

## **SECTION D2**

### **MANHOLES AND CATCH BASINS**

#### **GENERAL**

This section covers the installation of new manholes, catch basins, drop inlets, drywall structures and the installation of hoods in existing catch basins. New manholes, catch basins and other structures shall be precast concrete unless specified by the Commission or approved as a change by the Commission.

#### **MATERIALS**

Precast concrete manholes and catch basins shall conform to the ASTM Standard Specifications for precast reinforced concrete manhole sections, Designation C478, latest version, except as modified herein.

Wall sections shall be a minimum of 6 inches thick. Type II cement shall be used unless specifically authorized in writing.

Manhole section joint shall be O'Ring or profile type to accept O' ring or rubber gasket. Surfaces shall be parallel with a nominal 1/16-inch clearing and tongue equipped. Joint shall be sealed using the following three systems (Confined O'Ring Gasket, Butyl/Joint Sealant, External Wrap) to help ensure a watertight manhole.

- 1) Confined O'Ring/Rubber Gaskets: In accordance with ASTM C443 and as recommended by manufacturer.]
- 2) Butyl/Joint Sealant:
  - (a) In accordance with ASTM C1311 or ASTM C990.
  - (b) Trowelable or cartridge applied.
- 3) External joint wrap shall be made of materials that have been proven to be resistant to the following exposures and requirements:
  - (a) In accordance with ASTM C923.
  - (b) Thickness: 60 mils minimum.
  - (c) Resistant to corrosion or rotting under wet or dry conditions.
  - (d) Rated for use in gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide, and other trace gases at installation site.

Manholes shall be 4 feet in diameter (inside) unless otherwise noted on the plans or in the Special Conditions. Catch basins shall be 5 feet in diameter (inside) and 8 feet 6 inches deep as shown on the standard drawings.

The manhole base shall be precast and integral with the sidewall to receive the pipe sections and manhole sections.

Pipe penetrations shall be precast/preformed at the specified elevations and locations. Coordinate dimensions with pipe diameters. Seal pipe in manhole with a flexible joint that meets the requirements of ASTM C923. Seal shall have a demonstrated history of providing a watertight seal between the pipe and manhole and accommodate up to 10-degrees of deflection.

Catch basins shall have a pre-cast slot and opening suitable for mounting the hood and discharge pipe.

No more than two lift holes will be cast or drilled in each section.

The date of manufacturer and the name or trademark of the manufacturer shall be clearly marked on the inside of the barrel.

#### Brick and Block for the Construction of Catch Basins and Manholes (Where Approved)

Brick shall be sound, hard and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Brick shall comply with the ASTM Standard Specification for Sewer and Manhole Brick (made from clay or shale), Designation C32, latest version. Grade SS brick shall be used for paved inverts and shelves, and grade MS shall be used for walls.

Concrete masonry block shall be machine-made, solid, precast concrete masonry units. Block shall comply with the ASTM Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes, Designation C139, latest version, except as modified herein. The width of the units shall be six (6) inches. The inside and outside surfaces of the units shall be curved to the necessary radius (5 foot inside diameter) and so designed that the interior surfaces shall be cylindrical, except the top batter courses shall be designed to reduce uniformly the inside section of the structure to the required size and shape at the top. Blocks shall be designed so that only full-sized units are required to lay any one course.

#### Mortar

Type II cement shall be used unless otherwise authorized in writing.

Sand shall be well graded and with no grain larger than will pass a No. 8 sieve.

Hydrated lime shall be type S conforming to the ASTM Standard Specification for Hydrated Lime for Masonry Purposes, Designation C207, latest version.

The mortar shall be composed of portland cement, hydrated lime, sand and water in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The portions of cement and lime may vary from 1:1/4 for dense hard burned brick to 1:3/4 for softer brick. In general, mortar for Grade SS brick shall be mixed in the proportions of 1:1/2:4 1/2.

### Manhole Steps

Steps for manholes shall be non-skid raised edge-front steel reinforced polypropylene plastic type with at least a 14 inch wide stepping surface.

A. Manhole Steps shall be polypropylene and meet the following standards/requirements:

1. Fabricate from minimum 1/2 inch, Grade 60, steel bar meeting ASTM A615/ A615M.
2. Polypropylene encasement shall conform to ASTM D4101.
3. Minimum Width: 13 inches, center-to-center of legs.
4. Embedment: 3-1/2-inch minimum and 4-1/2-inch minimum projection from face of concrete at point of embedment to center of step.
5. Cast in manhole sections by manufacturer.
6. Load Test: Capable of withstanding ASTM C478 vertical and horizontal load tests.]

Steps shall not be mortared into place after the concrete has set.

