when pressure is applied.

E.16.4.6.5.3 A hydrostatic test pressure if 1.5 times the pipe at the lowest point in the system main shall be applied.

E.16.4.6.5.4 Pressurized pipe to require test pressure over a 3-hour period and hold requires test pressure for an additional hour to allow for pipe expansion and stretching prior to the leakage test.

E.16.4.6.5.5 Test period shall be for 2-hour duration. Amount of make-up water (leakage) required to return the pipe to required test pressure shall not exceed the allowance given in the following table.

Field Testing of Low Pressure Sewer Systems

Nominal Pipe Size mm	Allowance for Expansion (Leakage) (litres/100 m of pipe) 2 Hour Testing
50	1.6
75	1.9
100	3.1
150	7.5
200	12.5

Total time under test pressure must not exceed 8-hours. If test is not accepted due to leakage or equipment failure, test sections must be permitted to "relax" for 8-hour period prior to the next testing sequence.

E.16.5 Summary of Sanitary Sewer Systems Standards

The following is a summary of the standards applicable to the sanitary sewer systems materials and construction. In all cases, it is intended that the latest apply.

ASTM

A48	Grey Iron Castings
C14	Concrete Sewer, Storm and Drain, and Culvert Pipe
C76	Reinforced Concrete Culver, Storm Drain, and Sewer Pipe
C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C478	Precast Reinforced Concrete Manhole Sections
D698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures
D3034	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

CSA

A5	Portland Cements
A23.1	Concrete Materials and Methods of Concrete Construction
A257 Series	Standards for Concrete Pipe
B182.1	Sewer Pipe Fittings PVC Sewer Pipe and Fittings
B182.2	(PSM Type) Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings
B182.11	Billet Steel Bars for Concrete
G30.12	Reinforcement

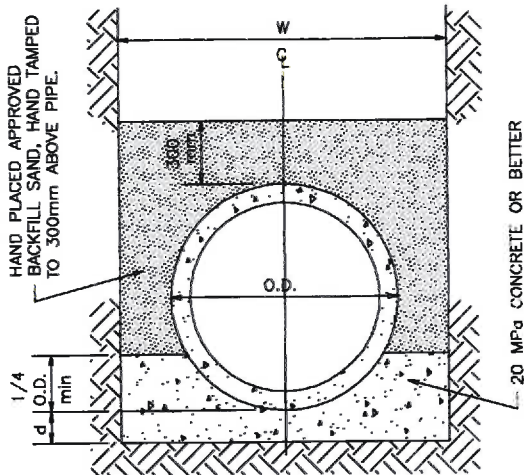


This page intentionally left blank.



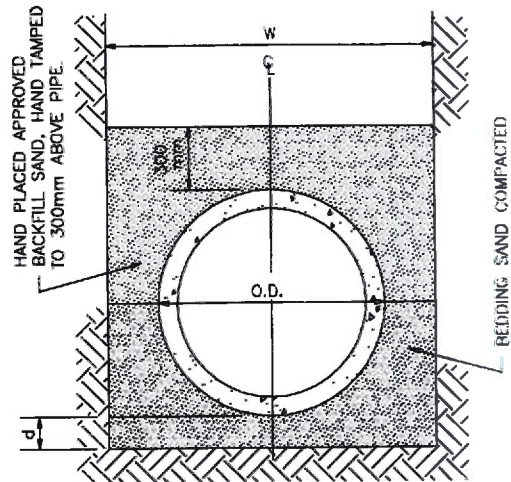
CLASS A BEDDING

$$L_f = 2.8$$



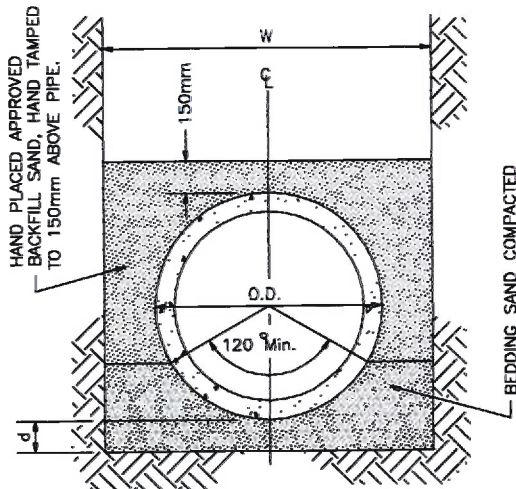
CLASS B BEDDING

$$L_f = 1.9$$



CLASS C BEDDING

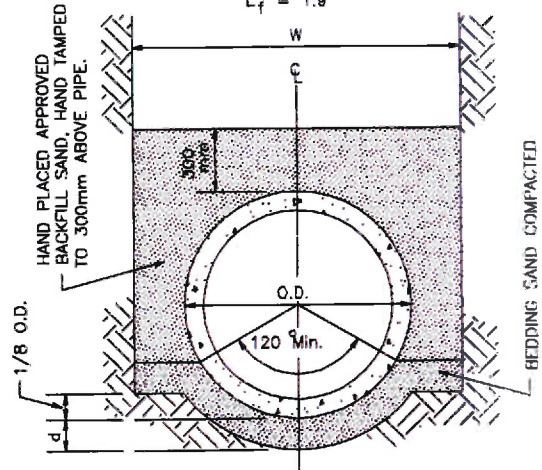
$$L_f = 1.5$$



CLASS B BEDDING

ALTERNATE - 375mm I.D. & UNDER

$$L_f = 1.9$$



NOTES:

- W = TRENCH WIDTH - O.D. + 450mm (MINIMUM)
- 1000mm max. FOR PIPES UP TO AND INCLUDING 400mm DIAMETER
- O.D. + 400mm max. (ON EITHER SIDE {800mm TOTAL}) FOR PIPE DIAMETERS 450mm AND ABOVE

- O.D. = OUTSIDE PIPE DIAMETER
- I.D. = INSIDE PIPE DIAMETER
- L_f = LOAD FACTOR
- d = DEPTH OF BEDDING BELOW PIPE
- I.D. = 675mm OR SMALLER - d min = 150mm
- I.D. = 750mm TO 1500mm - d min = 150mm
- I.D. = 1650mm AND LARGER - d min = 150mm



