

1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for constructing new outfall structures, precast and cast-in-place manholes and catch basins.

1.2 MEASUREMENT PROCEDURES

- .1 Measure 1200mm diameter Catch Basins by the unit. Included will be the supply and installation of the catch basins, excavation, backfilling, base slab, catch basin rings, adjusting tops, cover, frame, grating and any sealing required to complete the installation.
- .2 Measure abandoned existing sanitary manholes by the unit. Included will be the excavation, flowable fill and any other item necessary to complete this section.
- .3 Measure adjusting tops of existing manholes or catch basins in units adjusted.

1.3 REFERENCES

- .1 American Society for Testing and Materials:
 - .1 ASTM C139-11, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .2 ASTM C478-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
 - .3 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³(600 kN-m/m³)).
 - .4 ASTM A48/A48M-03 (2012), Standard Specification for Gray Iron Castings.
- .2 Canadian Standards Association (CSA):
 - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005):
 - .1 A3001-08, Cementitious Materials for Use in Concrete.
 - .2 A3002-08, Masonry and Mortar Cement.
 - .3 A3003-08, Chemical Test Methods for Cementitious Materials for Use in Concrete and Masonry.
 - .4 A3004-08, Test Methods and Standard Practices for Cementitious Materials for Use in Concrete and Masonry.
 - .5 A3005-08, Test Equipment and Materials for Cementitious Materials for Use in Concrete and Masonry.
 - .2 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .3 CAN/CSA-A165 Series-04 (R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
 - .4 CAN/CSA-G30.18-M92 (R2007), Billet-Steel Bars for Concrete Reinforcement.
 - .5 CAN/CSA A23.3-04 (R2010) includes G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies WHMIS MSDS – Material Safety Data Sheets.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 – Quality Control.
 - .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.
 - .2 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

2 Products

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2.1 MATERIALS

- .1 Cast-in-place concrete:
 - .1 In accordance with Section 03 30 00 – Cast-in-Place Concrete.
- .2 Concrete reinforcement:
 - .1 In accordance with Section 03 20 00 – Concrete Reinforcement.
- .3 Precast manhole units: to ASTM C478-13, circular. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
 - .1 Manholes shall have a top, intermediate and bottom section. Bottom Section benched.
- .4 Precast catch basin sections: to ASTM C139, ASTM C478-13.
- .5 Joints: to be made watertight using rubber rings, bituminous compound, epoxy resin cement.

- .6 Mortar:
 - .1 Aggregate: to CSA A82.56 – Aggregate for Masonry Mortar.
 - .2 Masonry Cement: to CAN/CSA A3002-08.

 - .7 Ladder rungs: to CAN/CSA G30.18, No. 25M billet-steel deformed bars, hot dipped galvanized to CAN/CSA G164. Rungs to be safety pattern (drop step type).

 - .8 Adjusting rings: to ASTM C478-13.

 - .9 Frames, gratings, covers to dimensions as indicated and as per the following requirements:
 - .1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
 - .2 Gray iron castings: to ASTM A48/A48M, strength class 30B.
 - .3 Castings: coated with two (2) applications of asphalt varnish.
 - .4 Minimum 195 kg per set.
 - .5 Catch basin frames and covers: minimum 195 kg per set.
 - .6 Size: 630 mm clear diameter, 610 mm square for grates.

 - .10 Granular bedding and backfill: in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.

 - .11 Unshrinkable fill: in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.
- 3 Execution
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- 3.1 EXCAVATION AND BACKFILL
- .1 Excavate and backfill in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling and as indicated.
 - .2 Obtain approval of Departmental Representative before installing manholes or catch basins.
- 3.2 CONCRETE WORK
- .1 Do concrete work in accordance with Section 03 30 00 – Cast-in-Place Concrete.
 - .2 Place concrete reinforcement in accordance with Section 03 20 00 – Concrete Reinforcement.
 - .3 Position metal inserts in accordance with dimensions and details as indicated.
- 3.3 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses. Maximum of three (3) units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.
- .4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 95% maximum density to ASTM D698.
- .5 Precast units:
 - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with Departmental Representative and Construction Manager approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof.
 - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .6 For sewers:
 - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
 - .2 Bench to provide a smooth U-shaped channel. Side height of channel to be 0.50 times full diameter of sewer. Slope adjacent floor at 1 in 20. Curve channels smoothly. Slope invert to establish sewer grade.
- .7 Compact granular backfill to 95% maximum density to ASTM D698.
- .8 Place unshrinkable backfill in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.
- .9 Installing units in existing systems:
 - .1 Where new unit is to be installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
 - .2 Make joints watertight between new unit and existing pipe.
 - .3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready to be put in operation, complete installation with appropriate breakouts, removals, redirection of flows, blocking unused pipes or other necessary work.
- .10 Place frame and cover on top section to elevation as indicated. If adjustment is required use concrete ring.

