

ITEM # 1403001A- MANHOLE – SANITARY SEWER

ITEM # 1403501A- RESET MANHOLE – SANITARY SEWER

ITEM # 1403010A- MANHOLE FRAME AND COVER – SANITARY SEWER

Description

- A. The work covered by this section includes the furnishing of all plant, labor, equipment, appliances and materials and performing all operations in connection with the satisfactory installation of precast reinforced concrete manholes and all incidental work, complete, in strict accordance with the specifications and applicable drawings and conditions of the contract.
- B. The Contractor shall provide the Engineer with shop drawings for all precast materials with a description of all methods of jointing. In addition shop drawings for manhole steps, manhole frames and manhole covers shall be submitted to the Engineer for approval prior to installation.
- C. It is the intention of these specifications and the desire of the Engineer that the manholes, including all component parts, have adequate space, strength and leak proof qualities considered necessary by the Engineer for the intended service. Space requirements and configurations, shall be as shown on the drawings. Manholes shall be an assembly of precast sections with steel reinforcement, with approved jointing or concrete cast monolithically in place with reinforcement. In any approved manhole, the complete structure shall be of such material and quality as to withstand loads of 8 tons (H-2O loading) without failure and excess leakage for the life of the structure. A period generally in excess of 25 years is to be understood as the life of the structure.
- D. Manholes shall be constructed at the locations, to the elevations, and in accordance with notes and details shown on the drawings.
- E. “Reset” shall mean the minor adjustment of frames and covers of existing units to the proposed grade NOT involving major reconstruction of the unit. Examples of resetting: are adding several courses of brick/block or use of an approved manhole extension ring to bring frame to required grade; removing some masonry courses for lowering a frame without reconstruction below required elevation of bottom of frame; providing that the frame is properly seated.

Materials

A. Precast reinforced concrete units:

1. Precast reinforced concrete manhole bases, risers, tops and grade rings shall be of the types indicated or as directed.
2. Precast reinforced concrete manhole bases, risers, transition sections and tops shall conform to the requirements of ASTM C478, latest revision except as modified herein and/or on the drawings.
3. The height and diameter of manhole bases shall be as required to accommodate the size of sewer pipe used.
4. The manhole risers shall be available in 2, 3, or 4-foot lengths. Manhole tops of the eccentric cone type shall be 3 or 4 feet high with a 36-inch inside diameter opening at the top. Wall thickness of manhole risers shall not be less than 5 inches. Manholes over 8 feet deep shall have 5-foot inside diameter.
5. When shallow installations do not permit the use of a cone type top or where directed, flat slab tops shall be used. Flat slab tops shall not be less than 6 inches thick, and shall have an opening with an inside diameter of 36 inches.
6. Transition sections shall be similar to the tops and used as reducers to join the larger bases with the four-foot diameter risers. The transition sections shall be of the length required and have a four-foot opening at the top. Wall thickness of transition sections and cone type tops shall not be less than 5 inches at the base and shall taper to a thickness not less than 8 inches at the top.
7. Manhole steps shall be provided in each manhole. Manhole steps shall be arranged in the manhole bases, transition sections, risers and cones so as to provide a manhole step ladder approximately 12 inches on center for the full height of installation. Manhole steps shall be copolymer polypropylene plastic coated ½" grade 60 steel reinforced step Model No. PS2-PFSL in conformance with ASTM C478 paragraph 11 as revised, as manufactured by M.A. Industries, Peachtree City, Ga. or approved equal.
8. All manhole bases, transition sections, risers and tops shall be joined using Butyl Rubber Section Joints conforming to Federal Specification SS-S-210.

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9. The exterior surfaces of all manholes shall be shop coated with two coats of Super Service Black as manufactured by Koppers Company Inc., or Heavy Duty Black 46-449 as manufactured by Tnemec or equal.

B. Openings In Manhole Bases And Risers

1. Openings for pipes entering manhole bases and risers shall be provided at the locations and to the arrangements and dimensions shown on the approved shop drawings.
2. Openings in manhole bases and risers shall be provided with a prefabricated mechanical type joint seal between manhole walls and entering pipes. Joint seal shall be of a type to insure water tight jointing between manhole and pipes under all conditions of installation. The type of joint seals to be used shall be subject to approval and shall be as shown on the approved shop drawings.

C. Mortar Grout

Non-shrink type mortar or grout shall be a factory-mixed ready-to-use product containing an especially prepared metallic aggregate, cement and sand and other components which shall produce a mortar or grout with properties to counteract shrinkage, increase density, withstand impact, improve workability and produce watertight joints.

D. Concrete

1. The concrete used for precast manhole bases, transition sections, risers and tops shall have an average strength of 5,000 psi at 28 days.
2. Strength shall be determined by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the manhole bases, transition sections, risers and tops or by any other approved method.
3. Not less than two concrete strength tests shall be made for each 100 vertical linear feet of manhole bases, transition sections, risers and tops.
4. Testing may be conducted at the manufacturer's plant or at an approved testing laboratory and shall be the responsibility of the Contractor, at no additional expense to the Owner.

E. Reinforcing Steel

1. Reinforcing steel used for precast manhole bases, transition sections, risers, and tops shall conform to ASTM A185, latest revision.

F. Cement

Cement shall be moderate heat-of-hardening portland cement conforming to ASTM Designation C 150, latest revision, Type I for Brick work and Type II for precast units.

G. Absorption

Absorption is to be determined by absorption test described in ASTM Designation C 478, latest revision, and shall not exceed 8 percent of dry weight.

H. Brick

1. Brick for manholes shall conform in all respects to ASTM Designation C 32, Grade SM, latest revision, size 2-1/2 inches by 3-3/4 inches by 8 inches.
2. Bricks that are broken, warped, cracked or of improper size or quality or unduly chipped or otherwise defective shall not be used in the work and shall be removed from the site.

I. Mortar Plaster

1. Mortar and plaster for brick work shall be composed of one part Portland cement and two parts sand with only sufficient water added to make a stiff plastic mortar of a consistency and texture satisfactory to the Owner.
2. Mortar shall be used so that it will be in place before the initial setting of cement has taken place; retempering of mortar in which the cement has started to set will not be permitted.

J. Sand

1. Sand for mortar shall be graded uniformly from fine to coarse and when dry shall pass a screen having 8 meshes to the inch.
2. Sand shall consist of an aggregate having clean, hard, durable, strong, uncoated grains and free from deleterious amounts of dust, lumps, soft

or flaky particles, shale, alkali, organic matter, loam or other deleterious substances.

3. The sand shall be washed clean before loading on delivery trucks. Natural sand which shows a color darker than the standard color when tested in accordance with the Standard Method of Test for Organic Impurities of ASTM Designation C 40, latest revision, will be cause for rejection.

K. Water

Mixing water for concrete and mortar shall be clean and fit to drink and obtained preferably from the municipal supply.

L. Bedding Materials

1. Gravel bedding shall consist of hard durable material free from roots, sod, rubbish, organic material, clay or loam and meeting ASTM C33 stone size No. 67 as follows:

100%	passing 1" screen
90 - 100%	passing 3/4" screen
20 - 55%	passing 3/8" screen
0 - 10%	passing #4 sieve
0 - 5%	passing #8 sieve

2. Where ordered by the Engineer to stabilize the base, screened gravel or crushed stone 1/2 inch to 1-1/2 inches shall be used.

M. Manhole Frames And Covers

Due to the lead time required to manufacture sewer frames and covers, the Water Pollution Control Facility (WPCF) will provide the required frames and covers with the stipulation that they be replaced prior to payment for same. **Please contact WPCF at 203-630-4261 to coordinate.**

1. Cast-iron manhole covers and cast-iron watertight frames and covers shall conform to the details, types and styles as specified and as shown on the drawings. Shop drawings shall be submitted to the WPCF for approval before fabrication.
2. Gray iron castings shall conform to the requirements of AASHTO Designation: AASHTO M 105 (ASTM A48), Class 35B. For castings

subject to traffic loads furnish gray iron castings conforming to AASHTO M 105 (ASTM A48), Class 35B and AASHTO M306, latest edition, and shall be rated H20 per AASHTO M306, "PROOF-LOAD TESTING."

3. Iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects in positions effecting the strength and value for the service intended.
4. The surface of the manhole covers shall have a diamond pattern with the words "MERIDEN" and "SEWER" or "STORM" as required, cast in raised letters.
5. Covers shall have two non-penetrating ergonomic pick slots, for ease of cover removal.
6. The cast-iron manhole covers and cast-iron watertight manhole frame and covers for manhole structures shall be as manufactured by EJ USA, INC., Campbell Foundry Company, or approved equal.

N. Sealant Materials

Sealant materials for manhole frames shall be manufactured by Avanti International (AV-219 Fibrotite and Polyurethane Hydrophylic Resin), Parsons Environmental (Parson PoxyF6) or approved equal.

O. Extension / adaptor rings

Manhole Extension/Adjustment/Riser Rings shall conform to the City Standard Details

1. Above Ground:

All material shall be domestic carbon steel conforming to ASTM A36. The bottom (inner) ring shall be rolled from $\frac{3}{4}$ " thick material, and the top (outer) ring shall be rolled from $\frac{1}{2}$ " thick material. The top (outer) ring shall have a nominal inside diameter equal to the existing top cover diameter plus $\frac{3}{16}$ ". The inner and outer rings shall be concentric and be joined together by welding.

For non-adjustable riser rings, the inner and outer rings shall be joined together with a full circumferential weld.

For adjustable riser rings, an adjustment system shall be supplied and welded in line with the bottom (inner) bearing bar. The mechanical adjustment stud shall be made of type 304 stainless steel, and have a positive lock nut. The adjustment system shall allow for the manhole riser diameter to adjust +/-3/8" from nominal.

For cover adjustments less than the thickness of the cover, the inner and outer rings shall be joined together with 12 or 14 gage strip steel conforming to ASTM A1011.

After fabrication, risers shall be coated with either water based bituminous asphalt paint or a BASF E-coat with charcoal black topcoat.

The manhole riser ring shall be anchored to the manhole frame with three 1" cone tip set screws to prevent any movement from traffic.

All welding shall be performed by AWS D1.5 certified welders.

2. Below Ground:

All below ground frame adjustments shall be completed with the use of a rubber composite adjustment ring. The ring shall be used to minimize water infiltration between the manhole frame and concrete cone or brick layer, and to protect the substructure from traffic vibration and concentrated load stresses. The rubber composite adjustment ring shall be an appropriate size (flat or tapered) with which the adjusted manhole frame will achieve the best match to the finished road surface

Below ground adjustment rings shall be a molded rubber composite ring.

Molded rubber composite rings shall be minimum 80% by weight recycled rubber and minimum 10% by volume, recycled coated fiber for added strength and durability.

The rubber composite adjustment ring shall be installed in conjunction with a polyurethane sealant, per the manufacturer's installation instructions.

All rubber composite manhole adjustment risers Rubber composite shall be the EJ USA, INC. INFRA-RISER® as manufactured and supplied by EJ USA, INC. or approved equal.

Construction Methods

A. Inspection

1. All manhole bases, transition sections, risers, tops, steps, frames and covers will be inspected upon delivery. Those, which do not conform to these specification requirements, will be rejected and shall be removed immediately from the site by the Contractor. The Contractor shall furnish all labor and facilities necessary to assist the inspector in inspecting the material.
2. All manhole bases, transition sections, risers, tops, steps, frames and covers which have been damaged after delivery or during installation shall be removed and replaced by the Contractor with new, sound and approved material, at no additional expense to the Owner. At the time of inspection, the surfaces of bases, transition sections, risers and tops shall be dense and close-textured. Cores shall serve as a basis for rejection of manhole bases, transition sections, risers and tops if poor bond with reinforcement steel exists or reinforcement is exposed.
3. The quality of all materials, process of manufacture, and the finished manhole bases, transition sections, risers, and tops shall be subject to inspection and approval by the Owner. Such inspection may be made at the place of manufacture and/or on the site, and the manhole bases, transition sections, risers, and tops shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample manhole bases, transition sections, risers, and tops may have been accepted as satisfactory.

B. Excavation And Backfilling

1. Excavation, backfilling and compacting shall be completed in accordance with the Specifications in this Contract.

C. Installation Of Manhole Bases And Sections

1. Precast bases shall be placed on a six-inch layer of compacted bedding material as described elsewhere in this Specification. The excavation shall be properly dewatered while placing bedding material and setting the base.
2. Each manhole base, transition section, riser, and top shall be eased into its position in the trench using materials and methods as recommended by the manufacturer of the precast units. The Contractor shall provide

all necessary slings, straps and other devices for the safe and satisfactory handling and support of manhole bases, transition sections, risers and tops during lifting, installation and final positioning. Lifting holes may be permitted provided the holes are plugged and sealed watertight with mortar, all as approved.

3. Manhole bases, transition sections, risers and tops shall be installed using approved jointing methods which are completed in accordance with the manhole manufacturer's recommendations, and as approved. Manhole bases, transition sections, risers, and tops shall be installed level and plumb. Water shall not be permitted to rise over newly made joints until after inspection and acceptance. All jointing shall be done in a manner to ensure watertight joints.
4. Openings shall be provided in the precast manhole bases and risers to receive entering pipes, and these openings shall be made at the place of manufacture. The openings for all entering pipes shall be provided with the approved type mechanical joint sealing device shown on the approved shop drawings and the installation of pipes entering the manholes and the installation of the mechanical joint sealing device made in strict conformance with the manhole manufacturer's printed recommendations and so as to obtain watertight joints between manholes and pipe and in a satisfactory manner. Five copies of the manufacturer's printed recommendations shall be furnished to the owner.
5. Care shall be taken to assure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Mortar used in sealing spaces between entering pipes and openings in manhole walls shall be of the non-shrink type. Damaged bases and risers by jointing devices will be rejected and shall be replaced by the Contractor at no additional expense to the Owner.
6. Manhole bases, transition sections, risers and tops shall be installed so that the manhole steps are in alignment.
7. Manhole steps shall be installed in accordance with the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration, CFR 29, Part 1910.27g, as amended.

D. Drop Manhole Connections

Drop manhole connections shall be constructed as shown on the drawings. The

encasement for the drop pipe shall be constructed after the installation of the pipe. Special care shall be taken to provide a water tight seal between the pipe and the manhole wall.

E. Installation Of Cast Iron Frames And Covers

1. Cast iron frames and covers shall be installed where shown on the plans. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
2. The cover shall not have vent holes, and shall fit firmly within the existing frame, with the top being flush with the existing frame. Gaskets or fillers will not be allowed. The cover shall have concealed pick holes.

F. Installation - Cast Iron Watertight Frames And Covers

1. Cast iron watertight frames and covers shall be installed where shown on the plans. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
2. The cover shall fit firmly within the frame with the top being flush. The entire installation shall be watertight. There shall be no vent holes.

G. Masonry Construction

1. Brick masonry shall include brick masonry walls for extending manhole walls to grade when directed; formed brick masonry for constructing manhole inverts and invert tables, mortar, building-in or manhole steps and pipes and appurtenant work.
2. Brick masonry shall be provided to the details and dimensions indicated or as directed. All exterior surfaces of brick masonry manhole walls

shall be plastered with a 1:2 Portland cement and sand mortar plaster to provide a minimum thickness of ½ inch; mortar plaster shall be applied with sufficient pressure to ensure a dense plaster completely filling all voids and thoroughly bonded to the brick work.

3. Inverts shall have a cross section shaped to conform with connecting sewers; changes in size shall be made gradually and evenly.
4. Brick masonry construction shall be done in a manner to ensure watertight construction and all leaks in brick masonry shall be sealed. Brick masonry shall be repaired or replaced so as to obtain watertight construction at no additional expense to the Owner.
5. All workmanship shall conform to the best standard practice and all brick masonry shall be laid by skilled workmen. Brick masonry walls shall be constructed to the thickness indicated. All beds on which masonry is to be laid shall be cleaned and wetted properly. Brick shall be wetted as required and shall be damp but free of any surface water when placed in the work.
6. Bed joints shall be formed of a thick layer of mortar which shall be smoothed or furrowed slightly. Head joints shall be formed by applying to the brick to be laid a full coat of mortar on the entire end or on the entire sides as the case requires, and then shoving the mortar-covered end or side of the brick tightly against the bricks laid previously; the practice of buttering at the corners of the brick and then throwing mortar or scrapings into the empty joints will not be permitted. Dry or butt joints will not be permitted. Joints shall be uniform in thickness and shall be approximately 1/4 inch thick. Joints on the inside face of walls shall be tooled slightly concave with an approved jointer when the mortar is thumb print hard, the mortar shall be compressed with complete contact along the edges to seal the surface of the joints.
7. Brickwork shall be constructed accurately to dimensions and brickwork at top of manholes shall be to the dimensions of the flange of the cast iron frames.
8. No water shall be allowed to flow against brickwork or to rise on the masonry for 60 hours after it has been laid and any brick masonry damaged in this manner shall be replaced as directed at no additional expense to the Owner.
9. Adequate precautions shall be taken in freezing weather to protect the

masonry from damage by frost.

10. All pipes, or castings to be embedded in the brickwork shall be accurately set and built-in as the work progresses; pipe stubs shall be closed with suitable plugs in an approved manner.
11. The outside face of all brickwork shall be plastered to the thickness and using the mortar specified herein; plaster shall be troweled to a smooth, hard finish and no backfill shall be placed until the mortar has thoroughly hardened.

H. Leakage Tests

1. Leakage tests shall be made by the Contractor at his expense and observed by the Engineer on each manhole. The test shall be by vacuum in accordance with ASTM Specification C-828-80. Notarized records of the test results shall be submitted by the Contractor to the Owner for approval.
2. The vacuum testing system shall be as supplied by NPC Systems, Inc., or approved equal. The testing shall be done immediately after assembly of the manhole and before back-filling. A 60-inch/lb. torque wrench shall be used to tighten the external clamps that secure the test cover to the top of the manhole. All lift holes shall be plugged with a non-shrinking mortar, as specified. The Contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe to prevent the pipes from being drawn into the manhole. A vacuum of 10 inches Hg (4.9 psi) shall be drawn and the vacuum pump shut off. The test shall pass if the vacuum remains at 10-inches of Hg or drops to 9 inches Hg (4.4 psi) in a time greater than one minute.
3. If the manhole fails the initial test, the Contractor shall locate the leak and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material. The manhole shall then be retested, repeatedly, if necessary, by the Contractor, until the required conditions are met, at no additional expense to the Owner.

Method of Measurement

- A. Precast concrete manholes shall be measured for payment by the unit "each" as listed in the Bid. The depth of a unit shall be the total depth from the top of the manhole frame to the invert of the sewer at the center of the manhole.

- B. Reset manholes shall be measured for payment by the unit "each" as listed in the Bid.
- C. Manhole frame and cover shall be measured for payment by the unit "each" as listed in the Bid.

Basis of Payment

- A. Precast concrete manholes measured in place as provided in the preceding paragraph, will be paid for at the contract unit price bid "each", as listed in the bid.
- B. The price and payments listed above shall constitute full compensation for furnishing and constructing precast manhole bases, transition sections, risers, cones, flat tops, complete with cast iron frames and covers, including watertight frames and covers if applicable, all pipe and pipe fittings and encasements for drop manholes, steps, brick masonry, for furnishing openings and connecting existing sewer pipelines, excavating and backfill and appurtenant work, for leakage tests complete in place; and for all labor, equipment, tools, materials, and all other costs and appurtenant work incidental and necessary to complete the items as specified, as indicated and as directed by the Owner.

<u>Pay Item</u>	<u>Pay Unit</u>
Manholes - Sanitary Sewer	Each
Reset Manhole – Sanitary Sewer	Each
Manhole Frame and Cover – Sanitary sewer	Each