

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A 48/A 48M-00, Standard Specification for Gray Iron Castings.
  - .2 ASTM C 117-04, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .3 ASTM C 136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM C 139-05, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
  - .5 ASTM C 478M-06, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.
  - .6 ASTM D 698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- .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-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.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL 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.
  - .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets.

1.2 ACTION AND  
INFORMATIONAL  
SUBMITTALS  
(Cont'd)

- .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, and cleaning procedures.

1.3 QUALITY  
ASSURANCE

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental Representative to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building subtrades.
  - .4 Review manufacturer's installation instructions and warranty requirements.

1.4 DELIVERY,  
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 and recycling.

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.
  - .3 Concrete mix design to produce 32 MPa minimum compressive strength at 28 days and containing 20 mm maximum size coarse aggregate, with water/cement ratio to CAN/CSA-A23.1, C2 exposure and 150 mm slump at time and point of deposit.
    - .1 Air entrainment to CAN/CSA-A23.1, class C2 exposure.
  - .4 Concrete reinforcement: in accordance with Section 03 20 00 - Concrete Reinforcing.
- .2 Precast manhole units: to ASTM C 478M, circular or oval.
  - .1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

## 2.1 MATERIALS

(Cont'd)

- .3 Precast catch basin sections: As supplied by Shaw Group - 1050 mm Dia CB W/AK 285 and 450 sump or owner approved equal.
- .4 Joints: made watertight using rubber rings, bituminous compound, epoxy resin cement or cement mortar.
- .5 Mortar:
- .1 Masonry Cement: to CAN/CSA-A3002.
- .6 Adjusting rings: to ASTM C 478M.
- .7 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 A 48/A 48M, strength class 30B.
- .3 Castings: coated with two applications of asphalt varnish and sand blasted or cleaned and ground to eliminate surface imperfections.
- .4 Manhole frames and covers: to Shaw Group:
- .1 Iron Frame R 10
- .2 Iron Frame S 401
- .3 Iron Grate S 401
- .4 or owner approved equal.
- .8 Granular bedding and backfill: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
- .1 Crushed gravel.
- .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
- .3 Table:
- | Sieve Designation | % Passing    |             |
|-------------------|--------------|-------------|
|                   | Stone/Gravel | Gravel/Sand |
| 200 mm            | -            | -           |
| 75 mm             | -            | -           |
| 50 mm             | -            | -           |
| 38.1 mm           | -            | -           |
| 25 mm             | 100          | -           |
| 19 mm             | -            | -           |
| 12.5 mm           | 65-90        | 100         |
| 9.5 mm            | -            | -           |
| 4.75 mm           | 35-55        | 50-100      |
| 2.00 mm           | -            | 30-90       |
| 0.425 mm          | 10-25        | 10-50       |
| 0.180 mm          | -            | -           |
| 0.075 mm          | 0-8          | 0-10        |
- .4 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

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 Obtain approval of Departmental Representative before installing outfall structures, manholes 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.

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 three 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 on 150 mm minimum of granular bedding compacted to 100% corrected maximum dry density maximum density to ASTM D 698.
- .6 Precast units:
  - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.
  - .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 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .7 Compact granular backfill to 95% corrected maximum dry density maximum density to ASTM D 698.
- .8 Installing units in existing systems:

3.4 INSTALLATION  
(Cont'd)

- .8 (Cont'd)
  - .1 Where new unit is 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 for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .9 Set frame and cover to required elevation on no more than four courses of brick.
  - .1 Make brick joints and join brick to frame with cement mortar.
  - .2 Parge and make smooth and watertight.
- .10 Place frame and cover on top section to elevation as indicated.
  - .1 If adjustment required use concrete ring.
- .11 Clean units of debris and foreign materials.
  - .1 Remove fins and sharp projections.
  - .2 Prevent debris from entering system.
- .12 Install safety platforms in manholes having depth of 5 m or greater, as indicated.

3.5 FIELD QUALITY  
CONTROL

- .1 Leakage Test
- .2 Install watertight plugs or seals on inlets and outlets of each new sanitary sewer manhole and fill manhole with water.
- .3 Leakage not to exceed 0.3% per hour of volume of manhole.
- .4 If permissible leakage is exceeded, correct defects.
- .5 Repeat until approved by Departmental Representative.
- .6 Departmental Representative will issue Test Certificate for each manhole passing test.

3.6 CLEANING

- .1 Do visual inspection of pipe and both catch basins to insure all debris and materials are removed.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

1.1 SECTION  
INCLUDES

- .1 Materials and installation for storm sewer.

1.2 MEASUREMENT  
PAYMENTS

- .1 This item will not be measured separately.  
Excavation, backfill, bedding and storm pipe will be measured in item #16, Section 01 29 00.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
- .2 ASTM C 117-95, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C 136-01, Standard Method for Sieve Analysis of fine and Coarse Aggregates.
- .4 ASTM D 1869-2000, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- .5 ASTM F 794-01, Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

1.4 DEFINITIONS

- .1 A pipe section is defined as length of pipe between successive catchbasins and/or manholes.

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 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .4 Submit to Departmental Representative 1 copy of manufacturer's installation instructions.

1.6 WASTE  
MANAGEMENT AND  
DISPOSAL

- .1 Place materials defined as hazardous or toxic in designated containers.

- 1.7 SCHEDULING .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

## PART 2 - PRODUCTS

- 2.1 PLASTIC PIPE .1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D 3034 CSA-B182.2.  
.1 Standard Dimensional Ratio (SDR): 28 35 41.  
.2 Locked-in Separate gasket and integral bell system.  
.3 Nominal lengths: 4 to 6 m.

- 2.2 PIPE BEDDING AND SURROUND MATERIAL .1 Granular material in accordance with Section 31 05 16 Aggregate Materials and following requirements:  
.1 Crushed or screened stone, gravel or sand.  
.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.  
.2 Table Sieve % Passing Designation (mm) Stone/Gravel  
Gravel/Sand 200 - - 75 - - 50 -  
- 38.1 - - 25  
100 - 19 - -  
12.5 65-90 100 9.5 -  
- 4.75 35-55 50-100 2.00  
30-90 0.425 10-25 10-50  
0.180 - - 0.075 0-8  
0-10

- 2.3 BACKFILL MATERIAL .1 As indicated.

## PART 3 - EXECUTION

- 3.1 PREPARATION .1 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 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.

- 3.4 INSTALLATION
- .1 Lay and join pipes to: ASTM C 12 and CSA B182.11.
  - .2 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.

- 3.5 PIPE SURROUND
- .1 Place surround material in unfrozen condition.

- 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.