

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 45 00 – Quality Control.
- .3 Section 01 74 11 – Cleaning.
- .4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .5 Section 03 30 00.01 – Cast-in-Place Concrete Short Form.
- .6 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 MEASUREMENT PROCEDURES

- .1 Supply and installation of manholes and catch basins shall be measured by the unit for each different diameter installed.
 - .1 Unit price includes excavation, bedding, backfilling, compaction, frame and grate/cover, subgrade drainage piping, final adjustments and cleaning.
- .2 Top elevation adjustment of existing manholes and catch basins shall be measured in units adjusted.
- .3 Connection to existing manholes, catch basins or pipe shall be considered as incidental to the work.
- .4 The removal and disposal of the existing storm sewer system shall be considered as incidental to the work.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A48/A48M-00, Standard Specification for Gray Iron Castings.
 - .2 ASTM C117-04, Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM C139-05, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .5 ASTM C478M-06, Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
 - .6 ASTM D1557-09, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m³)).
- .2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
 - .2 CSA-A3002-03, Masonry and Mortar Cement.
 - .3 CAN/CSA-A165 Series-04, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
 - .4 CAN/CSA-G30.18-M92(R2002), Billet Steel Bars for Concrete Reinforcement.
 - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 SUBMITTALS

- .1 Provide submittals 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.
- .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 3 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.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Cast-in-place concrete:

- .1 In accordance with Section 03 30 00.01 - Cast-in-Place Concrete Short Form.
- .2 Precast manhole units: to ASTM C478M, circular.
 - .1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation (if required).
 - .2 Monolithic bases to be approved by Departmental Representative and set on concrete slabs cast in place.
- .3 Precast catch basin sections: to ASTM C478M.
 - .1 Units shall have cast-in gaskets for inlets and outlets.
 - .2 The use of other types of gaskets when core-drilling inlets or outlets on-site shall be approved by Departmental Representative prior to their incorporation into the work.
- .4 Joints: made watertight using rubber gaskets or bituminous compound.
- .5 Mortar:
 - .1 Aggregate: to CSA A82.56.
 - .2 Masonry Cement: to CAN/CSA-A3002.
- .6 Adjusting rings: to ASTM C478M.
- .7 Steel gratings, I-beams and fasteners: as indicated.
- .8 Frames, gratings, covers to dimensions as indicated and following requirements:
 - .1 Metal gratings and covers to bear evenly on frames.
 - .1 Frame with grating or cover to constitute one unit.
 - .2 Assemble and mark unit components before shipment.
 - .2 Gray iron castings: to ASTM A48/A48M.
 - .3 Castings: coated with two applications of asphalt varnish, sand blasted or cleaned and ground to eliminate surface imperfections.
 - .4 Frames and covers: adjustable type.
 - .1 Frame: C-50M1 or approved equal.
 - .2 Cover: C-46 or approved equal.
 - .3 Grate: C-46 or approved equal.
 - .5 Manhole frames and covers: minimum 175 kg per set; heavy duty municipal type for road service.
 - .6 Catch basin frames and covers: minimum 175 kg per set.
- .9 Granular bedding: Type 2 fill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .10 Backfill material: Type 3 fill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 EXCAVATION AND BACKFILL

- .1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.
- .2 Obtain approval of Departmental Representative before installing, manholes or catch basins.

3.3 CONCRETE WORK

- .1 Do concrete work in accordance with Section 03 30 00.01 - Cast-in-Place Concrete Short Form.

3.4 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses.
- .3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.
- .4 Cast bottom slabs directly on undisturbed ground.
- .5 Set precast concrete base on 150 mm minimum of granular bedding compacted to 97% maximum density to ASTM D1557.
- .6 Precast units:
 - .1 Set bottom section of precast unit on leveled and compacted Type 2 fill.
 - .2 Make each successive joint watertight with approved rubber ring gaskets or bituminous compound.
 - .3 Plug lifting holes with concrete plugs set in cement mortar or mastic compound.
- .7 Compact granular backfill to 97% maximum density to ASTM D1557.
- .8 Place frame and cover on top section to elevation as indicated.
 - .1 If adjustment required use concrete ring.
- .9 Clean units of debris and foreign materials.
 - .1 Remove fins and sharp projections.
 - .2 Prevent debris from entering system.

3.5 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

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 61 00 – Common Product Requirements.
- .3 Section 01 74 11 – Cleaning.
- .4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .5 Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .6 Section 33 05 13 – Manholes and Catch Basin Structures.

1.2 MEASUREMENT AND PAYMENT

- .1 Supply and installation of Storm Sewer Piping shall be measured by the linear metre, measured horizontally from centre of structures, for each pipe size and type acceptably installed.
 - .1 Unit price shall include excavation, bedding, backfilling, compaction, connection to manholes, dewatering, flushing, video inspection and any other work required to install an operable system accepted by the Departmental Representative.
- .2 The removal and disposal of the existing storm sewer system shall be considered as incidental to the work. All existing piping shall be removed. Capping or plugging of existing pipes shall not be permitted in lieu of removing existing piping.
- .3 Connection of storm sewer piping to existing piping shall be considered as incidental to the work, and shall include all personnel, materials and equipment required to perform the work.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D1557-09, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft²; (2,700 kN-m/m²)).
 - .4 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - .5 ASTM F794-03(2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- .2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 CSA International
 - .1 CAN/CSA-B602-10 - Mechanical couplings for drain, waste, and vent pipe and sewer pipe.
 - .2 CAN/CSA-B1800-0, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.

