

## SECTION 336040

### MANHOLES, RINGS AND COVERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Requirements for providing sanitary sewer manholes and all other appurtenances for a complete installation. Provide precast reinforced concrete manholes conforming to ASTM C478 in accordance with the Plans and NPU Standard Details.
- B. See Related Work Specified in Other Division 33 Sections

##### 1.2 REFERENCE

- A. Codes and standards referred to in this Section are:
1. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
  2. ASTM C 478 - Specification for Precast Reinforced Concrete Manhole Sections
  3. ASTM C 32 - Specification for Sewer and Manhole Brick (Made for Clay or Shale)
  4. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets [Metric]
  5. AASHTO - American Association of State Highway and Transportation Officials
    1. M306-10: Drainage, Sewer, Utility, and Related Castings
      - a. Manufacture
      - b. Proof Testing
      - c. Inspection
      - d. Certification
      - e. Marking
    2. Standard Specification for Highway Bridges
  6. ASTM G154 – Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
  7. ASTM C 1028 – Standard Test Method for Determining the Static Coefficient of Friction

8. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
9. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

### 1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of sewer manholes as specified in Section 013000.
- B. Submit shop drawings for fabrication and installation of casting assemblies that are not included in the Plans or the NPU Standard Details. Include plans, elevations, sections and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.
- C. Quality Control: Submit shop and field test reports of concrete samples tested in an approved laboratory.

### 1.4 DELIVERY, STORAGE AND HANDLING

- A. General: Take every precaution to prevent injury to the manhole sections during transportation and unloading. Unload manhole sections using skids, pipe hooks, rope slings, or suitable power equipment, if necessary, and always keep the sections under control. Do not allow the manhole sections to be dropped, dumped or dragged under any conditions. Follow applicable requirements specified in Division 1.
- B. Damaged Section: If any manhole section is damaged in the process of transportation or handling (see Section 2.3.C below), contact the NPU for visual inspection. If NPU deems it necessary to reject the manhole section, reject and immediately remove such sections from the site, and replace the damaged manhole sections at no increase in Contract Amount.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Composite Access Products (CAP One), or an NPU approved equal, are acceptable for the sanitary sewer manhole frames and covers.

### 2.2 MATERIALS

- A. Concrete, Steel Reinforcement and Aggregates: Provide reinforced

concrete, cementitious materials, aggregates and steel reinforcement conforming to the requirements of ASTM C 478, with 4,000 psi concrete, Grade 40 reinforcement bars, Type II cement, and a minimum wall thickness of eight (8") inches.

B. Steel reinforced polymer concrete manholes may be furnished and installed instead of the Type II cement manholes described above. If provided, steel reinforced polymer concrete manholes shall not require interior and exterior protection as described in part 3.1 F and 3.1 G. All steel reinforced polymer concrete structures shall be supplied by a qualified company with a minimum of five (5) years experience manufacturing polymer concrete. All steel reinforced polymer concrete structures shall be manufactured and installed in accordance with the applicable requirements of ASTM C76, C478, C443, D6783, C33, C267, A82, A165, A496, A497, A615, and A615M.

C. Manhole Rings and Covers:

1. Provide manhole rings and covers as shown on the Plans and NPU Standard Details. Manhole rings and covers shall be molded composite for application in wastewater collection systems and facilities. All composite moldings shall consist of a thermosetting resin matrix blended and/or combined with reinforcing fiber rovings, short fiber filaments, or equivalent nonmetallic reinforcing structure(s). The thermosetting resin matrix shall be a polyester, vinylester, or a blend of these. The moldings shall be true to pattern in form and dimension and free from cracks, pores, knit-lines, or other defects in locations affecting their strength and value for the service intended. The words SANITARY SEWER, as well as City of North Port shall be cast in all manhole covers except those owned by a private party. All manhole rings and covers shall be traffic bearing unless otherwise specified.
2. All rings and covers units shall be made from high strength nonmetallic fiber reinforced polymer/composite materials. The material shall be a resin thermoset matrix that can be reinforced with continuous filament engineered fabrics, fiber rovings, short fiber filaments, or equivalent nonmetallic reinforcing structure(s). Sealing gaskets shall be bonded to the frame continuously at the interface with the cover to reduce wear, shock, noise, and malodors.
3. Rings and covers intended for traffic service shall be capable of withstanding AASHTO M306: Proof Testing (includes items such as frames, covers etc.)
4. Fabricate rings and covers to conform to shapes, dimensions, and with wording or logos shown on the NPU Standard Details.

5. **MOLDING PROCESS:** Before the moldings are removed from the molding operation, they shall be thoroughly deflashed and cleaned at the parting lines, holes, notches and all exposed edges. If using a lock, or latch, these must be independent of the method used to open the cover to ensure the cover can be opened in the event of lock or latch failure. Covers and frames shall be compression molded under high pressures (>0.5 tons/sq. inch of x-y surface area) and high temperatures (>200 degrees F). Metal reinforcements or metal hinges molded within the composite shall not be permitted. Small non-stress bearing pieces of metal may be encapsulated or attached.
6. All rings and covers shall be molded and assembled in the United States in accordance with the requirements of AASHTO M306.
7. Covers shall be provided with a positive sealing mechanism by means of four (4) austenitic 316 stainless-steel one-half inch (1/2") nuts and bolts # 11 National Coarse Thread. Nuts shall be molded in or attached at pre-molded designated points of the frame and shall be Teflon Coated. For bolted manhole covers a thin film of an "Anti-Seize" lubricant, approved by the Engineer, or his/her designated representative shall be applied to all bolts. Bolts shall be threaded by hand prior to the use of wrenches. Other equivalent locking mechanisms must be approved by NPU.
8. Composite covers shall be detectable by metal detectors.
9. **MARKINGS:** Covers and Frames shall have the following molded into the substrate of the cover: Name (or abbreviation) of molder, country of origin (where transformed by molding process), molding date, indication that the material is non-metallic.
10. Composite frame and covers shall be Composite Access Products, L.P., McAllen, Texas or pre-approved equal as documented by NPU.

- D. **Preformed Joint Sealing Compound:** Provide preformed joint sealing compound for joining manhole sections.
- E. **Concrete Protective Liner:** Provide concrete protective liner approved by Engineer and NPU.
- F. **Pipeline Connections:** Provide neoprene boots with type 316 stainless steel clamps of a design approved by the Engineer, NPU, or designee for joining wastewater collection piping to manhole riser sections. Fill the unfilled portion of the connection with mortar or concrete to guarantee a watertight seal.
- G. **Doghouse Manholes:** Doghouse manholes over existing wastewater collection pipes are permitted. Provide a concrete base a minimum of eight (8") inches

thick, with proper reinforcing rods to prevent cracking. Pour concrete base upon a 12-inch base of gravel. Precast manhole rings may be set in the concrete over the existing pipe. Concrete should then be used to form both the bench and to seal the pipe entrances, both inside and especially outside. Once dry, remove the top of the pipe in the manhole.

- H. Standard Manholes: The standard manhole shall be a minimum of four (4') feet in depth measured from the base of the cover frame to the top of the concrete footing and shall be of the concentric cone type, as shown in the NPU Standard Details. Manholes less than four (4') in depth, must be approved by NPU in writing prior to installation and shall be classified as a "Shallow Manhole" as specified below.
- I. Shallow Manholes: The shallow manhole shall be four (4') feet or less in depth measured from the base of the cover frame to the top of the concrete footing and shall be of flat top construction, as shown in the NPU Standard Details.
- J. Manhole Inverts: Form manhole inverts from concrete having a minimum 28-day compressive strength of 2,500 psi, and as shown on the NPU Standard Details. Inverts for "straight-through" manholes may be formed by laying the pipe straight through the manhole, pouring the concrete invert, and then cutting out the top half of the pipe. Construct curved inverts of concrete, as shown in the NPU Standard Details, and form a smooth, even, half pipe section. Precast inverts may be used, however, no large "bowls" shall be permitted in the center of the manhole. To alleviate this problem, grout the invert to form a smooth, uniform invert as shown in the NPU Standard Details. Maintain a 0.1-foot drop across the manhole.
- K. Inflow Protectors: No inflow protectors shall be installed with composite manhole ring and covers. For other manhole ring and covers, and at the discretion of NPU, install an inflow protector manufactured from a high-quality 304 stainless steel with a consistent thickness of not less than 18-gage. The inflow protector shall have a deep-dish bowl design with no less than eight (8") inches in depth to allow easy and unobstructed removal of the manhole cover. The manhole inflow protector is to be manufactured with a one-piece rubber gasket installed at the factory for a tight, consistent fit. The rubber gasket is to be designed to securely wrap around the entire leading edge of the inflow protector at the point where it comes in contact with the manhole frame and cover. The wrap around rubber gasket is to be manufactured to a width of no less than 3/8 inches, consistent on top and bottom of the leading edge of the inflow protector. The gasket shall be no more than 3/32 inches thick. The insert removal handle shall be manufactured of a high-quality stainless steel for strength and durability. The handle is installed in such a way that it does not interfere with the installation or removal of the manhole lid. The insert handle will be manufactured to withstand a minimum pull force of 500 pounds before it fails or separates from the insert. The inscription "PROPERTY OF CITY OF NORTH PORT UTILITIES" shall be etched, at the base of the handle frame, to provide a long-lasting identification marker for the

City.

