

ITEM 16

MANHOLES

1.0 DESCRIPTION. The Contractor shall, under this item, perform all required earth excavation, backfill and dewatering, and furnish all materials and labor to install all manhole types, drop attachments, and shallow manholes. The Contractor shall also provide connections to existing manholes to the diameter indicated where shown or ordered and as shown or specified.

2.0 SUBMITTALS. The Contractor shall submit the following in accordance with the conditions of this Contract.

A. Reference Standards.

1. For standard precast concrete manhole sections, the precast concrete producer will supply shop drawings showing conformance to project drawings and requirements and to applicable ASTM specifications listed in this specification.
2. For specific and/or unique precast concrete manhole structures, if required by the Owner the precast concrete producer shall supply shop drawings and/or informative literature. The precast concrete producer shall warrant that such products will perform the intended task.

B. Shop Drawings.

1. Shop drawings shall be furnished by the precast concrete producer for approval by the Engineer. These drawings shall show complete design, installation, and construction information in such detail as to enable the Engineer to determine the adequacy of the proposed units for the intended purpose. Details of steel reinforcement size and placement as well as supporting design calculations, if appropriate, shall be included. The means of watertight pipe connection information shall be included indicating confirmation to this specification as well as to the Ohio EPA requirements.
2. The drawings shall include a schedule, which will list the size and type of precast concrete manholes, the location where they are to be used, the angle(s) of all connections in relation to each other, the step location, the cone orientation and the invert of each connection. The precast concrete manholes shall be produced in accordance with the approved drawings.
3. The Contractor shall provide one (1) electronic copy of materials, equipment, equipment lists and spare parts data submittals in accordance with the provisions of the "General Conditions" and "Supplemental General Conditions" of this Contract.
4. Shop drawings shall indicate all principal dimensions, general construction and materials for the sewer system as specified herein. Shop drawings shall:
 - a. Show relationship of all sewer components, connections, and support items

- b. Be complete in all details and include identified parts lists.
 - c. Be submitted for review and approval and will be returned within two (2) weeks either approved or marked up for further design.
 - d. Not be Manufacturer's catalog or general web-site information. These types of submittals will NOT be sufficient to fulfill shop-drawing requirements and returned as Not Approved.
5. All shop drawings submitted for review electronically via email and shall be reviewed and returned within two weeks either approved or marked up for further design.
 6. After examination of such drawings by the Engineer and the return thereof, the Contractor shall make such correction to the drawings as have been indicated and shall furnish the Engineer with electronic corrections.
 7. If requested by the Engineer, the Contractor must furnish additional copies.
 8. Shop drawings shall be furnished by the dish insert manufacturer/producer for approval by the Engineer. These drawings shall show complete design, installation, and construction information in such detail as to enable the Engineer to determine the adequacy of the proposed system for the intended purpose.
 - a. The drawings shall include a schedule, which will list the dimensions of the dish inserts and the manhole locations where they are to be installed.

C. Calculations. In extreme depths and/or loading situations, SCMSD may require structural loading calculations in accordance with ASTM C890 and ACI 318.

D. Certifications. The precast concrete producer shall certify that manholes will meet the ASTM specifications referenced herein.

1. The Contractor shall provide manufacturer's certification that the dish inserts, when installed per the manufacturer's requirements, shall not exceed more than 1 gallon of inflow per 24 hours.

3.0 MATERIALS. All manholes and accessories shall comply with the following requirements.

A. General.

1. Manholes shall be constructed of precast reinforced concrete sections on poured-in-place monolithic concrete bases, or approved precast concrete bases, with troughs to be formed as approved by the Engineer. All concrete used in manholes shall conform to the requirements of Class A Concrete with the exception of benches and channels for which Class B concrete shall be used.
2. Manholes shall be of the size shown on the drawings and of the design and materials shown or specified. All protruding hardware from the "handling/lift aids" shall be removed and the holes filled with non-shrink grout and finished on the inside to conform to the manhole wall.
3. The finished grade for manhole castings shall be three-eighths (3/8) inch below paved roadway surfaces and shall be six (6) inches above ground line in all other

areas, unless otherwise shown on plans or directed by the Engineer. Paving Plates (Standard Drawing 34A) shall be used to protect the manholes and ensure that they are three-eighths (3/8) inch below the roadway surface. The roadway material topcoat shall be feathered up to the top of the casting from a distance of five (5) feet in all directions outside the manhole casting and be three-eighths (3/8) inch higher at the edge of the casting.