1.4 SCHEDULING

- .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Contractor shall review and stamp shop drawings prior to submitting to Departmental Representative for review.
- .4 Samples:
 - .1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .5 Certification to be marked on pipe.
- .6 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PLASTIC PIPE

- .1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D3034 and CAN/CSA-B1800.
 - .1 Standard Dimensional Ratio (SDR): 35.
 - .2 Locked-in gasket and integral bell system.
 - .3 Nominal lengths: 4 m.
- .2 Large diameter, ribbed PVC sewer pipe and fittings: to ASTM F794 and CAN/CSA-B1800.

2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material: Type 2 fill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

2.3 BACKFILL MATERIAL

- .1 Backfill material: Type 3 fill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Protect trench from contents of sewer.
- .3 Trench alignment and depth to 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 material 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 pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 97 % maximum density to ASTM D1557.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

3.4 INSTALLATION

- .1 Lay and join pipe 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 inverts 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 Joint deflection permitted within limits recommended by pipe manufacturer.
- .6 Water to flow through pipes during construction only as 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-B1800.
- .9 Flexible rubber couplings to CSA B602-10 shall be used when joining two dissimilar pipes.
- .10 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.

- .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 and catch basins.
- .13 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
 - .1 Joint to be structurally sound and watertight.
- .14 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.
- .15 Contractor shall use a laser to set horizontal and vertical alignment of piping. Any section having more than 5 mm in deviation from design elevation shall be rejectable at the Departmental Representative discretion.

3.5 PIPE SURROUND

- .1 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
 - .1 Leave joints and fittings exposed until field inspection is completed.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
 - .1 Do not dump material directly over pipe.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Compact each layer from pipe invert to mid height of pipe to at least 97 % maximum density to ASTM D1557.
- .5 Compact each layer from mid height of pipe to underside of backfill to at least 97 % maximum density to ASTM D1557.
- .6 When field inspections 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 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D1557. In other areas, compact backfill to at least 90% maximum density to ASTM D1557.

3.7 FIELD TESTS AND INSPECTIONS

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Departmental Representative, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Television and photographic inspections:
 - .1 The sewer shall be inspected for alignment and obstructions. Water ponding in gravity sewers that cannot be eliminated by flushing and cleaning will be considered as evidence of pipe settlement. One hundred percent (100%) of the sewers will be video inspected by the Contractor. Any and all defects such as water ponding, leaking joints, sags, improper grade or alignment, excessive deflection, obstructions, etc. shall be cause for rejection and such defects must be repaired by the Contractor at no expense to the owner.
 - .2 In the event of a repair, photos of the work being performed shall be provided to the Departmental Representative. The photos shall clearly show the defect area before and after the repair. A complete (MH to MH) CCTV inspection, clearly showing the repaired area shall be provided as well.
 - .3 Video inspection will be at the cost of the Contractor.
 - .4 Closed circuit video inspections shall conform with "Appendix B – Closed Circuit Video Inspections".
 - .5 Video inspection reports shall be submitted for review by contractor and approved by Departmental Representative prior to placement of Type "D" Asphalt.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 74 11 – Cleaning.
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .4 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

1.2 MEASUREMENT AND PAYMENT

- .1 Supply and installation of sub-drainage piping shall be considered as incidental to the Manhole and/or Catch Basin unit price.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³); (2,700 kN-m/m³).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 CSA International
 - .1 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Inform Consultant of proposed source of bedding and filter materials and provide access for sampling at least 4 weeks prior to commencing work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Submit manufacturer's certification that drain pipe materials meet requirements of this Section.

- .2 Certification to be marked on pipe.
- .4 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data that drain pipe materials meet requirements of this Section.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Perforated plastic pipe and fittings: to CAN/CSA-B1800. Nominal pipe size 100 mm.
 - .1 Pipe shall be fitted with a filter sock.
- .2 Bedding and pipe surround material: Type 2 fill.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sub-drainage piping installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TRENCHING

- .1 Do excavating, trenching and backfilling in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Place bedding material after approval of excavation by Departmental Representative.

3.4 BEDDING

- .1 Place 100 mm layer of bedding material to full trench width and compact to minimum 97% of maximum density to ASTM D1557.

3.5 INSTALLATION OF PIPE SUB-DRAINS

- .1 Four lengths of pipe, two metres in length each, shall be installed on the subgrade at each manhole and catch basin. Pipes shall be installed at 12 o'clock, 3 o'clock, 6 o'clock and 9 o'clock.
- .2 Wrap or sleeve perforated pipe with geotextile filter as indicated.
- .3 Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with bed throughout full length.
- .4 Begin laying at outlet and proceed in upstream direction.
- .5 Lay perforated pipes with perforations at 4 o'clock and 8 o'clock positions.
- .6 Lay bell and spigot pipe with bell ends facing upstream.
 - .1 Do not mortar joints.
- .7 Make joints tight in accordance with manufacturer's instructions.
- .8 Make watertight connections to existing drains, new or existing manholes and catch basins where indicated or as directed by Departmental Representative.
- .9 Plug open upstream ends of pipes with watertight concrete, steel or wood bulkheads.
- .10 Surround and cover drain with Type 2 uniform 150 mm layers to an elevation of at least 150 mm above top of drain and compact to at least 95% maximum density ASTM D1557.
- .11 Backfill remainder of trench as indicated.
- .12 Do not place bedding surround and backfill materials in frozen condition.
- .13 Protect sub-drains against flotation during installation.

3.6 CONNECTIONS TO MUNICIPAL FACILITIES

- .1 Connect pipe sub-drains to municipal storm sewer system where indicated.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION