ITEM NO. 855
RECONSTRUCTION OF EXISTING MANHOLES

855.1 DESCRIPTION: This item shall consist of the reconstruction of all existing manholes, all types and sizes, to include the replacement of manhole ring and covers, the cones, manhole section(s) required regardless of type shown in the contract documents and in conformity with the provisions of these specifications. All material and construction work shall be in accordance with current Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewage Systems (30 TCEQ § 217). All reconstructed manholes shall be watertight and coated with a SAWS-approved sewer coating. Sewer manhole ring and cover castings shall meet the current requirements of AASHTO Designation M306-10. Existing Monolithic Manholes are not to be reconstructed, but replaced under Item Nos. 852, “Sanitary Sewer Manholes” or 850, “Sanitary Sewer Structures.” The approved list of sewer coating manufacturers will be found herein.

855.2 REFERENCED STANDARDS: The following standards are referenced herein or otherwise related to the project work and shall be the current edition:

1. AASHTO – American Association of State Highway and Transportation Officials:
2. ASTM – American Society for Testing and Materials:
3. COSA – City of San Antonio:
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855.3 **SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Owner’s requirements and submittals shall be approved by the Owner prior to delivery of new materials.

855.4 **MATERIALS:**

1. **Precast Reinforced Concrete Manhole Sections:** Precast reinforced concrete manhole sections shall conform to the requirements of ASTM Designation C478.

2. **Concrete Grout:** All concrete grout used for patching or other similar fill-in work shall be of non-shrink type made with a Komponent® formulation, as manufactured by CTS Cement Manufacturing Corporation, or approved alternate. The non-shrink grout shall be prepared in accordance with the manufacturer’s recommended formulation with Portland cement, fine aggregate, water, and water reducer to produce compressive strengths of approximately 4,800 psi within 7 days and 7,250 psi within 28 days at a 70 °F baseline temperature.

3. **Manhole Ring and Cover:** The manhole ring and cover shall be of ductile iron or gray cast iron construction. The cover shall be solid with no vent or pick holes; hinged with underlying special hinge area leakage protection; the cover secured with four (4) stainless steel bolts; and shall have a recessed “pick bar” for cover opening. Cam lock type covers shall not be allowed. Approved manufacturers, as listed below, have previously completed required inflow leakage shop testing and have met a maximum allowable leakage rate criterion of 1 gallon per minute (gpm) at 12 inches of water submergence above the manhole cover. Rings and covers shall be furnished from either of the following two manufacturers with the specified features:

   a. **Approved Manufacturers:**
      (1) Neenah Foundry, Division of Neenah Enterprises, Inc.
         a) 24-inch Clear Opening Cover: “Lift Mate” Model R-1650-LM. Refer to drawing DD-852-07, Sheet 4 of 5.
         b) 30-inch Clear Opening Cover: “Lift Mate” Model R-1743-LM. Refer to drawing DD-852-07, Sheet 5 of 5.
         c) Hinge Area Leakage Protection (both cover sizes): Insertion plug beneath hinge shall be neoprene, pre-installed by the manufacturer. The plug shall be self-
sealing and held firmly in place by direct contact of the hinge upon closure and bolting down of the cover.

(2) East Jordan (EJ)

a) 24-inch Clear Opening Cover: Product Numbers NPR16-3611A and NPR16-3611J. Refer to drawings DD-852-07, Sheets 1 and 2 of 5.

b) 30-inch Clear Opening Cover: Model NPR16-3611L. Refer to drawing DD-852-07, