

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 – Excavating Trenching and Backfilling
- .2 [03 30 00 - Cast-in-Place Concrete]

1.2 MEASUREMENT PROCEDURES

- .1 Measure excavation and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.
- .2 Measure drywells and other drainage rock structures in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.
- .3 Measure maintenance holes, infiltration manholes and catch basins in units within depth classifications as follows, measured from top of cover or grating to lowest pipe invert:
 - .1 2 m or less.
 - .2 Greater than 2 m but not more than 2.5 m.
 - .3 Greater than 2.5 m but not more than 3 m.
 - .4 Greater than 3 m but not more than 3.5 m.
 - .5 Further stages in increments of 0.5 m.
- .4 Measure outfall structures in units.
- .5 Measure adjusting tops of existing maintenance holes or catch basins in units adjusted.
- .6 Measure gratings in units supplied and installed.
- .7 Measure I-beam in metres of each size incorporated into work.
- .8 Measure sealing over existing maintenance holes or catch basins in units sealed.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM A48/A48M-03(2012), Standard Specification for Gray Iron Castings.
 - .2 ASTM A123/A123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM C117-13, Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C139-11, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - .6 ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

- .7 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³(600 kN-m/m³)).
- .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 CSA Group
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A165 Series-04(R2009), CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
 - .3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

1.4 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 for maintenance holes and catch basin structures and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
 - .2 Where drainage holes are to be provided in the infiltration maintenance holes, provide shop drawings indicating a minimum of size, location, and spacing of holes as well as the method in which the holes are to be created. Drawings to be stamped and signed as noted above.

1.5 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control.
- .2 Certifications:
 - .1 Submit manufacturer's test data and certification at least 2 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, and cleaning procedures.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect maintenance holes and catch basin structures from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Waste Reduction Workplan.

Part 2 Products

2.1 MATERIALS

- .1 Cast-in-place concrete:
 - .1 In accordance with Section 03 30 00 - Cast-in-Place Concrete.
 - .2 Cement: to CAN/CSA-A3001, Type GU.
 - .3 Concrete mix design to produce 30 MPa minimum compressive strength at 28 days and containing 20 mm maximum size coarse aggregate, with water/cement ratio to CSA A23.1, C-1 exposure and 80 mm slump at time and point of deposit.
 - .1 Air entrainment to CSA A23.1, class C-1 exposure.
 - .4 Supplementary cementitious materials: with maximum 20% fly ash replacement, by mass of total cementitious materials to CAN/CSA-A3001.
 - .5 Concrete reinforcement: in accordance with Section 03 20 00 - Concrete Reinforcing.
- .2 Precast maintenance hole units: to ASTM C478M, circular or oval.
 - .1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
 - .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.
- .4 Joints: made watertight using rubber rings, bituminous compound, epoxy resin cement or cement mortar.
- .5 Adjusting rings: to ASTM C478M.
- .6 Concrete Brick: to CAN/CSA-A165 Series.
- .7 Drop maintenance hole pipe: same as sewer pipe.

- .8 Galvanized iron sheet: approximately 2 mm thick.
- .9 Steel gratings, I-beams and fasteners: as indicated.
- .10 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 Maintenance hole frames and covers: as indicated.
 - .3 Catch basin frames and covers: as indicated.
- .11 Granular bedding and backfill: in accordance with Section 31 05 16 - Aggregate Materials.
- .12 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .13 Unshrinkable fill: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

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 maintenance holes and catch basin structures 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 and receipt of written approval to proceed from Departmental Representative.

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 outfall structures, maintenance holes or catch basins.

3.3 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 Reinforcing.
 - .3 Position metal inserts in accordance with dimensions and details as indicated.
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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.
 - .1 Maximum of 2 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 Cast bottom slabs directly on undisturbed ground.
- .5 Set precast concrete base (catch basins) on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density.
- .6 Set precast concrete base (maintenance holes) as indicated compacted to 100% corrected maximum dry density.
- .7 Precast units:
 - .1 Set bottom section of precast unit on granular bed as indicated.
 - .2 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination of these materials.
 - .3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .4 Perforated barrels on infiltration maintenance holes to be drilled prior to installation. Drilled perforations are not to be used for lifting of the maintenance hole.
- .8 For sewers:
 - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
- .9 Compact granular backfill to 95% corrected maximum dry density.
- .10 Place unshrinkable backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .11 Place frame and cover on top section to elevation as indicated.
 - .1 If adjustment required use concrete ring.
- .12 Clean units of debris and foreign materials.
 - .1 Remove fins and sharp projections.
 - .2 Prevent debris from entering system.

