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**2.10 MANHOLES, INLETS AND CATCH BASINS**

2.10.1 GENERAL

2.10.1.1 **Description**

This work shall consist of supplying materials and constructing manholes, inlets and catch basins of concrete, with or without steel reinforcement as specified, and of precast reinforced concrete units, complete with necessary frames, castings and fittings in accordance with these specifications and in conformity with the dimensions, lines, elevations and design shown on the plans herein, at locations as indicated.

All references to "Standards" or "Specifications" refer to the latest edition at the time of tender.

2.10.2 MATERIALS

The Contractor shall supply all materials required in accordance with the applicable specifications.

2.10.2.1 **Aggregate**

The Contractor shall produce aggregate materials for backfill in accordance with Specification 3.2, Aggregate Production and Stockpiling. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate and haul aggregate in accordance with Specification 4.5, Hauling.

2.10.2.2 **Concrete**

All materials for the manufacture of concrete shall be supplied by the Contractor and shall comply with requirements specified in Specification 5.5, Supply of Portland Cement Concrete. Class "B28" air-entrained Portland Cement Concrete shall be used, unless otherwise specified or shown on the plans.

2.10.2.3 **Reinforcing Bars and Wires**

Steel reinforcing bars shall be deformed bars in accordance with the most recent edition of CSA G30.12 - M "Billet Steel Bars for Concrete Reinforcement".

Cold drawn wire or welded wire fabric for concrete reinforcement shall conform to the requirements of the latest edition of CSA G30.5.

2.10.2.4 **Precast Reinforced Concrete**

Precast reinforced concrete units shall be as specified in the Contract and shall be supplied by the Contractor.

2.10.2.5 **Concrete Block Units**

Concrete block for the construction of concrete block units shall be supplied by the Contractor. Concrete masonry blocks used for construction of manholes, inlets, and catch basins shall conform to the requirements of A.S.T.M. Designation C139.

**2.10.2.6 Mortar**

Mortar shall be composed of one part Portland cement and two parts fine aggregate by volume. Materials for the manufacture of mortar shall be supplied by the Contractor.

**2.10.2.7 Frames, Castings and Fittings**

All required metal frames, castings and fittings shall be supplied by the Contractor.

**2.10.3 CONSTRUCTION****2.10.3.1 Preparation of Base**

Foundation pits for manholes, inlets and catch basins shall be excavated to elevations established by the Consultant, and shall be of sufficient size to accommodate the entire dimensions of the structure and foundation slab. All soft and yielding, or other unsuitable material, when encountered at foundation elevation, shall be removed to depth as required and replaced with acceptable gravel backfill. The backfill shall be placed in uniform layers not exceeding 0.15 m in depth and thoroughly compacted. The base shall be finished to provide a smooth and firm surface.

**2.10.3.2 Forms**

Forms for poured-in-place structures shall be of wood or metal, straight and free from distortion and of sufficient strength to resist springing during the process of depositing and tamping the concrete. All forms shall be thoroughly cleaned and oiled before the concrete is placed therein.

**2.10.3.3 Reinforcing Steel**

Reinforcing steel shall be accurately placed, and during placing of concrete firmly held in the position shown on the plans by means of stays, blocks, ties, hangers or other approved devices.

**2.10.3.4 Mixing and Placing Concrete**

Concrete for poured-in-place manholes, inlets, catch basins and foundation slabs shall be proportioned and mixed in accordance with requirements specified in Specification 5.5, Supply of Portland Cement Concrete.

Concrete shall be placed in such manner as to avoid segregation, spread in horizontal layers when practicable and consolidated sufficiently to eliminate all voids.

Exposed surfaces shall be thoroughly floated with a moist wooden float to produce a uniform even surface, and edges rounded with an approved finishing tool having a radius of 5 mm.