- L. Chimney Seals: Install a minimum of two (2) precast concrete or HDPE riser rings with a chimney seal between manhole and frame.

## 2.3 SOURCE QUALITY CONTROL

- A. If requested by NPU, Engineer, or designee, at least three cylinders shall be taken each day that manhole sections are cast, with batch samples to be designated by the laboratory representative. At least one set of cylinders will be taken from each nine (9) cubic yards of concrete used in manhole section construction. These samples will be tested for strength. If the samples fail to meet specified minimum concrete strength requirements, all manhole sections manufactured from the concrete from which the cylinders were made will be rejected.
- B. NPU, Engineer, or designee reserves the right to core manholes either at the job site or point of delivery to validate strength of concrete and placement of steel. If cores fail to demonstrate the required strength or indicate incorrect placement of reinforcing steel, all sections not previously tested will be considered rejected until sufficient additional cores are tested, at no increase in Contract Amount, to substantiate conformance to these requirements.
- C. Components of the manhole shall be free of fractures, cracks, and undue roughness. Concrete shall be free of defects, which indicate improper mixing or placing, and surface defects such as honeycomb or spalling. Cracks or broken ends due to improper handling will not be acceptable. No lift holes will be allowed except in rise and corbel sections. These holes shall not penetrate the wall and shall be filled with non-shrink grout after installation.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Lifting Holes: Grout lifting holes through the structure with non-shrink grout.
- B. Precast Base: Provide a precast base of not less than eight (8”) inches in thickness with a minimum dimension across the precast base of 72 inches poured monolithically with the bottom section of the manhole walls, reinforced, with a minimum 28-day compressive strength of 4,000 psi.
- C. Joining Manhole Sections: Join precast sections using plastic joint sealing compound and trimmed prior to grouting. The first construction joint shall be not less than two (2’) feet above the base slab. Use tongue and groove joints suitable for the flexible gasket. Use non-shrink grout inside and outside for sealing between manhole precast sections. Grout shall be of a type acceptable to the Engineer, NPU, or designee and designed for use in water. Seal all openings

and joints watertight.

- D. Top Termination: Terminate manhole tops at such elevations as will permit laying up grade rings under the manhole frame to make allowances for future street grade adjustments.
- E. Drop Connections: Manufacture drop connections, where required on precast manholes, with the manhole elements at the casting yard. Drop manholes shall be constructed per the NPU Standard Details.
- F. Internal Protection:
  - 1. Provide internal protection for all manholes. I.E.T Systems, Engineered Coating Solutions, Green Monster Liner (GML), and Raven 405 are approved by NPU. Note, internal protection is not required for steel reinforced polymer concrete manholes as described in 2.2 B. above.
  - 2. Install the coating systems per manufacturer's recommendation and completely protect the structure from corrosion. The liner or coating systems must extend and seal onto manhole ring, seal onto and around pipe openings, and any other protrusions, and completely cover the bench and flow invert. Provide a ten (10)-year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the coating or liner system and shall protect the structure for at least five (5) years from all leaks and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide. Repair internal coating of existing manholes cored during tie-in of new wastewater collection system piping by applying approved coating material as listed above in accordance with the manufacturer's recommendations. If existing manhole has an internal coating other than that listed above, sandblast the interior of the existing manhole to remove existing coating(s) and expose the concrete substrate and apply an approved coating in accordance with the manufacturer's recommendations.
- G. Coal Tar Epoxy: Coat all manhole, wet well, and valve vault exteriors with two (2) coats of coal tar epoxy to a minimum thickness of eight (8) dry mills (not required for steel reinforced polymer concrete manholes as described in 2.2 B. above).
- H. Rings and Covers: Install composite frames and covers according to approved NPU Standard Details, shop drawings, and written instructions from the manufacturer. Set units accurately at required locations to proper alignment and elevation. Keep units plumb, level, true, and free of trash. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.

END OF SECTION