### Castings

All iron castings for frames, grates and covers shall be in accordance with the dimensions shown on the Commission's standard detail drawings and shall conform to the requirements of ASTM A48-76 for Class No. 35 gray iron castings.

### Grade Rings

Grade rings for the use of raising castings to match grade shall be concrete, recycled rubber, HDPE or other materials approved by the Commission.

## CONSTRUCTION METHODS

### Manholes

Barrel sections (walls) shall be set so as to be vertical, with steps in alignment.

Invert channels and shelves in all manholes and shall be faced with brickwork.

In all manholes, the invert channel within the structure shall be an inverted arch with bricks laid as stretchers and on edge and so constructed as to conform in shape to the lower half of the pipe. Also, in these structures an arch shall be constructed over inlet and outlet pipes with bricks laid as headers and on edge. The shelf in manholes shall consist of bricks laid flat and the top of the shelf shall be at the elevation of the top of the pipe, as indicated on the drawings, and shall be sloped to drain toward the channel.

An approved grade ring shall be placed between the cone section and the cast iron frame for purposes of setting the frame to match the roadway grade. More than one ring may be necessary to match the required grade but in no base shall the rings exceed 16" in height. The use of bricks to level frames is only allowed with written permission of the Engineer.

Special manholes for 36 inch pipe and larger shall have reinforced concrete bases and precast concrete or brick chimneys as detailed on the drawings.

Manhole stubs, where indicated on the drawings, shall be short pieces (maximum length 3.5 feet) cut from the bell ends of the appropriate size and class of pipe. PVC stubs shall be plugged with a PVC stopper and RCP stubs shall be plugged with brick masonry or approved plug.

Inverts shall conform accurately to size of the adjoining pipe. Side inverts and main inverts where the direction changes shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerline of the adjoining pipe lines.

All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1- 1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface and then finished smooth and flush with the adjoining surfaces.

The exterior surfaces of precast manholes shall be given two heavy coats of a water and polymer based concrete coating which shall act as a watertight barrier. The material shall be manufactured as a water proofing material for use on concrete that will be continuously exposed to water and wet soils.

The waterproofing material shall be non-toxic, low VOC meeting ASTM D3792 and fire safe. Materials may include PPS 922 Superseal or other similar products. All coatings are to be submitted to the Engineer for review and approval prior to use. The waterproofing material shall

be applied by brush or spray and in accordance with the instructions of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

All connections between pipe and manholes shall be made with a positive seal connector manufactured for this purpose. The type of connector proposed shall be subject to review and approval by the Engineer.

Openings for pipe and materials to be embedded in the walls of the manhole for those joints shall be cast in the barrel sections or base at the required locations during the manufacturing process.

All materials, accessories, and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint.

The Contractor shall furnish to the Engineer the manufacturers written instructions for installation prior to such installation.

### Catch Basins

Unless specifically noted otherwise, or approved by the Engineer, all catch basins shall be type 5 as shown on the standard drawings. Type 13 catch basins shall only be used where type 5 basins cannot be built due to conflicts with existing structures.

Precast concrete units for catch basins shall be built as specified above for manholes unless modified herein. All new catch basins shall be constructed with a new section of granite curb with a guttermouth as shown on the Commission's standard details.

When approved by the Engineer, catch basins may be constructed with brick or concrete masonry blocks, and reinforced concrete base, as an alternative to pre-cast concrete units.

Drop inlets shall be precast or where approved, constructed with brick or concrete masonry block walls and poured concrete bases as detailed on the standard drawings.

When concrete masonry units are used:

- a.) Each block shall be dry and laid in a full bed of mortar.
- b.) Vertical keyways shall be completely filled with mortar.

Catch basins shall be fitted with a BWSC standard hood and a 12-inch outlet pipe. The connection between the pipe and catch basin or drop inlet shall be made with an approved positive seal flexible connector.

### Drywells

Drywells shall be precast concrete with dimensions and details as shown on the contract plans. Drywells shall be constructed using 5,000 psi concrete and ASTM GR.60 steel reinforcement and shall be manufactured to support AASHTO HS20-44 live load.

All holes shall be cored and connections shall be made in accordance with the specifications for manholes. Frames and covers shall be BWSC standard and set in accordance with the plans and these specifications. The cover shall read BOSTON DRAIN.

### MEASUREMENT AND PAYMENT

ITEM D2-1                      Manhole Base ..... EA.

The number of manhole bases to be paid for under this item shall be equal to the actual number constructed or installed.

The unit price for a manhole base shall constitute full compensation for trench excavation, placing and compacting backfill material, placing and compacting a screened gravel sub-base, cast in place or pre-cast base slab complete as shown on the standard drawings and specified herein. The price paid shall also include forming invert channels and openings (w/seals) for pipes as specified herein.