General Municipal Servicing Standards

Rev.	
Rev.	
Rev.	
Rev.	
Date: APRIL 2013	

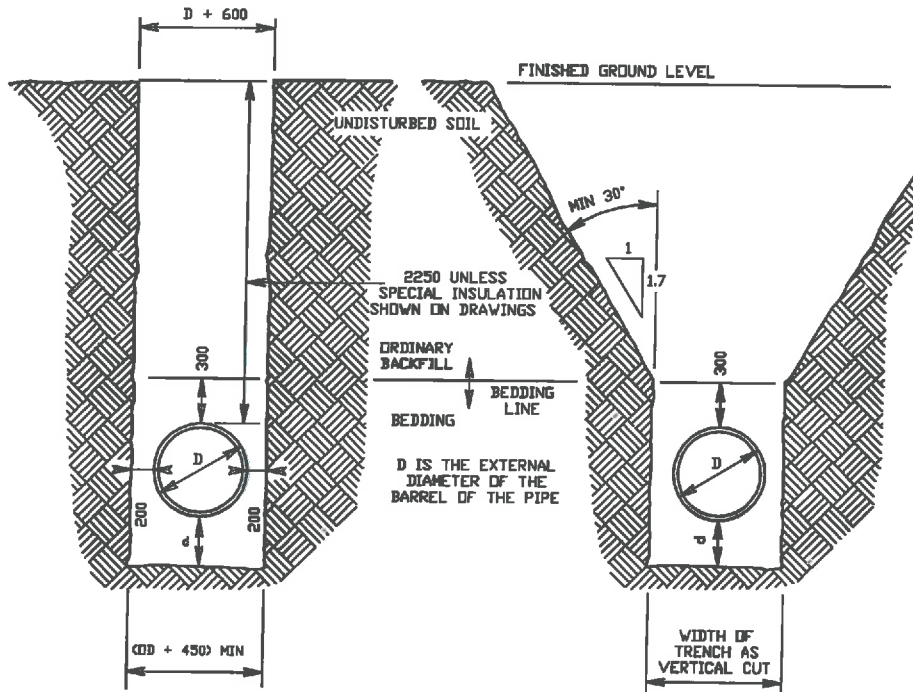


File No.: ED60.36498
Design:
Drawn: JIM
Scale NTS

Approved:

STANDARD TRENCH BEDDING
FOR CIRCULAR PIPES

Drawing
E-01



**STANDARD TRENCH
VERTICAL CUT**

(TO BE SHORED AS PER
OCCUPATIONAL HEALTH AND
SAFETY STANDARDS)

**STANDARD TRENCH
SLOPING CUT**

(TO BE SLOPED AS PER
OCCUPATIONAL HEALTH
AND SAFETY STANDARDS)

MAXIMUM TRENCH WIDTHS FOR SINGLE PIPES

- UP TO AND INCLUDING 400mm DIAMETER - 1000mm
- 450mm DIAMETER AND ABOVE - OD + 600mm

DEPTH OF BEDDING BELOW PIPE BARREL (d)

- EXTERNAL DIAMETER OF 700mm AND BELOW :75
- EXTERNAL DIAMETER GREATER THAN 700mm :100

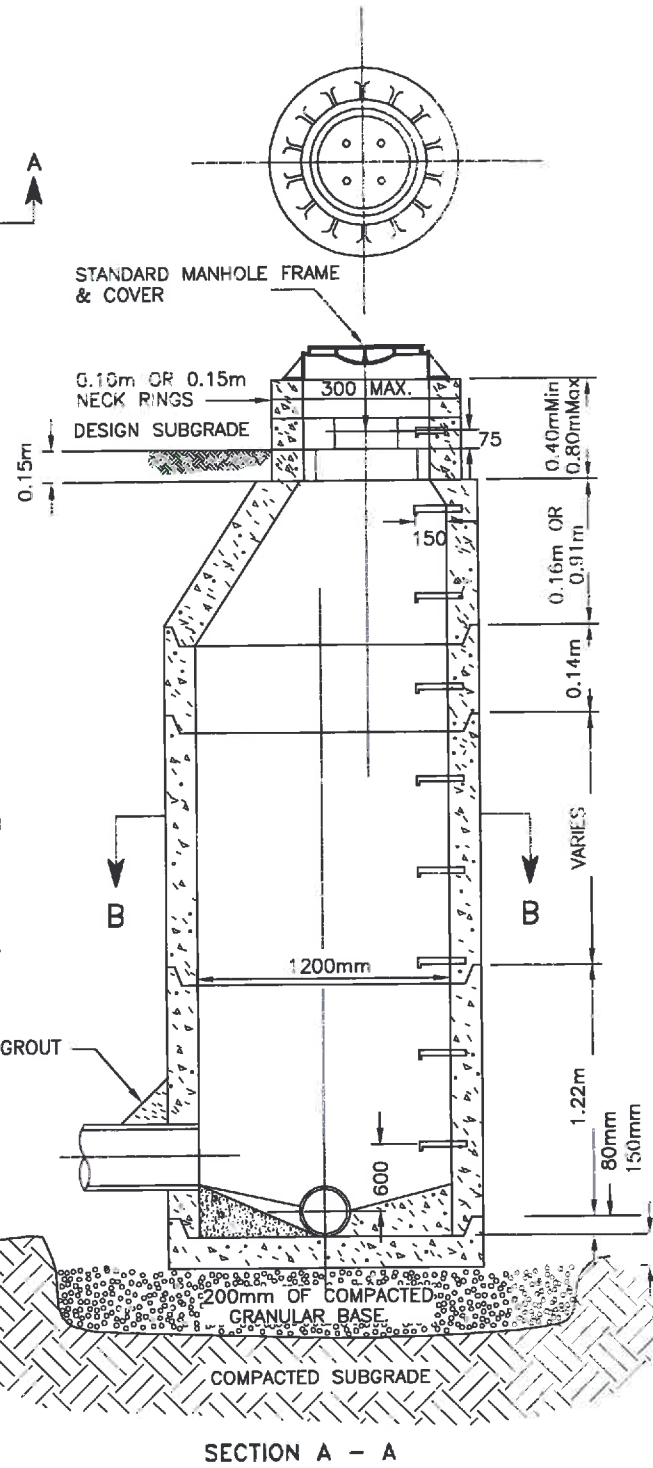
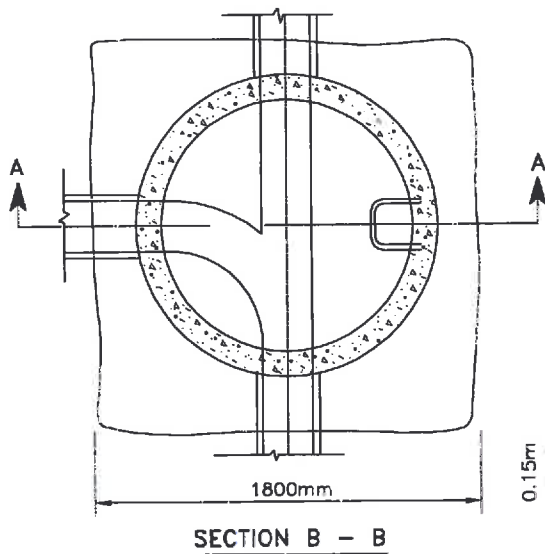
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED



Lamont County

General Municipal Servicing Standards

Rev.	Stewart Weir	STANDARD TRENCH DIMENSIONS FOR CIRCULAR PIPE		
Rev.				
Rev.				
Rev.	File No.: ED60.36498	Design:	Approved:	Drawing E-02
Date: APRIL 2013	Drawn: JIM	Scale: NTS		



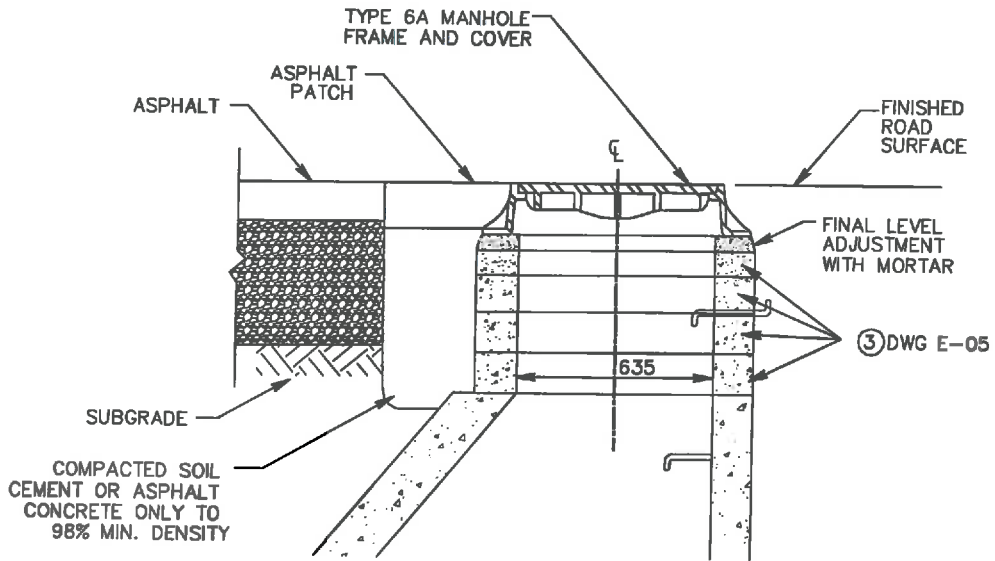
NOTES

1. STANDARD M.H. FRAME & COVER.
2. MANHOLE BARRELS TO MEET A.S.T.M. C478
3. FORMANHOLES OVER 5.00m IN DEPTH. PRECAST OR POURED IN PLACE BASES SHALL BE REINFORCED WITH BARS.
4. POURED IN PLACE CONCRETE TO BE 30MPa AT 28 DAYS.
5. INLET & OUTLET PIPE TO BE GROUTED FLUSH WITH WALL.
6. GALVANIZED STEEL SAFETY STEPS AT 0.41m MAXIMUM TO FULL HEIGHT OF M.H.
7. RUBBER GASKET JOINT.
8. SAFETY GRATING TO BE USED WHEN THE DEPTH OF THE MANHOLE EXCEEDS 5 METRES. THE SAFETY GRATING WILL BE PLACED AT 3m BELOW THE MANHOLE TOP.

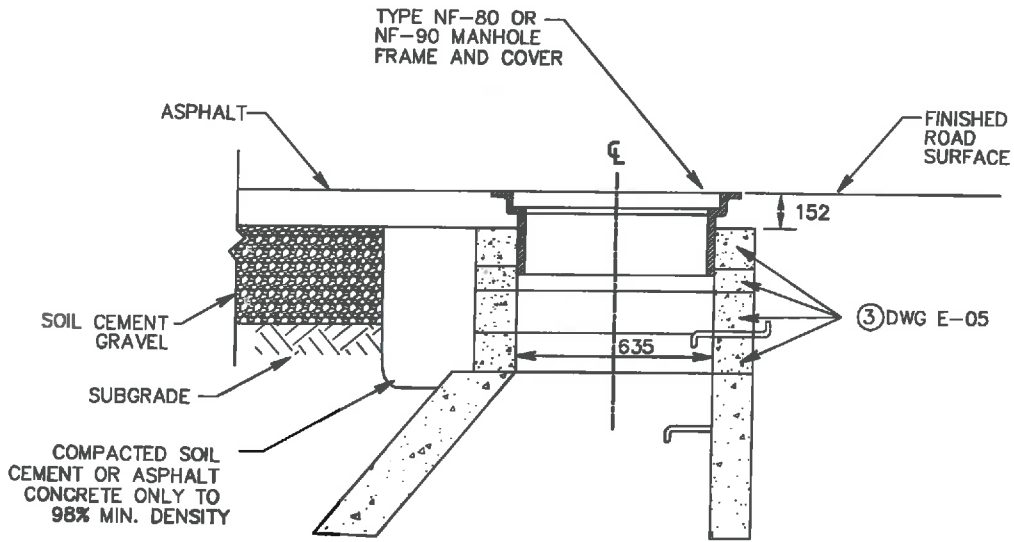


General Municipal Servicing Standards

Rev.		STANDARD 1200mm MANHOLE		Approved:	Drawing E-03
Rev.					
Rev.					
Rev.	File No.: ED60.36498	Design:	Approved:		
Date: APRIL 2013	Drawn: JIM	Scale: NTS			

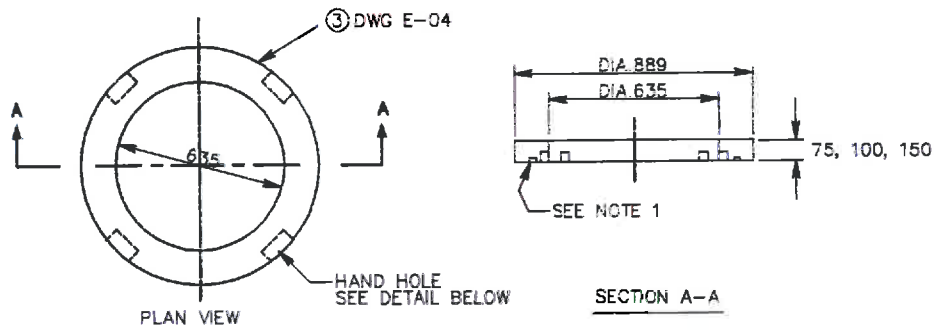


ALL DIMENSIONS ARE IN mm
UNLESS OTHERWISE NOTED

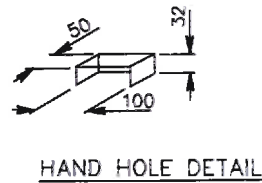


General Municipal Servicing Standards

Rev.		NECK SECTION DETAILS FOR STANDARD 1200 MANHOLE		Approved:	Drawing E-04
Rev.					
Rev.					
Rev.	File No.: ED60.36498	Design:	Approved:	Drawing E-04	
Date: APRIL 2013	Drawn: JIM	Scale: NTS			



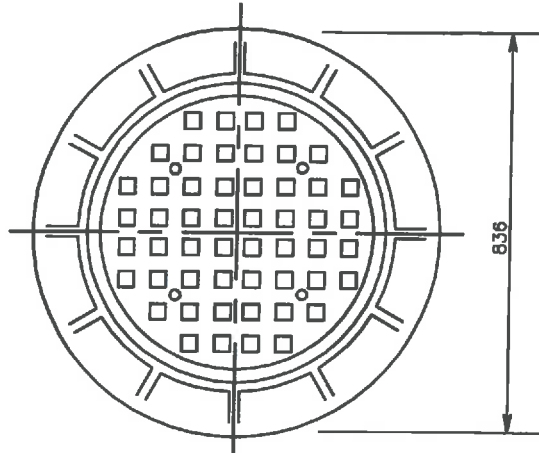
635 RING
 (NECK RING FOR USE WITH TYPES 4A, 6, 6A, B, NF-80, NF-90
 FRAMES AND COVERS/GRATINGS)



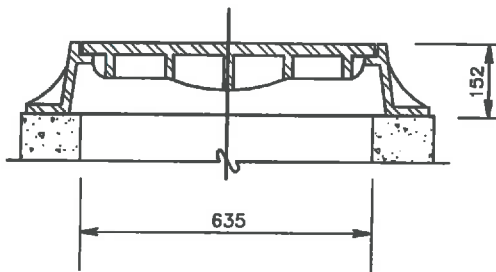
- NOTES:
1. A CONCENTRIC GROOVE LOCATED AT MID CROSS SECTION, SUITABLE FOR SEALANT IS REQUIRED FOR NECK RINGS AND EXTENSION RINGS.
 2. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE NOTED

Lamont County General Municipal Servicing Standards

Rev.		635 NECK RING		
Rev.				
Rev.				
Rev.	File No.: ED60.3649B	Design:	Approved:	Drawing
Date: APRIL 2013	Drawn: JIM	Scale NTS		E-05




ALL DIMENSIONS ARE IN mm
UNLESS OTHERWISE NOTED

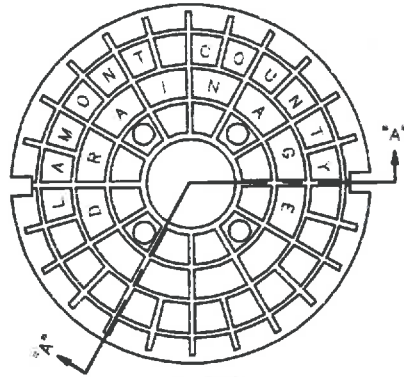


MATERIAL;
FRAME: GRAY IRON CLASS 20B
COVER: GRAY CLASS 20B

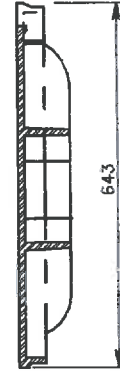


General Municipal Servicing Standards

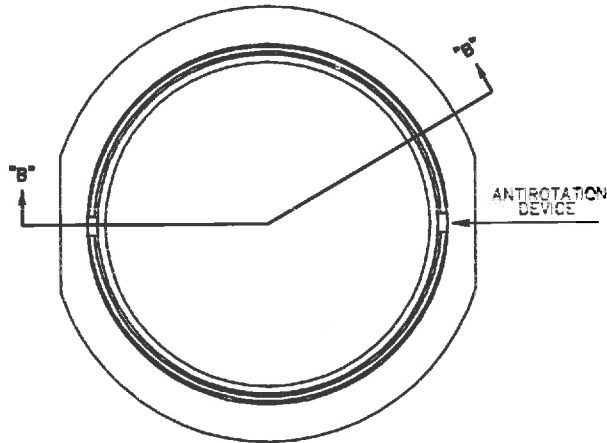
Rev.		TYPE 6A COVER AND FRAME		
Rev.				
Rev.				
Rev.	File No.: ED60.36498	Design:	Approved:	Drawing E-06
Date: APRIL 2013	Drawn: JIM	Scale NTS		



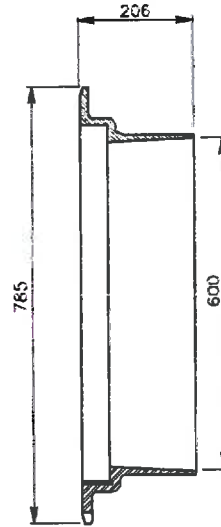
TOP VIEW
MANHOLE COVER
WITH 4 VENTHOLES



SECTION "A-A"



PLAN



SECTION "B-B"

NOTES:

1. MATERIAL SPECIFICATION:
DUCTILE IRON TO CONFORM TO A.S.T.M. A536 (LATEST EDITION) GRADE 80-60-03
2. NF-90 FRAME AND COVER IS WATERTIGHT VARIATION OF NF-80.
THERE ARE NO VENTING HOLES IN NF-90 COVER AND A GASKET IS
PLACED BETWEEN THE FRAME AND COVER
3. ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED

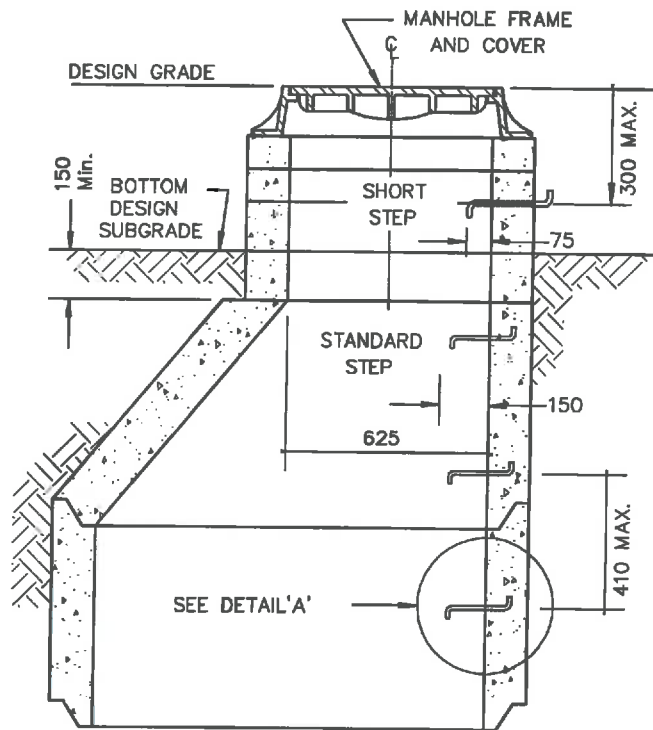


General Municipal Servicing Standards

Rev.		FLOATING MANHOLE FRAME AND COVER TYPE NF-80 AND NF-90		Approved:	Drawing E-07
Rev.					
Rev.					
Rev.					
Date: APRIL 2013	File No.: ED60.36498 Drawn: JIM	Design: Scale NTS			

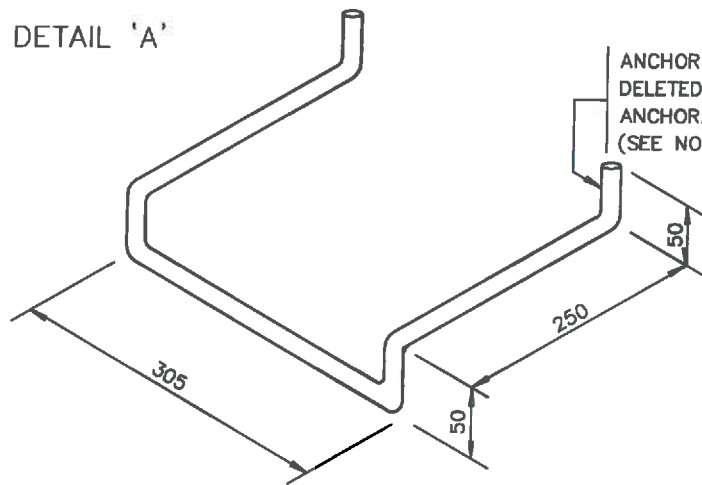
PLACEMENT:

1. EXCEPT WHERE SPECIFIED OTHERWISE, SAFETY STEPS SHALL BE INSTALLED IN ALL PRECAST MANHOLE SECTIONS & CONES, IN THE GRADE ADJUSTMENT SECTIONS AND IN CAST IN PLACE SECTIONS SO THAT WHEN THE VARIOUS SECTIONS ARE ASSEMBLED IN ANY COMBINATION THEY WILL FORM A CONTINUOUS VERTICAL LADDER WITH RUNGS EQUALLY SPACED AT A MAXIMUM OF 410mm TO WITHIN 300mm BELOW THE COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING.
2. STEPS SHALL BE CAST FIRMLY IN PLACE OR SECURED WITH A SUITABLE MECHANICAL ANCHORAGE TO PREVENT PULLOUT, AND MAINTAIN WATER TIGHTNESS.
3. "STANDARD STEPS" SHALL PROJECT A DISTANCE OF 150mm MEASURED AT THE POINT OF EMBEDMENT.
4. A "SHORT STEP" WITH A PROJECTION OF 75mm SHALL BE INSTALLED WITHIN THE GRADE ADJUSTMENT SECTION, CAST INTO THE NECK OR FIRMLY MORTARED IN PLACE BETWEEN THE NECK RINGS, WITH THE ANCHOR LEGS OUTSIDE OF THE NECK RING.
5. EXCEPT AS SPECIFIED ABOVE, DESIGN AND INSTALLATION OF SAFETY STEPS SHALL CONFORM TO A.S.T.M. C478.



TYPICAL MANHOLE SECTION

DETAIL 'A'



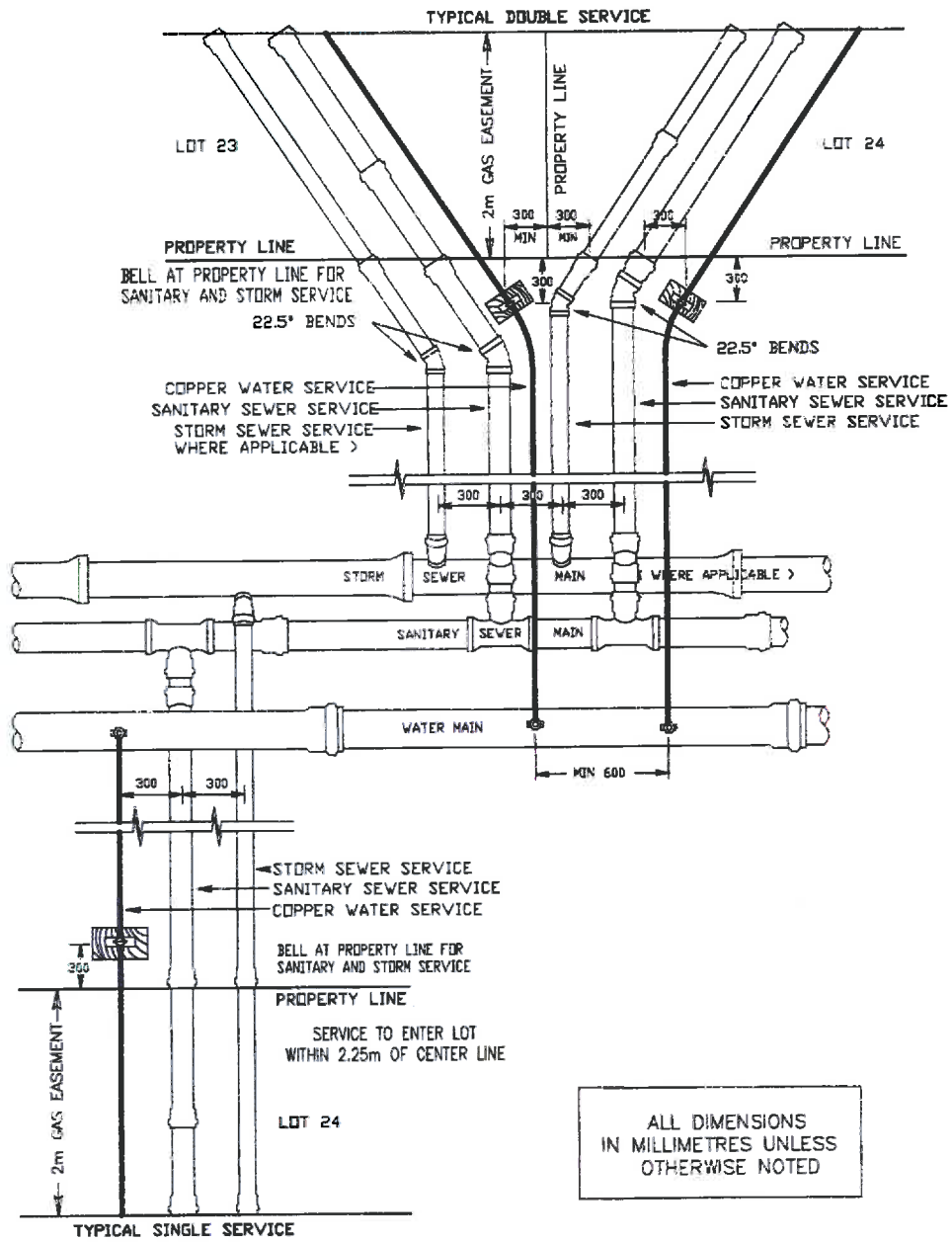
ANCHOR LEG MAY BE DELETED WHERE MECHANICAL ANCHORAGE IS PROVIDED (SEE NOTE #2)

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED



General Municipal Servicing Standards

Rev.		SAFETY STEPS FOR MANHOLES		Approved:	Drawing E-08
Rev.					
Rev.					
Date: APRIL 2013	File No.: ED60.36498	Design:	Scale: NTS		
	Drawn: JIM				



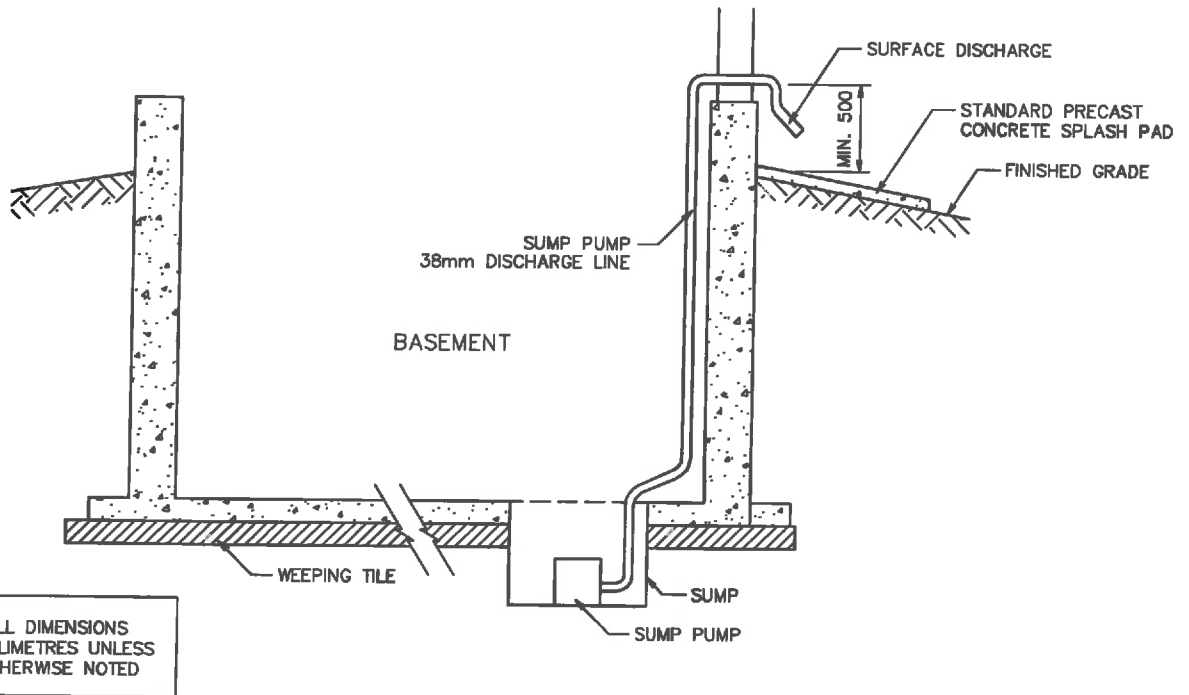
NOTES:

1. WATER AND SEWER SERVICES MAY BE EXTENDED TO EDGE OF 2.0m GAS EASEMENT.
2. THE CITY ACCEPTS NO RESPONSIBILITY FOR THE CONSTRUCTION OR MAINTENANCE OF SERVICES INSTALLED WITHIN THE EASEMENT.
3. MARK ENDS OF SERVICES AT EDGE OF GAS EASEMENT WITH A 50mm X 100mm X 750mm STAKE PROTRUDING 450mm ABOVE GROUND AND PAINTED BLUE. MARK THE CURB CONTROL VALVE WITH A SIMILAR STAKE PAINTED RED.
4. THE END OF COPPER WATER SERVICE PIPING SHOULD NOT BE CRIMPED CLOSED, PERMEABLE FILTER CLOTH MAY BE USED TO PREVENT INTRUSION OF DEBRIS AND TO ALLOW TESTING FLOW OF CURBSTOP.

Lamont County

General Municipal Servicing Standards


Rev. Rev. Rev. Rev. Date: APRIL 2013		File No.: ED60.36498 Design: Drawn: JIM Scale: NTS	TYPICAL SERVICES (SINGLE & DUAL) Approved:	Drawing E-09
--	--	---	---	------------------------



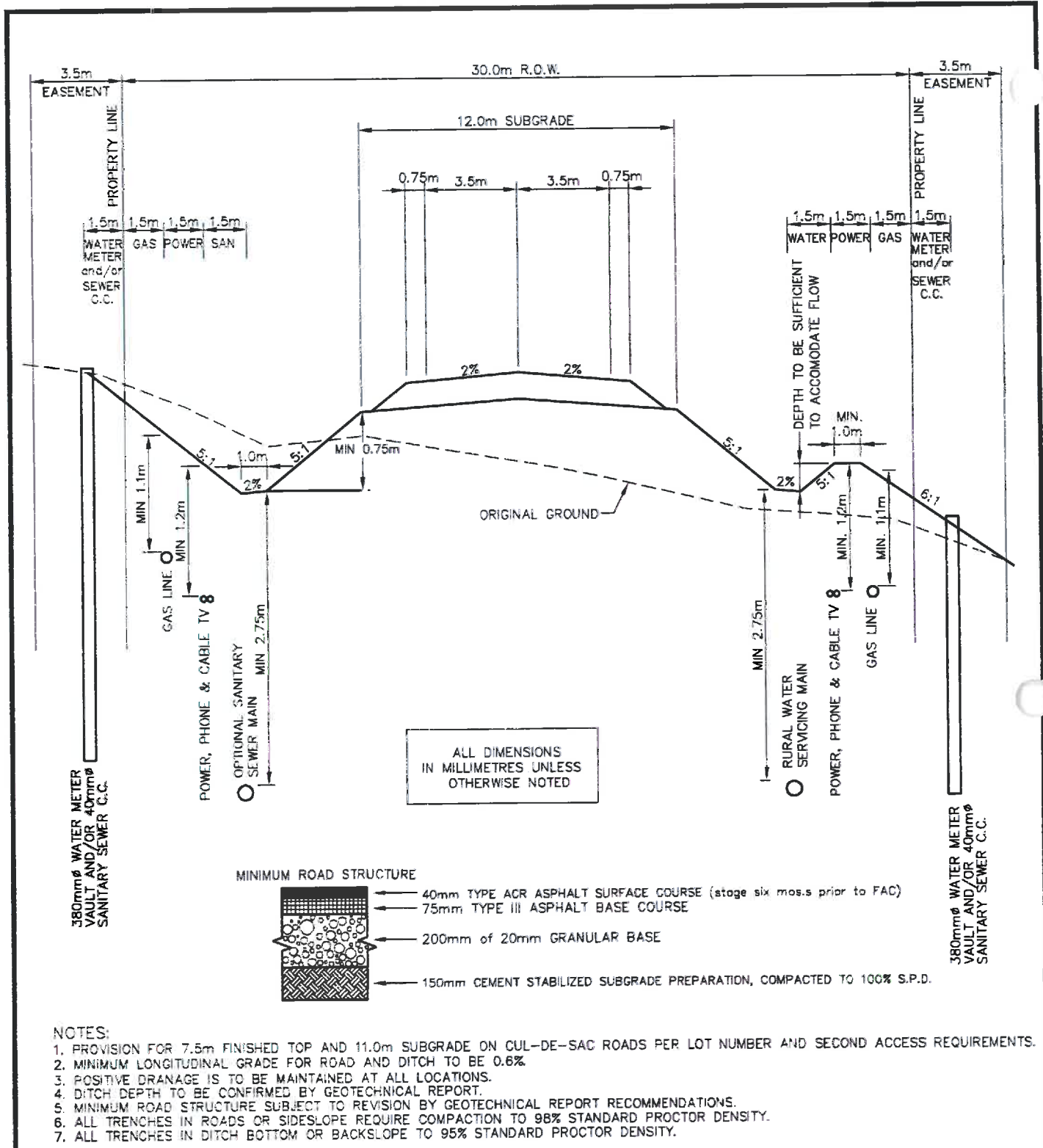
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

- NOTES:
1. ROOF LEADERS (DOWNSPOUTS) OR ANY OTHER STORM WATER SOURCE MUST NOT BE CONNECTED TO THE SUMP DISCHARGE COLLECTION SERVICE LINE.
 2. THE SURFACE DISCHARGE MUST BE INSTALLED TO PROVIDE AN OVERFLOW IN THE EVENT THAT THE STORM DRAINAGE SYSTEM CANNOT ACCOMMODATE FLOWS DUE TO CAPACITY, FREEZING OR OTHER PROBLEMS.

