

PART 1 - GENERAL

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| <u>1.1 Description</u>            | .1 | This section specify requirements for supplying, producing, placing, pre-cast catch basins and pipes, fittings including excavation, bedding, backfilling, frames, and covers. |
| <u>1.2 References</u>             | .1 | ASTM A48/A48M-08(R2012), Gray Iron Castings.   |
|                                   | .2 | ASTM C478M-13, Precast Reinforced Concrete Manhole Sections.   |
|                                   | .3 | ASTM D 3034-14 Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer pipe and fittings.  |
|                                   | .4 | Canadian Standards Association (CSA)<br>.1 CAN/CSA-B182.2-95 PVC Sewer Pipe and Fittings   |
| <u>1.3 Material Certification</u> | .1 | Upon request of Consultant, submit manufacturer's test data and certification.   |
|                                   | .2 | Certification, date of manufacture and name or trademark of the manufacturer to be marked on catch basin.  |
| <u>1.4 Shop Drawing</u>           | .1 | Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.   |
| <u>1.5 Scheduling of Work</u>     | .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.  |
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- 1.6 Measurement for .1  
Payment
- Catch Basin: Supply and installation of storm sewer piping and catch basin including excavation, testing and backfilling, granular bedding and surround will be measured as a lump sum price item.
- .2 Granular bedding and surround will not be measured for payment but considered incidental to the work.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Cast-in-place concrete:
- .1 To Section 03 30 00
  - .2 Precast catch basin sections: to ASTM C478M. Units are to have rubber gaskets at both inlet and outlet as indicated in detail drawings.
  - .3 Mortar:
    - .1 Aggregate: to CSA A82.56.
    - .2 Cement: to CAN/CSA A8.
  - .4 Adjusting rings: to ASTM C478M.
  - .5 Frames, gratings to dimensions as indicated and following requirements:
    - .1 Metal gratings and covers to bear evenly on frames. A frame with grating to constitute one unit. Assemble and mark unit components before shipment.
    - .2 Gray iron castings: to ASTM A48, strength class 30B.
    - .3 Castings: coated with two applications of asphalt varnish, sand blasted or Cleaned and ground to eliminate surface imperfections.
    - .4 Catch basin frame and grates: minimum 136 kg per set.
    - .5 bedding: As per Granular Base Section 31 23 10
- .2 Plastic Pipe
- .1 Type PSM Poly Vinyl Chloride (PVC): to CAN/CSA B1800.
    - .1 Standard Dimensional Ratio (SDR): 35
    - .2 Locked in gasket and integral bell system.
    - .3 Colour: white
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| 2.1 MATERIALS<br>(Cont'd) | .3 | Pipe and Manhole Bedding   |
|                           | .1 | Granular material to Section 31 23 10 and with following requirements.   |
|                           | .1 | Crushed or screened stone or gravel.   |
|                           | .2 | Gradation to be within the limits specified when tested to ASTM C136-06 and ASTM C117-13. Sieve sizes to CAN /CGSB-8.1 |

<u>Sieve</u>	<u>% Passing</u>
25 mm	-
19 mm	-
12.5 mm	100
9.5 mm	-
4.75 mm	50-100
2.00 mm	30-90
0.425 mm	10-50
0.180 mm	-
0.075 mm	0-10

### PART 3 - EXECUTION

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| 3.1 Preparation              | .1 | Clean pipes and fittings of debris and water before installation and remove defective materials from site to approval of the Departmental Representative. |
| 3.2 Excavation and Backfill  | .1 | Excavate and backfill in accordance with Section 31 23 10 - Excavating and Backfilling as indicated.  |
|                              | .2 | Obtain approval of Consultant before installing catch basins.   |
| 3.3 Installation Catch Basin | .1 | Construct units in accordance with details indicated, plumb and true to alignment and grade.  |
|                              | .2 | Dewater excavation to approval of Consultant and remove soft and foreign material before placing concrete base.   |
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- 3.3 Installation Catch Basin (Cont'd)

  - .3 Set precast concrete base on 150 mm minimum of granular bedding compacted to 95% maximum density to ASTM D698.
  - .4 For storm sewer precast units:
    - .1 Set bottom section of precast unit in Granular Base Material (31.5 mm).
    - .2 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound
  - .5 Compact granular backfill to 99% corrected maximum dry density.
  - .6 Set frame and grate to required elevation on either concrete risers (max. 300 mm) or steel adjustment rings.
  - .7 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

3.4 Pipe Laying

  - .1 Site Preparation
    - .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to the approval of the Departmental Representative.
  - .2 Trenching
    - .1 Do trenching work in accordance with Section 31 23 10 - Excavating and Backfilling.
    - .2 Do not allow contents of any sewer or sewer connection to flow into trench.
    - .3 Trench alignment and depth to approval of Consultant prior to placing bedding material and pipe.
  - .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. 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% maximum density to ASTM D 698.

3.4 Pipe Laying  
(Cont'd)

- .4 Installation
  - .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Consultant.
  - .2 Handle pipe using methods approved by Consultant. 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. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
  - .4 Commence 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 Consultant.
  - .7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .5 Joints:
  - .1 Support pipes with hand slings or crane as required to minimize material pressure and maintain concentricity until pipe is properly positioned.
  - .2 Align pipes before joining.
  - .3 Maintain pipe joints free from mud, silt, gravel and other foreign material.
  - .4 Wrap each pipe joint with a strip of geotextile 600 mm wide and with an overlap of 600 mm.
  - .5 Complete each joint before laying next length of pipe.
  - .6 Minimize joint deflection after joint has been made to avoid joint damage.
- .6 When any stoppage of work occurs, restrain pipes as directed by Consultant, to prevent "creep" during down time.
- .7 Plug lifting holes with Consultant approved prefabricated plugs, set in shrinkage compensating grout for concrete pipe.

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| <u>3.4 Pipe Laying<br/>(Cont'd)</u> | .8  | 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. |
|                                     | .9  | Make watertight connections to manholes and catch basins.   |
|                                     | .10 | Use "Insert a Tee" connections for connecting pipes to existing sewer pipes. Joint to be structurally sound and watertight.   |
|                                     | .11 | Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.  |
|                                     | .12 | Contractor shall use a laser to set horizontal and vertical alignments of piping. Any section having more than 3 mm in deviation shall be removed and reinstalled.  |
|                                     | .13 | Place surround material in unfrozen condition.  |

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Materials and installation for water mains, valves, water system components, including service connections.

**1.2 RELATED SECTIONS**

- .1 Section 31 23 33.01 Excavating, Trenching and Backfilling

**1.3 MEASUREMENT PROCEDURES**

- .1 Work performed under this Section shall form part of the lump sum contract. No additional compensation will be made.

**1.4 RELATED WORK**

- .1 Section 31 23 33.01 Excavating, Trenching and Backfilling

**1.5 REFERENCES**

- .1 CAN/CSA – B137.3, Rigid Polyvinyl / Chloride (PVC) pipe for pressure applications,
- .2 ASTM D1785, D2665, Polyvinyl Chloride (PVL) plastic pipe, schedules 40, 80 and 120.

**1.6 SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.
- .2 Submit manufacturer's test data and certification that pipe materials meet requirements of this section at least 4 weeks prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .3 Pipe certification to be on pipe.

**1.7 RECORD DRAWINGS**

- .1 Provide one copy of drawings marked in red showing as constructed data for record purposes.

**1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Store and protect materials from damage.
- .3 Replace defective or damaged materials with new.

## **1.9 SCHEDULING OF WORK**

- .1 Schedule work to minimize interruptions to existing services.
- .2 Notify Engineer a minimum of 24 hours in advance of any interruption in service.

## **1.10 CLOSEOUT SUBMITTALS**

- .1 Provide record drawings, including, details of pipe material, valves, fittings and maintenance and operating instructions.
  - .1 Include top of pipe, horizontal location of fittings and type, valves and fittings.

## **1.11 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse in accordance with local requirements.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Distribution piping to be Schedule 40, PVC.
- .2 Remaining materials to be added here.

### **2.2 PIPE BEDDING AND SURROUND MATERIAL**

- .1 Bedding and Surround Material - Bedding material in accordance with Section 31 23 33.10 - Excavating, Trenching and Backfilling.
- .2 Concrete for thrust block to be a minimum 20 MPa strength.

### **2.3 BACKFILL MATERIAL**

- .1 Backfill material in accordance with Section 31 23 33.10 - Excavating, Trenching and Backfilling.



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### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Clean pipes, fittings, valves, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects to approval of Engineer. Remove defective materials from site as directed by Engineer.

#### **3.2 TRENCHING**

- .1 Do trenching work in accordance with Section 31 23 33.10 - Excavating, Trenching and Backfilling.
- .2 Trench depth to provide cover over pipe of not less than 1.80 metres from finished grade.
- .3 Trench alignment and depth require Engineer's approval prior to placing bedding material and pipe.

#### **3.3 GRANULAR BEDDING**

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth of 150 mm below pipe invert.
- .2 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .3 Shape transverse depressions in bedding as required to suit joints.
- .4 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.
- .5 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling, with compacted bedding material.

#### **3.4 PIPE INSTALLATION**

- .1 Lay pipes to manufacturer's standard instructions and specifications.
- .2 Join pipes in accordance with manufacturer's recommendations.
- .3 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 metres.
- .5 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater,

face socket ends up-grade.

- .6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Position and join pipes with equipment and methods approved by Department of Supply and Services Representative.
- .9 Cut pipes in an approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .10 Align pipes carefully before jointing.
- .11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .12 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.
- .13 Complete each joint before laying next length of pipe.
- .14 Minimize deflection after joint has been made.
- .15 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .16 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Department of Supply and Services Representative. A retaining gland is to be installed at the joint at the boot of the hydrant.
- .17 Do not lay pipe on frozen bedding.
- .18 Do hydrostatic and leakage test and have results approved by Department of Supply and Services Representative.
- .19 Backfill remainder of trench.

### **3.5 THRUST BLOCKS**

- .1 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, standpipes and fittings and undisturbed ground as indicated.
- .2 Keep joints and couplings free of concrete.

### 3.6 LEAKAGE TESTING

- .1 Provide labour, equipment and materials required to perform leakage tests hereinafter described.
- .2 Notify Engineer at least 24 hours in advance of all proposed tests.
- .3 Where any section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .4 Test pipeline in sections not exceeding 365 metres in length, unless otherwise authorized by Engineer.
- .5 Upon completion of pipe laying and after Department of Supply and Services Representative has inspected work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated or directed by Engineer.
- .6 Open valves.
- .7 Expel air from main by slowly filling main with potable water.
- .8 Underground domestic water mains shall be tested to 517 kPa (75 psi) for a minimum of 2 hours.
- .9 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 hours.
- .10 Allowable leakage is less than value of:

$$\frac{nd p^{1/2}}{130\,000}$$

n = number of joints in section under box  
d = nominal diameter in mm  
p = test pressure in kPa

- .11 Locate and repair defects if leakage is greater than amount specified.
- .12 Repeat test until leakage is within specified allowance for full length of water main.

### 3.7 PIPE SURROUND

- .1 Upon completion of pipe laying and after the Engineer has inspected work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.

- .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 95% maximum density to ASTM D698.

### **3.8 BACKFILL**

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.
- .2 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698. In other areas, compact to at least 95% maximum density to ASTM D698.

### **3.9 FLUSHING**

- .1 Flushing operations shall be witnessed by the Engineer. Notify Department of Supply and Services Representative at least 2 days in advance of proposed date when flushing operations will commence.
- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce a velocity of 1.5 m/s, within pipe for 10 minutes, or until foreign materials have been removed and flushed water is clear.
- .3 Provide connections and pumps for flushing as required.
- .4 Open and close valves and service connections to ensure thorough flushing.

### **3.10 SURFACE RESTORATION**

- .1 After installing and backfilling over water mains, restore surface to original condition as noted on drawings or as directed by Engineer.

**END OF SECTION**