ITEM D2-2                      Manhole Walls ..... V.F.

The quantity of manhole walls to be paid under this item shall be measured by the vertical foot from the manhole invert to the top of the pre-cast cone section or the top of the uppermost block for a block manhole. In the case of a manhole built from brick, the top of the manhole walls will be taken as the top surface of the third row of brick below the cast iron frame (two rows are included in the manhole frame and cover item, D2-3). For special manholes the quantity of manhole walls shall be measured from the invert to the top of the concrete structure below any risers.

Manhole walls to be set on special pipe tees shall be measured for payment by the vertical foot. Measurement shall be from the crown of the pipe which connects to the special tee section to the top of the cone section.

The unit price for manhole walls shall constitute full compensation for materials, trench excavation, placing and compacting backfill material, furnishing and setting all required barrel sections and cone sections complete with gaskets and/or seals as required for joints between sections as well as joints connecting pipe to manhole, manhole risers and all else as specified herein for which there are no separate pay items.

ITEM D2-3                      Manhole Frame With Cover ..... EA.

The number of manhole frames with covers to be paid for under this item shall be equal to the actual number furnished and installed.

The unit price for manhole frames with covers shall constitute full compensation for furnishing and installing the manhole frames with covers, including grade rings as indicated on the drawings and as specified herein.

The unit price shall also include salvaging and returning existing frames and/or covers to the Commission's storage yard.

ITEM D2-4 Catch Basin EA.

The number of catch basins paid for under this item shall be the actual number furnished and installed, or constructed, regardless of the type.

The unit price for catch basins shall constitute full compensation for earth excavation and refill, including constructing the screened gravel base, cast in place or precast concrete base slab, connectors, granite guttermouth, precast concrete or concrete block catch basin complete, including hood (or hood and trap if required), frame with cover or grate and grade rings as indicated on the standard drawings and specified herein. The unit price shall also include salvaging and returning existing frames and grates to the Commission's storage yard.

This item shall be used for both type 5 catchbasins and type 13 catchbasins. In addition, when a type 13 basin is required due to field conditions or notations on the plan, payment will be made under Item D2-4A, below, as well as under this item.

Item shall also include payment for installing **DON'T DUMP** signs supplied by the Commission.

ITEM D2-4A Catch Basin, Type 13 Modification EA.

The number of Catch Basins Type 13 Modifications paid for under this item shall be the actual number of type 13 catch basins installed.

The unit price for catch basins type 13 modification shall constitute full compensation for all work necessary, and materials supplied, to construct a type 13 catch basin, in addition to that required to construct a type 5 catch basin. The cost under this item shall also include the work involved in converting a Bradley Head type basin into a Type 13 basin, including the removal of the granite apron and all other incidental work.

ITEM D2-5 New Hood in Existing Catch Basin EA.

The number of new hoods in existing catch basins paid for under this item shall be the actual number installed.

The unit price for this item shall include the removal and disposal of the existing hood and trap, furnishing and installing the new hood including any necessary brick masonry work, and all else in connection therewith which is not covered by a separate pay item.

ITEM D2-6                      New Hood and Trap in Existing Catch Basin                      EA.

The number of new hood and traps in existing catch basins paid for under this item shall be the actual number installed.

The unit price for this item shall include the removal and disposal of the existing hood and trap, furnishing and installing the new hood and trap including any necessary brick masonry work, and all else in connection therewith which is not covered by a separate pay item.

ITEM D2-7                      Brickwork in Existing Structure                      V.F.

The quantity of brickwork in existing structures to be paid for under this item shall be measured by the vertical foot, in place.

The unit price paid under this item shall constitute full compensation for earth excavation and refill, removal and disposal of portions of the existing structure, furnishing and installing all necessary brick masonry and all else necessary to repair, rehabilitate or connect to an existing sewer or drain structure.

ITEM D2-8                      Drop Inlet                      EA.

The number of drop inlets paid for under this item shall be the actual number furnished and installed, or constructed.

The unit price for drop inlets shall constitute full compensation for earth excavation and refill, including constructing the screened gravel base, poured concrete base, brick or concrete masonry block walls, including iron hood, frame with cover as indicated in the standard drawings. The unit price shall also include salvaging and returning existing frames and grates to the Commission's storage yard.

Item D2-13                      Drywell                      EA.

The number of drywells paid for under this item shall be the actual number of drywells installed.

The unit price for drywells shall include full compensation for earth excavation and gravel bedding, furnish and place precast concrete drywell, coring for connections to inlet and outlet pipes, installing frame and cover including grade rings and connections to all pipes including connectors.

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