**2.10.3.5 Precast Reinforced Concrete Units**

Precast reinforced concrete units shall be constructed on poured-in-place foundations, in accordance with the details shown on the plans. All structures shall have the lower section from the foundation to the top of the inlet and outlet pipes built up with poured-in-place concrete. Precast units shall be used for the structure above the top of the pipe inlets or outlets. All joints of the precast unit shall be sealed with mortar.

Inlet or outlet pipe entering precast units of the structure shall be accommodated in precast holes, having a diameter 75 mm larger than the outside diameter of the pipe. No holes for inlet or outlet pipes shall be made in precast units at the site of the work, unless otherwise directed by the Consultant.

Pipes placed in foundation slabs or precast units shall extend through the walls and beyond the outside surface a sufficient distance to allow for connections. Joints around pipes entering precast units shall be carefully sealed with mortar to prevent leakage.

#### **2.10.3.6 Concrete Block Units**

Concrete block units shall be constructed on poured-in-place foundations in accordance with the details shown on the plans. All joints of the concrete block units shall be sealed with mortar.

Pipes placed in foundation slabs or concrete block units shall extend through the walls and beyond the outside surface a sufficient distance to allow for connections. Joints around pipes entering precast units shall be carefully sealed with mortar to prevent leakage.

#### **2.10.3.7 Ladder Rungs**

Galvanized metal ladder rungs shall be installed in all poured-in-place structures having a depth greater than 1 m. When ladder rungs are required in structures constructed of precast units, the units shall be supplied with ladder rungs installed.

#### **2.10.3.8 Frames, Castings and Fittings**

Metal frames and fittings shall be set in the concrete true to line and elevation, as established and as required to fit the adjacent surfaces.

Castings shall be set in full mortar beds, or otherwise secured, as shown on the plans.

#### **2.10.3.9 Cleaning**

Upon completion, each manhole, inlet, and catch basin shall be thoroughly cleaned of any accumulations of silt, debris, or other foreign matter, and shall be maintained free of such accumulations until final acceptance of the work.

#### **2.10.3.10 Backfill**

After the concrete or mortar has set sufficiently, approved granular backfill material shall be placed and thoroughly compacted in layers not exceeding 0.15 m in depth. The backfill shall be neatly graded off flush with the top of the structure, or to depth as directed by the Consultant, and the complete work left in a neat and tidy condition.

2.10.4 MEASUREMENT AND PAYMENT2.10.4.1 **Preparation of Base**

Excavation of foundation pits and preparation of the base will not be measured and paid for separately, but shall be included in the prices bid for manholes, inlets and catch basins.

2.10.4.2 **Manholes, Inlets and Catch Basins**

Manholes, inlets and catch basins, of dimensions and standard depths as shown on the plans, will be measured by the unit complete in place. Structures which exceed the standard depth shown on the plans will be measured by the unit of standard depth complete in place, plus the vertical length in excess of the standard depth as measured by the metre.

The depth of the structures will be measured from the top of the foundation slab to the top of the manhole cover, or to the flow line of the inlet grating of catch basin or inlets.

Payment will be made at the unit price bid each for "Manholes, Inlets and Catch Basins", of standard depth and type as specified and at the unit price bid per metre for corresponding vertical length in excess of standard depths. These payments will be full compensation for excavating and preparing the base; supplying all required materials for manufacture of concrete and mortar; supplying all specified precast units, placing all materials; placing backfill; and all labour, equipment, tools and incidentals necessary to complete the work in accordance with the plans and specifications.

2.10.4.3 **Placing Reinforcing Steel**

Reinforcing steel incorporated in the work will be measured by the kilogram, with the total weight being determined using the theoretical weight of bars as shown in the following table:

<b>BAR NUMBER</b>	10	15	20	25	30	35	45	55
<b>WEIGHT kg/m</b>	0.785	1.570	2.355	3.925	5.495	7.850	11.775	19.625

Payment for placing reinforcing steel will be made at the price bid per kilogram for "Reinforcing Steel".

2.10.4.4 **Backfill**

Backfilling will not be measured or paid for separately, but shall be included in the price bid for manholes, inlets and catch basins.