- .11 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

3.4 ADJUSTING TOPS OF EXISTING UNITS

- .1 Remove existing gratings, frames and store for re-use.
- .2 Sectional units:
 - .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
 - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section. When amount of rise is less than 600 mm, use standard manhole brick, modoloc or grade rings.

3.5 SEALING OVER EXISTING UNITS

- .1 Fill with cast-in-place concrete as approved by Departmental Representative.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 SECTION INCLUDES

- .1 Work under this section includes the supply of all labour, materials and equipment for the installation for sanitary gravity sewer mains and all incidentals required to make a complete functional system.

1.2 MEASUREMENT PROCEDURES

- .1 Measure supply and installation of sanitary sewer PVC Pipes and Fittings, including testing, excavation and backfilling, bedding and surround horizontally from manhole face to manhole face in metres of each size pipe and/or class installed.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
- .1 ASTM C117-13, Standard Test Method for Materials Finer than 75- μm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM C443M-11, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - .4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .5 ASTM D3034-08, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .2 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International):
- .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005)
 - .2 CAN/CSA B1800-02, Plastic Non-Pressure Pipe Compendium – B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11):
 - .1 CAN/CSA-B182.1-02, Plastic Drain and Sewer Pipe and Pipe Fittings.
 - .2 CAN/CSA B182.2-02, PVC Sewer Pipe and Fittings (PSM Type).
 - .3 CAN/CSA B182.6-02, Profile Polyethylene Sewer Pipe and Fittings for Leak-Proof Sewer Applications.
 - .4 CAN/CSA B182.11-02, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

1.4 DEFINITIONS

- .1 Pipe section is defined as length of pipe between successive manholes and/or between manhole and any other structure which is part of sewer system.

1.5 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Inform Departmental Representative, at least four (4) weeks prior to beginning work, of proposed source of bedding materials, and provide access for sampling.
- .4 Submit manufacturer's test data and certification at least two (2) weeks prior to beginning work.
- .5 Ensure certification is marked on pipe.
- .6 Submit manufacturer's information data sheets and instructions in accordance with Section 01 33 00 – Submittal Procedures.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide data to produce record drawings, including top of pipe, horizontal location of fittings and type, and manhole structures.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

1.8 SCHEDULING OF WORK

- .1 Schedule work to minimize interruptions to existing services and maintain existing sewage flows during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
- .3 Notify Departmental Representative a minimum of 48 hours in advance of any interruption in service.

2 Products

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2.1 PLASTIC PIPE

- .1 Type PSM Poly(Vinyl) Chloride (PVC): to ASTM D3034, CAN/CSA B182.2:
 - .1 Standard Dimensional Ratio (SDR): 35.
 - .2 Locked-in gasket and integral bell system.
 - .3 Nominal lengths: 4 m.

2.2 SERVICE CONNECTIONS

- .1 Type PSM Poly(Vinyl) Chloride (PVC): to CAN/CSA-B182.2.
- .2 Plastic pipe: to CAN/CSA B182.1, with push-on joints.
- .3 PVC service saddles: with oil resistant gaskets, two (2) stainless steel clamps and oil resistant "O" rings in branch end. Fowler Inserta-Tee, gasketed one (1)-piece PVC Tee or DFH/HPI flexible rubber service saddle.

2.3 CEMENT MORTAR

- .1 Portland cement: to CAN/CSA A3000.
- .2 Mix mortar one (1) part by volume of cement to two (2) parts of clean, sharp sand mixed dry.
 - .1 Add only sufficient water after mixing to give optimum consistency for placement.
 - .2 Do not use additives.

2.4 PIPE BEDDING AND SURROUND MATERIALS

- .1 Granular material in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.
- .2 Concrete mixes and materials for bedding, cradles, encasement, supports in accordance with Section 03 30 00 – Cast-in-Place Concrete.

2.5 BACKFILL MATERIAL

- .1 As indicated on drawings.
- .2 Common Fill: to Section 31 23 10 – Excavating, Trenching and Backfilling.
- .3 Unshrinkable Fill: to Section 31 23 10 – Excavating, Trenching and Backfilling.

