

SECTION 5000 - MANHOLE CONSTRUCTION

PART 1 - GENERAL

1.01 SCOPE: This Section covers manhole construction for sanitary and storm sewers; and pipeline and bedding materials for sanitary and storm sewers.

1.02 RELATED WORK: Refer to the following sections for related work:

Concrete for Cast-in-Place Manholes	Section 4200-Concrete Structures
Hydrostatic Testing	Section 5100-Sanitary Sewer Main

1.03 REFERENCE STANDARDS: The following documents are referenced in this Section:

A. Documents by the American Society for Testing and Materials are referenced as “ASTM”.

1.04 SUBMITTALS: Contractor shall submit the following for review:

A. Suppliers certifications for pipe materials, precast manholes, castings, joints gaskets, non-shrink grout, and dampproofing.

PART 2 - PRODUCTS

2.01 MANHOLES: Precast manhole risers, cones, and grade rings shall conform to ASTM C478. Cast-in-place manholes shall conform to the requirements for cast-in-place concrete referenced in Part 1; precast grade rings shall be used for cast-in-place manholes. Minimum manhole diameter shall be 4 feet. In addition, all manholes shall conform to the following:

A. Wall thickness shall conform to the following table:

<u>Manhole diameter</u>	<u>Wall Thickness, inches</u>			
	<u>Precast Manhole</u>		<u>Cast-In-Place Manhole</u>	
	depth 16' or less	depth greater than 16'	depth 12' or less	depth greater than 12'
4 ft	4	5	6	8
5 ft	5	6	6	8
6 ft	6	7	6	8

B. Concentric cones shall be used unless otherwise shown on drawings or Special Conditions.

C. Flat slab tops may be used only on manholes six feet or less in depth. Flat slab top shall be precast and designed to resist HS-20 loading with one foot cover.

- D. Wall openings for pipe shall be cast with 1" x 1" keyway for grouted pipes or shall have a precast clamping shoe.
- E. External dampproofing shall be asphalt ASTM D449, Type A and shall be applied to all sanitary sewer manholes.
- Internal waterproofing, where required, shall be 60-mil polyvinylchloride or polyethelene sheet with webs or ribs to mechanically lock the sheet to the manhole wall. Joint strips shall be ribless and shall be a minimum of 4 inches wide.
- F. Joint sealant for precast sections and castings shall be preformed, flexible, butyl rubber joint sealant, conforming to Federal Specification SS-S-210. Waterstops for pipe joints shall be 3/8-inch synthetic rubber O-rings or clamping type shoe.
- External joint waterproofing shall be a composite sheet material consisting of a butyl compound and an elasto-polymer-backing sheet with a composite thickness of 80 mils and a minimum width of 6 inches.
- G. Covers and rings shall conform to ASTM 48, class 35B and shall be of the weight, dimension, and design shown on the detail drawings. Bolt-Down Covers and Rings shall be used where called out and conform to Detail UG 5000-E.
- H. Steps shall be polypropylene encased steel core steps. Steps shall conform to ASTM C478, Paragraph 11. Steel core shall conform to ASTM A615, grade 60 and shall have section properties equal or greater than 1/2-inch round section. Coating shall conform to ASTM D2146, Type II. Steps shall be set at 90° to the exiting main such that descent will be onto the largest shoulder of the shaped manhole base. Steps are only required where called out in the special conditions or project drawings.
- I. Non-shrink grout shall be shrink compensating in the plastic state, shall show no expansion after set (ASTM C827 test method), shall have a compressive strength of at least 3,000 psi (ASTM C109 test method), and shall have a placement time of at least 45 minutes.
- J. Brick for the repair of existing manholes shall conform to ASTM C32, grade SS or SM, nominal size 2-1/4" x 4" x 8". Mortar and plaster coating for brick shall be 2 parts portland cement, 1 part masonry cement, and 6 parts plaster sand. Mortar and plaster shall be used within 30 minutes or discarded.

PART 3 - EXECUTION

3.01 MANHOLE INSTALLATION: New manholes shall be precast or cast-in-place.

- A. Connecting pipes shall be encircled with a waterstop, and the wall opening filled with non-shrink grout. Pipe stubs shall be made with a bell end of pipe abutting the outside wall. Stub shall be stopped with watertight removable stopper.

- B. Bases shall be integral with cast-in-place section or shall be cast in place; unattached precast base shall not be used. See Standard Detail for dimensions of base.

Invert channels shall be formed to a "U" shape, matching the lower half of the pipe cross section and extending to 3/4 height of the pipe. Channels connecting pipes of different sizes shall transition smoothly over the length of the manhole. When the pipes come in at differing angles, the channel shall be formed with as large of radius as possible. Channels shall be provided for all pipes including stub lines. Benches shall slope to the channel at 1:12 slope.

- C. Joint sealant shall be installed between all precast sections, including grade rings and between grade rings and cover ring. Lifting holes shall be filled with non-shrink grout.

External joint waterproofing shall be installed to all joints including adjustment rings. Overlap shall be minimum of 1 foot.

External dampproofing shall be applied to all sanitary sewer manholes. Two 6-mil coats shall be applied following manufacturer's recommendations.

- D. Two grade rings shall be installed at each manhole. Thickness of rings shall be as required to adjust to grade as described below, but normally one 4-inch and one 6-inch ring are desired. If more than 12 inches of grade rings would be required, the manhole shall be reconstructed. Grade shall be matched within 1/2-inch.

3.02 CONNECTION TO EXISTING MANHOLE: Wall break out of existing manhole shall be the minimum width required for inserting the new pipe. The bench on the existing base shall be removed on the side the new pipe enters and a new channel and bench installed. Contractor shall retrieve all debris that enters the downstream sewer main. Pipe installation and wall repair shall be the same as for new manholes.

3.03 ACCEPTANCE TESTING: Manholes may be subjected to visual inspection, and sanitary sewer manholes shall be subjected to hydrostatic testing or vacuum testing. Vacuum testing will be conducted only on newly constructed manholes.

- A. Hydrostatic test shall be conducted after a manhole has been in place for 28 days. Manholes shall be filled to the top or to 25 feet, whichever is less. Manhole shall be prefilled 12 hours in advance of testing. Test shall consist of filling the manhole, and measuring replacement water at the end of one hour. Exfiltration rate shall be less than 0.05 gallon per hour per vertical foot of manhole.
- B. Vacuum testing shall use an Air-Loc Vacuum Manhole tester by Cherne Industries, Inc. or approved equal. The time for the vacuum to drop from 10 inches Hg to 9 inches Hg shall be not less than the following:

<u>Manhole Diameter</u>	<u>Time</u>
4 feet	60 Seconds
5 feet	75 Seconds
6 feet	90 Seconds

- C. Visual inspection shall evaluate the completeness of the manhole and the alignment of the invert channel.
- D. Manholes failing acceptance tests shall be repaired or rebuilt and retested.

STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:

UG 5000-A STANDARD MANHOLE DETAIL – SHEET 1 OF 3
UG 5000-B STANDARD MANHOLE DETAIL – SHEET 2 OF 3
UG 5000-C STANDARD MANHOLE DETAIL – SHEET 3 OF 3
UG 5000-D DROP MANHOLE DETAIL
UG 5000-E BOLT-DOWN MANHOLE DETAIL

END OF SECTION 5000