Lamont County General Municipal Servicing Standards

Rev. Rev. Rev. Rev. Date: APRIL 2013	 Stewart Weir		TYPICAL SUMP PUMP DISCHARGE CONNECTION	
	Drawn: JIM	Scale: NTS		E-10

36498 ED60 04BS - Lamont County 000000\BOM\WODg\rele\kpr\A\Let\Figurs E\LAMONT COUNTY-E10-SUMP PUMP.dwg
 Lamont County



ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

MINIMUM ROAD STRUCTURE




- ← 40mm TYPE ACR ASPHALT SURFACE COURSE (stage six mos.s prior to FAC)
- ← 75mm TYPE III ASPHALT BASE COURSE
- ← 200mm of 20mm GRANULAR BASE
- ← 150mm CEMENT STABILIZED SUBGRADE PREPARATION, COMPACTED TO 100% S.P.D.

NOTES:

1. PROVISION FOR 7.5m FINISHED TOP AND 11.0m SUBGRADE ON CUL-DE-SAC ROADS PER LOT NUMBER AND SECOND ACCESS REQUIREMENTS.
2. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.6%.
3. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL LOCATIONS.
4. DITCH DEPTH TO BE CONFIRMED BY GEOTECHNICAL REPORT.
5. MINIMUM ROAD STRUCTURE SUBJECT TO REVISION BY GEOTECHNICAL REPORT RECOMMENDATIONS.
6. ALL TRENCHES IN ROADS OR SIDESLOPE REQUIRE COMPACTION TO 98% STANDARD PROCTOR DENSITY.
7. ALL TRENCHES IN DITCH BOTTOM OR BACKSLOPE TO 95% STANDARD PROCTOR DENSITY.



General Municipal Servicing Standards

Rev.		RESIDENTIAL SUBDIVISION ROAD 8.5m FINISHED TOP ON 12.0m SUBGRADE		
Rev.		File No.: ED60.36498	Design:	Approved:
Rev.		Drawn: JIM	Scale: NTS	Drawing: E-11
Date: APRIL 2013				

This page intentionally left blank

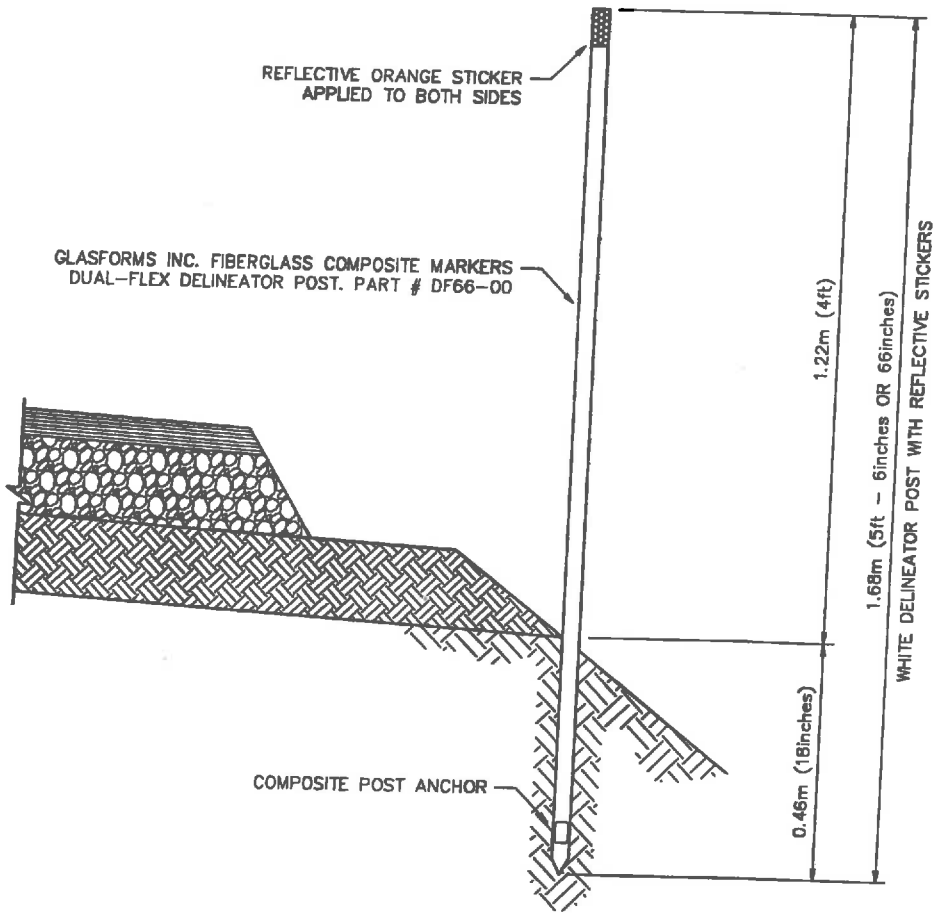
Section H Landscaping: Illustrates the requirements and restriction in regard to landscaping within municipal right of ways and for commercial/industrial sites including berm requirements. Restrictions on vegetation species are also reviewed.

Section I Street Lighting: The standards, guidelines and approvals for the use of street lighting are reviewed.

Section J Rural Fire Protection: Provides the general overview and outlines the requirements to engage a professional engineer to ensure design consideration meet with Regulator requirements.

Section K References: A listing of Standards, Regulations and Acts is provided.





NOTES:

1. POSTS TO BE INSTALLED AT EDGE OF SUBGRADE PREPARATION.
2. EACH POST TO INCLUDE ONE POST ANCHOR.
3. SIX POSTS REQUIRED PER SUBDIVISION ACCESS (EXCEPT ON CLASS I GRID ROADS).
4. TWO POSTS REQUIRED PER RESIDENTIAL ACCESS.

Lamont County

General Municipal Servicing Standards



FLEXIBLE DELINEATOR POSTS

Rev.	
Rev.	
Rev.	
Rev.	
Date:	APRIL 2013

File No.:	ED60.36498
Design:	
Drawn:	JIM
Scale:	NTS

Approved:	
-----------	--

Drawing	E-12
---------	------

\\lamont\lms\jobs\46498 ED60 0199 - Lamont County\BIDDING\BIDDING\Drawings\Drawings\LAMONT COUNTY-E12-FLEX POST.dwg

This page intentionally left blank