3 Execution
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3.1 PREPARATION

- .1 Clean and dry pipes and fittings before installation.
- .2 Obtain Departmental Representative approval of pipes and fittings prior to installation.

3.2 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.
- .2 Do not allow contents of any sewer or sewer connection to flow into trench.
- .3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .1 Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with common backfill.

3.4 INSTALLATION

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .2 Handle pipe using methods approved by Departmental Representative.
 - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipe during construction, except as may be permitted by Departmental Representative.
- .7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CAN/CSA B182.11.
- .9 Pipe jointing:
 - .1 Install gaskets in accordance with manufacturer's recommendations.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
 - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 When stoppage of work occurs, block pipes as directed by Departmental Representative to prevent creep during downtime.
- .11 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .12 Make watertight connections to manholes.
 - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .13 Use prefabricated saddles or field connections approved by Departmental Representative, for connecting pipes to existing sewer pipes.
 - .1 Joints to be structurally sound and watertight.
 - .2 All connections to existing PVC sanitary sewer mains shall be with approved PVC repair sleeve. No Fernco type connections will be permitted without the approval of the Departmental Representative.

3.5 PIPE SURROUND

- .1 Place surround material in unfrozen condition.

- .2 Upon completion of pipe laying and after Departmental Representative have inspected pipe joints, surround and cover pipes as indicated.
 - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
 - .1 Do not dump material within 1 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid-height of pipe to at least 95% maximum density to ASTM D698.
- .6 Compact each layer from mid-height of pipe to underside of backfill to at least 90% maximum density to ASTM D698.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.6 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material above pipe surround in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698.
 - .1 In other areas, compact to at least 90% maximum density to ASTM D698.
- .4 Place unshrinkable fill in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.

3.7 SERVICE CONNECTIONS

- .1 Install pipe to manufacturer's instructions and specifications.
- .2 Maintain grade for 100 and 125 mm diameter sewers at 1 vertical to 50 horizontal unless directed otherwise by Departmental Representative.
- .3 Service connections to main sewer: standard Tee or Wye fittings Departmental Representative approved saddles.
 - .1 Do not use break-in and mortar patch-type joints.
- .4 Service connection pipe: to extend 10 mm into interior of main sewer.
- .5 Make up required horizontal and vertical bends from 45 degree bends or less, separated by straight section of pipe with minimum length of four (4) pipe diameters.
 - .1 Use long sweep bends where applicable.

- .6 Plug service laterals with watertight caps or plugs as approved by Departmental Representative.
- .7 Place location marker at ends of plugged or capped unconnected sewer lines.
 - .1 Each marker: stake extending from pipe end at pipe level to 0.6 m above grade.
 - .2 Paint exposed portion of stake red with designation SAN SWR LINE in black.

3.8 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Remove foreign material from sewers and related appurtenances by flushing with water.
- .3 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .4 Do infiltration and exfiltration testing as specified herein and as directed by Departmental Representative.
 - .1 Perform tests in presence of Departmental Representative.
 - .2 Notify Departmental Representative 24 hours in advance of proposed tests.
- .5 Carry out tests on each section of sewer between successive manholes including service connections.
- .6 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- .7 Conduct air test in accordance with ASTM C924. No extra allowance for service connections.
 - .1 Duration at exfiltration test: two (2) hours.
 - .2 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
- .8 Repair and retest sewer line as required until test results are within limits specified.
- .9 Repair visible leaks regardless of test results.
- .10 Video Inspection: Video inspection reports shall include the video record on DVD appropriately marked and dated as well as the written report. All gravity sewer mains shall be video inspected between 9 and 12 months after completion.
 - .1 Gravity mains that are put into service as they are installed cannot be air tested and therefore these mains shall be visually inspected during installation, video inspected once upon completion, and video inspected a second time between 9 and 12 months after completion.
 - .2 Provide Departmental Representative with photographs and video copy.
Note: Value of work completed at year end will reflect that final video inspection is not completed: ie., the estimated amount for the video inspection will be deducted from the value of work completed, and identified for payment in the following year once the video inspection is completed satisfactorily.

- .11 Repair and Abandonment of Existing Mains and Service Laterals: The Contractor shall provide all labour, materials and equipment to repair all existing sewers as a result of construction. Piping materials used for repair work shall be similar to those damaged or and approval equal. No additional payment will be made for such repairs.

All services that are abandoned during construction shall be plugged permanently with cementitious mortar brick, cap or plug, or a method approved by the Departmental Representative.

END OF SECTION