

SECTION 02601

MANHOLES, COVERS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Construct manholes, covers, frames, brick masonry, and apply waterproofing in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere (when applicable):
  - 1. Pipe, excavation, backfill, paving and dewatering are specified in the appropriate Sections in this Division.
  - 2. Concrete and grout are specified in Division 3.

1.2 QUALITY ASSURANCE

- A. Precast Manhole Base, Barrel and Top Sections:
  - 1. Conform to ASTM C478-97 except as modified herein, and on the Drawings.
  - 2. Average strength of 4,000 psi at 28 days.
  - 3. Testing:
    - a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
    - b. Have tests conducted at the manufacturer's plant or at a testing laboratory approved by the Engineer.
    - c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.
- B. Manhole Steps
  - 1. Acceptable Manufacturers:
    - a. Aluminum Company of America.
    - b. Reliance Steel Products, Inc.
    - c. M. A. Industries, Inc.
    - d. Or equivalent.
- C. Frames and Covers:
  - 1. Acceptable Manufacturers:
    - a. Etheridge Foundry Co.
    - b. Neenah Foundry Co.
    - c. E. L. LeBaron Foundry Company.
    - d. Or equivalent.
- D. Masonry:
  - 1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick.
  - 2. Cement: ASTM C-150.
  - 3. Hydrated Lime: ASTM C-207
  - 4. Sand: ASTM C33

- E. Waterproofing:
  - 1. Acceptable Manufacturers:
    - a. Minwax Fibrous Brush Coat, Minwax Co., N.Y., N.Y.
    - b. Tremco 121 Foundation Coating, Tremco Mfg. Co., Newark, N.J.
    - c. Or approved equal.

### 1.3 SUBMITTALS

- A. Submit shop drawings and manufacturer's literature in conformance with Section 01340 and the Standard General Conditions of the Construction Contract.
- B. Precast Manhole Sections: Submit test results and receive approval from the Engineer prior to delivery to the site.

## PART 2 - PRODUCTS

### 2.1 PRECAST MANHOLE SECTIONS

- A. Dimensions, shall be as shown on the Drawings:
  - 1. Base & Riser Sections:
    - a. Diameter: As shown on the Drawings.
    - b. Length: As required.
    - c. Wall Thickness: Not less than 5 inches.
    - d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
  - 2. Tops:
    - a. Diameter: Eccentric cone type, 24 inches I.D. at top, 48 inches I.D. at bottom unless otherwise shown on the Drawings.
    - b. Length: 4 feet.
    - c. Wall thickness: Not less than 5 inches at the base, tapering to not less than 8 inches at the top.
    - d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
    - e. Exterior face of cone sections shall not flare out beyond the vertical.
- B. Openings:
  - 1. Provide openings in the risers to receive pipes entering the manhole.
  - 2. Make openings at the manufacturing plant.
  - 3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
  - 4. Location: To permit setting of the entering pipes at the correct elevations.
  - 5. Openings shall have a flexible watertight union between pipe and the manhole base.
    - a. Cast into the manhole base and sized to the type of pipe being used.
    - b. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instructions.

1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
  2. Kor N Seal made by National Pollution Control System, Inc.
  3. Press Wedge II made by Press-Seal Gasket Corporation.
  4. A-Lok Manhole Pipe Seal made by A-Loc Corporation.
  5. Or equivalent.
- C. Joints:
1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer.  
Acceptable Materials:
    - a. Kent-Seal No. 2
    - b. Ram-Nek
    - c. Or equivalent.
  2. Joints between precast sections shall conform to related standards and manufacturer's instructions.
  3. All manholes greater than 6 ft. diameter and all manholes used as wet wells, valve pits and other dry-pit type structures shall be installed with exterior joint collars. The joint collar shall be installed according to the manufacturer's instructions. Acceptable materials:
    - a. MacWrap exterior joint sealer as manufactured by Mar-Mac Manufacturing Company.
    - b. Or equivalent.
- D. Waterproofing:
1. The exterior surface of all manholes shall be given two coats of bituminous waterproofing material at a application rate of 75 to 100 square feet per gallon, per coat.
  2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
  3. Sufficient 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.
- E. Frost Protective Wrapping:
1. The frost protective wrap shall be constructed of an ultraviolet resistant polyethylene material and shall be a minimum thickness of 6 mils.

## 2.2 FRAMES AND COVERS

- A. Standard Units:
1. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
  2. Have machined bearing surfaces to prevent rocking.
  3. Castings shall be smooth with no sharp edges.
  4. Constructed to support an HS-20 wheel loading.
  5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the Engineer:
    - a. Covers - solid with sewer in 3-inch letters diamond pattern.

- b. Frame - 24-inch diameter clear opening, with flange bracing ribs.
6. Minimum weight of frame and cover shall be 430 lbs.

### 2.3 MANHOLE STEPS

- A. Aluminum or polyethylene coated steel safety type designed with a minimum concentrated live load of 300 pounds.
- B. Thoroughly clean all surfaces to be embedded with a suitable cleaning agent to ensure that the surfaces are free from all foreign matter such as dirt, oil and grease.
- C. Aluminum surfaces to be embedded shall be given a protective coating of an approved heavy-bodied bituminous material. The steps shall become thoroughly dry before being placed into the concrete.
- D. All steps shall be cast into walls of the precast section so as to form a continuous ladder with a distance of 12-inches between steps.

### 2.4 MASONRY

- A. Brick:
  1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
  2. Immediately remove rejected brick from the work.
- B. Mortar:
  1. Composition (by volume):
    - a. 1 part portland cement.
    - b. 1/2 part hydrated lime.
    - c. 4-1/2 parts sand.
  2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.
- C. Cement shall be Type II portland cement.
- D. Hydrated lime shall be Type S.
- E. Sand:
  1. Shall consist of inert natural sand.

2. Grading:

<u>Sieve</u>	<u>Percent Passing</u>
3/8-inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 50	10-30
No. 100	2-10
Fineness Modulus	2.3 - 3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Manhole Sections:

1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
2. Install riser sections and tops level and plumb.
3. Make all joints watertight.
4. When necessary, cut openings carefully to prevent damage to barrel sections and tops. Replace damaged manhole sections and tops at no additional cost to the Owner.
5. When manhole steps are included in the Work, install barrel sections and tops so that steps are in alignment.

B. Adjust to Grade:

1. Adjust tops of manholes to grade with brick masonry.
2. Concrete rings are not acceptable for adjusting to grade.

C. Pipe Connections to Manholes: Connect pipes to manholes with joint design and materials approved by the Engineer.

E. Masonry:

1. Laying Brick:

- a. Use only clean bricks in brickwork for manholes.
- b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
- c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
- d. Construct all joints in a neat workmanlike manner. Construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
- e. Outside faces of brick masonry shall be plastered with mortar from 1/4-inch to 3/8-inch thick.
- f. Completed brickwork shall be watertight.

2. Curing:

- a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
  - b. Protect brick masonry from the weather and frost as required.
- F. Frames and Covers:
1. Set all frames in a full bed of mortar, true to grade and concentric with the manhole opening.
  2. Completely fill all voids beneath the bottom flange to make a watertight fit.
  3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the manhole all around its circumference.
  4. Clean the frame seats before setting the covers in place.
- G. Plugging and Patching:
1. Fill all exterior cavities with non-shrink grout and with bituminous waterproofing once the concrete and mortar has set.
  2. Touch up damaged water proofing.
- H. Cleaning:
1. Thoroughly clean manholes, steps, frames and covers of all debris and foreign matter.
- I. Bedding and Backfilling:
1. Bedding of manholes shall be 6 inches of 3/4" screened stone.
  2. Backfill a minimum of 18 inches all around manhole with gravel borrow.
- J. Frost Protective Wrap:
1. The Contractor shall comply with the manufacturer's instructions for the particular conditions of installations in each case.
  2. Clean each manhole exterior of all dirt and remove any sharp protrusions.
  3. Apply two (2) 6-inch wide vertical strips of bituminous waterproofing material and/or duct tape from the top to bottom of the manhole per layer.
  4. Prior to installing pipe through each manhole or valve pit, wrap each manhole to the maximum depth of frost penetration, but not less than 5 feet below grade, with four (4) layers of the polyethylene material by beginning the wrap at the adhesive strip and proceeding around the manhole, valve pit, etc., continuously by overlapping the adhesive strip by 24 inches on the final layer. Cut the polyethylene wrap in areas where piping exits the manhole. The size of the cut is to be equivalent to the pipe's outside diameter.
  5. Tuck and pleat the polyethylene wrap at the top of each manhole in a continuous manner, minimizing the size of each fold. Extend the polyethylene wrap past the top of the manhole frame and temporarily tuck the remainder inside the frame, until final backfill and paving.
  6. In paved areas, cut the polyethylene wrap flush with the manhole rim after the pavement is in place.
  7. In unpaved areas, pull the polyethylene wrap together, and tie around frame with galvanized wire.

8. Protect the installed frost barrier from harmful weather exposures and from possible physical abuses, where possible by prompt installation of concealing work or, where that is not possible, by temporary covering or enclosure.
  9. Backfill around the manhole/frost barrier with material as outlined in Section 02200 - Earthwork.
- K. Manhole Repairs:
1. Correct leakage by reconstruction, replacement of gaskets and/or other methods as approved by the Engineer.
  2. The use of lead-wool or expanding mortar will not be permitted.
- L. After the manholes have been backfilled and prior to final acceptance, any signs of leaks or weeping visible inside the manholes shall be repaired and the manhole made watertight.

END OF SECTION