4. Precast grade adjustment rings shall be used under the casting as required to slope the top of the casting to match the roadway surface, i.e. the casting shall not be constructed level on a roadway with a grade. As an alternative, the County will accept East Jordan's "Infra-Riser" (or equal) tapered to fit the road slope.
5. An outside drop inlet shall be provided for invert elevations greater than 24 inches. All drop assemblies proposed for new manhole assemblies shall be of the precast type. New outside drop assemblies required for existing manholes may be cut in the field. Where the difference in elevation between the incoming sewer and the manhole invert is less than, or equal to, 24 inches, the invert shall be filleted to prevent solids deposition and provide a smooth transition for the flow to the discharge pipe.
6. Cone sections shall be of precast reinforced concrete of the same quality materials specified for the rings and shall have a taper as shown on the drawings. Cone sections shall be eight (8) inches thick at the top.
7. All pipe connections to manholes shall be made with a flexible, watertight pipe to manhole seal meeting the requirements of ASTM C425, C923 and C443. All new manholes will have factory installed seals built into the structure, prior to delivery to the job-site. Kor-N-Seal boots by NPC, A-LOK Products or approved equal shall be used.

B. Manhole Bottoms.

1. Manhole bottom sections shall be thoroughly bonded to the manhole barrel and all connections neatly made without projections or voids, and shall all be **watertight**. The bottom of manholes shall be benched to a depth equal to the inside diameter of the largest pipe entering or leaving the manhole and of a width equal to the diameter of the pipe.
2. Channels shall be smooth, curved where required, and shall provide clear flow lines. All channels shall be of formed concrete or of pipe sections. Manholes shall be narrow at the top to fit the cast iron frame and cover as shown on the contract drawings. Manhole steps shall be set with uniform spacing not over sixteen (16) inches center to center.

C. Manhole Grade Adjustment.

1. Precast grade adjustment rings, cast iron rings, or East Jordan's "Infra-Riser" (or equal) shall be used to adjust the manhole casting to the proper elevation, as shown on the drawings. All manholes must have at least 6-inches of ring adjustment as a minimum.

2. The maximum height of casting adjustment allowed is 12-inches. For heights less than or equal to 3-inches, East Jordan "Infra-Risers" may be installed in accordance with the manufacturer's installation instructions.

D. Manhole Steps.

1. Steps shall be of reinforced plastic of the style indicated on the drawings or approved by the County.
2. Manhole steps shall be cast in place, grouted in place, or "drive-in" type; they must be watertight. If grouted in place a non-shrinking agent shall be added to the grout.

E. Manhole Frames & Covers.

1. Manhole frames and covers shall be of the size and style shown on the drawings, which is known as Stark County Standard. All covers shall be non-vented with closed pick holes and bear the Stark County logo, with the exception of watertight castings, as provided in the associated standard drawings. Finished dimensions shall not vary more than 1/8 inch. The rim and cover shall be machined to prevent rocking of the cover.

F. Manhole Chimney Seals.

1. Install an internal chimney seal as manufactured by Cretex, Trelleborg or approved equal, per manufacturer requirements with appropriate size to cover the interior surface area from approximately 3" below the top of the manhole cone section, to the top of the casting base. Apply bituminous seal or butyl wrap, as manufactured by ConSeal or approved equal, on entire exterior surface area of grade adjustment.
2. See SCMSD Detail Drawing No. 12.

G. Manhole Accessories.

1. All ductile iron pipe and fittings supplied for use with drop attachments shall meet the requirements of SCMSD Item 11 Ductile Iron Pipe and Fittings.
2. All cast iron shall be of good quality cast iron conforming to ASTM Specification A48, Class 35B Iron. Casting shall be cleaned by shot blasting and shall be coated with asphaltic coating to provide a smooth, tough and tenacious coating.
3. Orifice plates, where called for, shall be furnished and installed as shown on the drawings.

H. Precast Concrete Manholes.

1. The design of precast concrete manholes shall be approved by the Engineer before any sections are delivered to the site of the work. Precast concrete manhole rings and cone sections shall meet ASTM C478.
2. Each pre-cast reinforced concrete manhole riser and top section shall be clearly marked with the name of the manufacturer and the date of manufacture.
3. All joints shall be made with rubber gaskets conforming to ASTM C443. All joints shall be watertight. Inside joints shall be smooth. Details of pipe through manhole walls shall be submitted to the Engineer for approval prior to commencement of construction. Tar strips meeting hydrostatic performance set forth in ASTM C990

shall be installed at all manhole joints. Acceptable products shall be Con Seal CS-102 or approved equal.

4. The Contractor shall also apply an exterior joint sealer to each joint, meeting the requirements of ASTM C877. Acceptable manufacturers shall be MacWrap External Collar by Mar Mac Construction Products Co. Inc., EZ-wrap by Press Seal Gasket Corporation or CS-212 by Conseal Concrete Sealants, Inc.
5. The sealer installation shall be approved by the Engineer after application and prior to backfilling.

I. Drop Attachments (Item 16A).

1. Drop attachments shall be provided as shown in Standard Drawing Nos. 14, 15, 15A, or 15B.

J. Corrosion Protection (Item 16X).

1. Where manholes are shown on the Contract Drawings to be provided with a corrosion protection, they shall be lined with SprayWall® by Sprayroq, Inc., "Spectrashield" by CCI Spectrum, Inc., "OBIC" by OBIC or approved equal in accordance with Item 16X.

K. Casting & Cover Replacement to Existing/New Manholes (Item 16D).

1. Where manholes require new castings and grade ring assemblies, the Contractor shall excavate around the manhole exposing the casting, grade ring assembly and enough of the cone section to facilitate replacement. Any existing casting and grade ring assembly shall be removed and disposed of as per the contract. The Engineer may wish to recover the casting and cover for scrap or reuse.
2. The Contractor shall examine the condition of the top of the cone section or flat top for water-tightness and the ability to accept the new grade ring assembly. If the condition or structure of the cone is compromised, the Contractor shall inform the Engineer. If the surface to which the new grade ring assembly is to be affixed is not flat or cannot accept the assembly, the Contractor shall repair or adapt the surface in order to make the replacement flat and watertight.
3. The Contractor shall follow the specifications for grade ring and casting placement under Sec. 4.03 Standard Manholes using Standard Detail Drawing No. 12. The Contractor shall keep all cementitious materials and tar off the bench and out of the flow-line of the manhole and will be responsible for backfilling and restoration around the casting once it has been placed.

L. Shallow Manholes.

1. Shallow manholes shall be as shown on SCMSD Detail Drawing No. 11 and shall be similar in detail to standard manholes, except that, in order to obtain all possible headroom, a reinforced concrete slab (flat top) shall be placed as the top instead of tapered construction.

M. Inflow Dish Inserts – For All New Castings/Lids Except for Watertight Castings/Lids.

1. Inflow dish inserts are to be installed to prevent rainwater from entering the manhole through any non-watertight manhole cover.
2. The inflow dish inserts and components shall be manufactured of materials resistant to corrosion from the atmospheres containing hydrogen sulfide and dilute sulfuric acid.
3. The inflow dish shall allow venting of sewer gases and vacuum release, have a factory installed gasket, and allow no more than 1 gallon per 24-hour period to inflow into the manhole.
4. The inflow dish insert shall have a manufacturer-installed corrosion resistant removal/reinstallation strap.
5. The recommended manufacturers are:
 - a. V2P Manhole Inserts by Parson Environmental, or
 - b. Engineering approved equal.
6. Installation shall be in accordance with manufacturer's recommendations and shall not impede the proper seating of the manhole cover.
7. Each dish insert shall be spray-painted with an orange "X" to provide visible notification during nighttime that such a dish insert is installed.
8. No holes shall be drilled into the dish inserts, except for those provided by during the manufacturing process.
9. Additional Items:
 - a. One (1) additional dish insert will be supplied as spare parts for each five (5) or less non-watertight manholes furnished under this project.
 - b. No extra or separate payment will be made for supplying the additional dish inserts and all costs shall be included for payment under this Item.

4.0 EXECUTION. Manholes shall be installed in accordance with all industry standard practices and all contract drawings and details.

A. Foundations.

1. Where poor soils are present underneath new manholes, additional support required for a stable foundation may include undercutting or piling in accordance with SCMSD and/or a professional geotechnical engineer.
2. Payment for the support system shall be included in Item 16 unless the project contract differs.

B. Connections to Existing Manholes.

1. Where existing manholes require connections for proposed sanitary sewer or conduits, the Contractor shall core drill manholes for openings required that do not exist. Inlet and outlet pipes shall be connected to new and existing manholes with a gasketed flexible watertight connection satisfying ASTM C425 and C443.
2. Kor-N-Seal boots by NPC, A-LOK Products or approved equal shall be used.
3. Conduits shall be sealed per SCMSD Item 29 with an adjustable interlocking rubber link as manufactured by "Link-Seal" or equal.

4. This specification Item shall include all rework of the existing manhole bench required to provide the new flow channel for the proposed connection.
5. All work shall be completed under dry conditions. Any bypassing of flows required to perform this work shall also be supplied.