3.5 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 recycling in accordance with Waste Reduction Plan.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 16 - Aggregate Materials
- .2 Section 31 23 33.01 - Excavating, Trenching and Backfilling

1.2 PRICE AND PAYMENT PROCEDURES

- .1 After television and photographic pipe inspections:
 - .1 If no defective work is found, Departmental Representative will pay costs for inspectors, trained operators, equipment rental and materials.
 - .2 If defective work is found, pay Departmental Representative a part of total inspection cost proportional to number of defective pipe sections of sewer to total number of pipe sections inspected.
- .2 Measurement procedures:
 - .1 Measure excavation and backfill under Section 31 23 33.01 - Excavating, Trenching and Backfilling.
 - .2 Measure supply and installation of storm sewer including testing, excavation and backfilling, and granular bedding and surround horizontally from manhole face to manhole face in metres of each pipe size and depth class installed.
 - .3 Measure concrete bedding and encasement of pipes in cubic metres in place.
 - .4 Measure granular bedding and surround in cubic metres compacted in place.

1.3 REFERENCES

- .1 ASTM International
 - .1 ASTM C14M-07, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
 - .2 ASTM C76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
 - .3 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .4 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C425-04(2009), Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
 - .6 ASTM C428-97(06), Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
 - .7 ASTM C443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - .8 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³(600 kN-m/m³)).

- .9 ASTM D1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- .10 ASTM D1869-95(2010), Standard Specification for Rubber Rings for Asbestos-Cement Pipe.
- .11 ASTM D2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .12 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .13 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-8.1-M89, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
 - .3 CAN/CGSB-34.9-94, Asbestos-Cement Sewer Pipe.
- .3 CSA International
 - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium.
 - .2 CSA A257 Series-M92(R2009), Standards for Concrete Pipe.
 - .3 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.
 - .4 CSA G401-07, Corrugated Steel Pipe Products.

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 for pipes and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Shop drawings to indicate proposed method for installing carrier pipe for undercrossings.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia.
- .4 Samples:
 - .1 Inform Departmental Representative at least 2 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.
- .7 Manufacturer's Instructions: submit to Departmental Representative 1 copy of manufacturer's installation instructions.

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.
- .4 Develop Waste Reduction Workplan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan.

Part 2 Products

2.1 PLASTIC PIPE

- .1 Type PSM Poly Vinyl Chloride (PVC): to CAN/CSA-B1800.
 - .1 Standard Dimensional Ratio (SDR): 35.

2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Surrounding non-perforated pipes in parking lot areas: Type 1 gravel to NSTIR Standard Specifications for Highway Construction and Maintenance (latest edition), Division 3, Section 2.
 - .2 Surrounding perforated pipes in infiltration trenches and other areas as specified: Type C3 clear stone NSTIR Standard Specifications for Highway Construction and Maintenance (latest edition), Division 3, Section 4.

2.3 BACKFILL MATERIAL

- .1 Type 3 in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Unshrinkable fill: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.4 JOINT MORTAR

- .1 Portland cement: to CAN/CSA-A3000, normal Type 10.
- .2 Mortar: one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

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, according to requirements of authorities having jurisdiction.
 - .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.
- .4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by Departmental Representative.

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 95% corrected maximum dry density.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with approved 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 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.
- .10 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.
- .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.
 - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .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.

3.5 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 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 testing is completed.

- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .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% corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90% corrected maximum dry density.
- .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 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 95% corrected maximum dry density. In other areas, compact backfill to at least 90% corrected maximum dry density.
- .4 Place unshrinkable backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.7 FIELD TESTS AND INSPECTIONS

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction directed by Departmental Representative.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Television and photographic inspections:
 - .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.
 - .2 Provide means of access to permit Departmental Representative to do inspections.
 - .3 Payment for inspection services in accordance with Price and Payment Procedures in PART 1.

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 or recycling in accordance with the Waste Reduction Workplan.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION
