

MANHOLES

PART I: GENERAL

A. Precast Concrete Manholes

- 1) Manholes shall be made of precast concrete sections of which the top section shall be eccentric or flat slab top. The bottom section shall be a precast concrete manhole base.
- 2) Poured in place bases will not be acceptable.
- 3) All precast manhole sections shall be manufactured in accordance with and meet the requirements of specification ASTM C-478, latest revision.
- 4) All precast manhole sections shall be manufactured by the wet cast method.
- 5) The minimum compressive strength of the concrete for all sections shall be 4000 psi (27 MPa). The maximum allowable absorption of the concrete shall not exceed 9 percent of the dry weight. Tests, when required, shall be in accordance with ASTM C-497, "Determining Physical Properties of Concrete Pipe or Tile", latest revision.
- 6) Steel reinforcement for all manhole diameters shall be in accordance with ASTM C-478, latest revision.

PART II: PRODUCTS

A. Precast Concrete Manholes

- 1) Standard Manhole
 - a) The manholes shall be constructed of precast reinforced concrete manhole sections. The sections shall be a minimum of four feet (1219 mm) in diameter for pipe sizes up to and including 20 inches (508 mm) internal diameter (for pipe sizes with an internal diameter 24 inches (610 mm) and greater, see Plans).
 - b) The sections shall conform to the requirements of "Specification for Precast Reinforced Concrete Manhole Sections" (ASTM C-478, latest revision). Joints shall be sealed with a preformed plastic gasket that meets all the requirements of ASTM C-990, "Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections", Butyl-Lok as manufactured by A-Lok Products Corporation, Trenton, New Jersey or D-Lok rubber gasket as specified to meet the requirements of ASTM specification C-443, as supplied by Atlantic Concrete Products Company, Tullytown, PA or an approved equal.
 - c) Manhole Bases
 - 1) Manhole bases shall be precast reinforced concrete. Poured in place bases will not be acceptable.
 - 2) The bases shall be monolithically cast and shall

consist of a manhole bottom and a wall which shall extend a minimum of 10 inches (254 mm) above the top of the highest influent sewer. The top of the base section shall be carefully formed to receive the tongue of the barrel section. There shall be a minimum distance of 3 inches (76 mm) between the invert of the lowest effluent sewer and floor of the precast base to provide for the construction of a formed invert and bench wall within the manhole. No more than two lift inserts or holes shall be cast in the bases.

- a) All precast manhole bases shall have pipe to manhole flexible seals as manufactured by A-LOK Products Corporation Tullytown, PA., "A-LOK full compression seals" or an approved equal.
 - 1) Pipe seals up to and including 20 inches (508 mm) in size shall be cast into 48" (1219 mm) diameter manhole bases.
 - 2) 21 inch (533 mm) through 30 inch (762 mm) pipe seals shall be cast into 60 inch (1524 mm) diameter manhole bases.
 - 3) 33 inch (838 mm) through 42 inch (1067 mm) pipe seals shall be cast into 72 inch (1829 mm) diameter manhole bases.
 - 4) 48 inch (1219 mm) through 54 inch (1372 mm) pipe seals shall be cast into 84 inch (2134 mm) diameter manhole bases.
 - 5) 60 inch (1524 mm) pipe seals shall be cast into 120 inch (3048 mm) diameter manhole bases.
 - 6) Flexible pipe to manhole seals shall meet all the test and performance requirements of ASTM specification C-923, "Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals".
 - 7) Installation of pipe to manhole flexible seals shall be made in accordance with the manufacturers suggested specifications.
- b) Manholes 4 feet (1219 mm) in diameter shall have a bottom at least 6 inches (152 mm) thick and a wall at least 5 inches (127 mm) thick.
- c) Manholes 5 feet (1524 mm) in diameter shall have a bottom at least 8 inches (203 mm) thick and a wall at least 6 inches (152 mm) thick.
- d) Manholes 6 feet (1829 mm) in diameter shall have a bottom at least 8 inches (203 mm) thick and a wall 7 inches (178 mm) thick.
- e) Manholes 7 feet (2134 mm) in diameter shall have a bottom at least 12 inches (305 mm) thick and a wall at least 8 inches (203 mm) thick.
- f) Manholes 8 feet (2438 mm) in diameter shall have a bottom at least 12 inches (305 mm) thick and a wall at least 9 inches (229 mm) thick.

- g) Manholes 10 feet (3048 mm) in diameter shall have a bottom at least 12 inches (305 mm) thick and a wall 10 inches (254 mm) thick.
 - h) Manholes 12 feet (3658 mm) in diameter shall have a bottom at least 12 inches (305 mm) thick and a wall 12 inches (305 mm) thick.
- d) Risers and Top Section
- 1) The top of base walls, the ends of reinforced concrete risers and the bottom ends of precast tops shall be so formed that when risers and tops are assembled with the base, they will make a continuous manhole. Joints shall be of such design as will permit effective joining and placement without irregularities in the interior wall surface of the manhole.
 - 2) Manhole barrels shall consist of riser and top section with a minimum wall thickness of 5 inches (127 mm). The top section shall be an eccentric conical section with thickened upper walls with the smallest inside diameter equal to 24 inches (610 mm), to receive the manhole frame and cover. No more than 2 lift inserts shall be cast in each barrel or top section.

B. Manhole Steps

- 1) Manhole steps shall be of extruded 6061-T6 aluminum or Polypropylene step #PS4B as manufactured by M.A. Industries, Peachtree City, Georgia or approved equal.
- 2) Manhole steps shall be cast into the walls of base, risers and conical top sections, and shall be aligned vertically and spaced so as to be on equal centers in the assembled manhole at a maximum distance apart of 12 inches (305 mm). Steps shall be located a minimum of 6 inches (152 mm) from the ends of base, riser, and top sections, and shall be securely embedded in manhole sections by mortar or cast in place polypropylene inserts.
- 3) Manhole step dimensions shall meet the requirements of OSHA Standard 1910.27 for fixed ladders.

C. Manhole Frames and Covers

- 1) Casting shall be tough gray iron, free from cracks, holes, swells, and cold shuts. All manhole casting shall be made accurately to the pattern and to the dimensions shown on Plans, and shall be planed where marked, or where otherwise necessary to secure perfectly flat and true surfaces. All lids which "rock" and do not lie solid after construction is finished will be condemned and must be replaced by perfect lids.
- 2) Anchor Bolts
 - a) Anchor Bolts for bolting manhole frame to precast or brick manholes shall be $\frac{3}{4}$ " (19 mm) diameter galvanized

all thread steel rods with 5 inch (127 mm) hook for embedment in the manhole top and a minimum 2 inch (51 mm) projection through the bars of the frame.

- b) Two Bolt Slots or inserts shall be cast into the manhole top, positioned at 180 degrees at the time of manufacture.

PART III: EXECUTION

A. Precast Concrete Bases

- 1) All precast concrete bases shall be installed on a layer of crushed stone which shall have a minimum depth of 6 inches (152 mm). The crushed stone shall conform to the quality and grading requirements specified in Section 703.3 of the Pennsylvania Department of Transportation Specifications Form 408 for No. 1B - Type C crushed stone coarse aggregate.
- 2) All pipe openings shall have pipe to manhole flexible seals as previously mentioned.
- 3) In constructing "Drop Manholes", the Contractor shall use one of the following methods:
 - a) Encase and support the riser and incoming pipe with concrete down to undisturbed earth as shown on the Detail Sheet. The cost of this concrete shall be included in the price of the drop manhole. Encasing the riser with brick will not be acceptable. Care shall be taken to have all pipes laid to correct lines and grades before concreting is undertaken.
 - b) Purchase precast base with a 90 degree bend precasted into the base section and protect the vertical pipe with precast Drop Collars.
 - c) Purchase a minimum 5'-0" (1524 mm) diameter manhole and run the drop inside the manhole. Internal piping to be secured by expansion bolts and stainless steel bands.

B. Masonry Work

- 1) The top of all precast manholes may be brought to proper grade for receiving manhole frames by using not more than four courses of brick or precast concrete grade rings. Masonry construction shall be performed by experienced and qualified workmen only. All work shall be laid plumb, straight, level, square and true. Brick shall be laid in full beds of mortar and shoved into place. All joints shall be full and not more than one-half inch (13 mm) in thickness. The Contractor shall set in place and bond in the masonry all necessary steps and miscellaneous items specified elsewhere. The masonry walls shall be pargeted on the inside and outside with a one-half inch (13 mm) coat of Portland Cement mortar.
- 2) Mortar to be used in brickwork, setting manhole frames, and pargeting, shall be prepared by thoroughly mixing: one (1) volume of Type II Portland Cement with three (3) volumes of sand and sufficient clean water to produce a rich mass of

approved consistency. Mixing mortar on the ground or any paved surface shall not be permitted. Sand to be used in making mortar shall be clean, well-graded, and shall pass a standard No. 4 sieve.

- 3) All mortar to be used in joining manhole section, filling lift holes in risers shall be an approved mixture of sand, cement and Embecco aggregate.
- 4) Masonry shall not be constructed during cold weather (air temperature below 40 degrees F (5° C)) unless necessary precautions are observed as directed by the Engineer.

C. Flow Channels and Bench Walls

- 1) In precast bases the flow channels and bench walls in each manhole shall be carefully formed of mortar and brick, or concrete, to 1/2 pipe section and to the dimensions indicated on the drawings.
- 2) The minimum depth of flow channel shall be equal to 1/2 the diameter of the pipe to which it connects. The channel shall be graded to give a smooth, uninterrupted flow through the manhole.
- 3) Bench walls shall be pitched a minimum of 1 inch per foot (82 mm per meter) from the inside periphery of the manhole to the edge of the flow channel.
- 4) The Contractor has the option to pour the flow channels or to have them precast by the manhole manufacturer.

D. Manhole Frames and Covers

- 1) Manhole frames and covers shall be brought to proper grade as previously noted, set in ¼" (6 mm) bed of mastic, and anchored in place with the top two (2) ¾" (19 mm) diameter anchor bolts which shall be securely embedded in the top of the manhole.

E. Waterproofing

- 1) The entire outer surface of all precast concrete manholes shall be coated with two (2) coats of an approved bitumastic coating. Coating shall be Koppers 300 M Epoxy or Pennsbury 32-B-4 Epoxy, or approved equal.
- 2) A pvc entry sleeve shall be installed on each manhole cone or flat slab top section to prevent surface infiltration. The sleeve shall be Water-LOK Manhole Entry Sleeve as manufactured by A-LOK Products, Tullytown, PA., or equal.

PART IV: SPECIAL CONDITIONS

A. Manhole liner for Sanitary Systems

- 1) Where indicated on the contract drawings, the manholes,

Pumping Stations and Force main manholes shall be internally lined with a corrosion resistant PVC Liner.

- 2) This liner shall have dove-tail ribs so it can be integrally and securely cast into the concrete structure.
- 3) The Liner shall be white in color in order to reflect light.
- 4) Liner shall be Dura-Plate 100 as manufactured by A-LOK Products, Tullytown, PA., or equal.