C. Modification of Existing Manholes.

1. This item shall include all labor, materials, and equipment required for the modification of existing manholes noted as such in the plans. Manholes that are to be modified shall be plugged or sealed where pipes join manholes.
2. All existing sewers encountered in construction operations that are inactive or are to be abandoned as determined by the Engineer, shall be plugged or sealed, at both ends where broken into, before proceeding with backfilling.
3. Portions of the sewer to be abandoned that interferes with construction shall be removed with the remaining abandoned portions securely sealed. Pipes shall be sealed at the required locations by the construction of masonry bulkheads of concrete with the minimum thickness of one (1) foot.
4. The Contractor shall fill the manhole interior volume using material conforming to the ODOT Construction and Material Specifications Item 613, Low Strength Mortar backfill with the mix adjusted to ensure a flow able material. All material used shall be acceptable to the Engineer. The fill material be placed in the manhole to an elevation one foot below the proposed sewer invert elevation.
5. A Class B concrete invert, channel and bench shall be provided which has a minimum thickness of twelve (12) inches under the sewer flowline elevation foot and a steel trowel finish to smoothly and completely direct the sewage flow through and across the manhole as described in Section 16.03A-1.
6. Flexible connections as described in Section 16.03E (Item 16C) shall be provided at each new manhole penetration.

C. Dish Insert Installation.

1. The manhole frame rim shall be thoroughly cleaned of all dirt and debris before placing the dish insert upon the rim.
 - a. The Contractor is to exercise good work practices to ensure that no dirt, rocks, or other such debris is allowed to fall into the manhole.
2. The dish insert shall be fully seated around the manhole frame rim.

5.0 ELECTRICAL. This section is not applicable.

6.0 QUALITY ASSURANCE.

A. Testing. Upon completion of the manhole installation the Contractor shall provide the following testing:

1. Vacuum Testing - Vacuum Testing of all new manholes is required and shall meet the requirements of ASTM C1244 (latest version).

- a. Manholes shall be sealed with plate-style sealing equipment on top of the casting so that the adjustment rings can also be tested.
- b. Bladder-style sealers are not acceptable
- c. If a lateral is extended out of a manhole, the lateral shall be vacuum tested with the manhole test, i.e. the lateral shall not be sealed off during the test.
 - i. A vacuum of ten inches mercury shall be drawn.
 - ii. The time to drop one inch shall be measured. The manhole shall pass if the time is greater than:
 - a) Sixty seconds for a 48" diameter manhole.
 - b) Seventy-five seconds for a 60" diameter manhole.
 - c) Ninety seconds for a 72" diameter manhole.
- d. If the manhole does not pass the vacuum test the Contractor shall be responsible to make all necessary repairs and re-test the manhole at their expense.
- e. No testing of manholes shall be performed without the presence of a Stark County inspector on site.

7.0 MEASUREMENT. All manholes, appurtenances and associated work will be categorized, quantified and where applicable, measured for basis of payment upon their final completion and acceptance.

- A. Measurement for manholes will be made from the flow line to the final, top of casting elevation. Measurement for drop attachments shall be made from the flow line of the manhole to the flow line of the upper inlet pipe, as shown on the drawings.
- B. For manholes modified, Item 16E shall be the actual number of manholes modified and shall include the bulkheads both seen and unforeseen required on each pipeline at the manhole (Contractor shall field verify the number of connections prior to bidding).

8.0 PAYMENT. The unit price stipulated per standard, shallow and lined manholes for each diameter shall include all the construction of each manhole in place, including all labor, materials, tools and appliances, cast iron manhole frame and cover, steps, toe pockets, orifice plates (if called for), reinforcing steel, concrete, precast concrete sections, bases, cones, top elevation adjusting rings and site restoration, dish inserts, complete as specified or shown. The unit price shall also include all sewer stubs and plugs as indicated on the contract drawings, specified or shown:

- A. The unit price stipulated per drop attachment shall include the required earth excavation and the furnishing of all labor, ductile iron pipe, fittings and other materials, tools, and appliances necessary to complete the work as specified or shown. When PVC carrier pipe is being used, the price for drop attachments shall include all ductile iron pipe that is required.

- B.** All earth excavation and backfilling shall be completed as specified under SCMSD Item 1, however, payment for this item shall be included under this Item 16.
- C.** Cost for Casting and Cover Replacement to Existing/New Manholes – Item 16D shall include the required earth excavation and the furnishing of all labor, materials, cast iron manhole frame and cover, concrete, precast concrete sections, bases, cones, top elevation adjusting rings, site restoration, tools and all appliances necessary to complete the work as specified or shown. Payment shall be made under Item 16D.
- D.** Cost for Manhole Modified – Item 16E shall be paid for each manhole modified. All materials, labor, tools, restoration and equipment to complete the work as called for on the drawings and as specified herein shall be included in the unit price bid.

<u>Item</u>	<u>Unit</u>	<u>Description</u>
16	EA	Type A Manhole (Less than or equal to 12' Deep)
16	EA	Type A Manhole (Greater than 12' Deep)
16A	EA	Type A Precast Drop Manhole
16C	EA	Connection to Ex. Manhole
16D	EA	Manhole Casting & Cover (New and Existing)
16E	EA	Modification of Existing Manhole

END OF SECTION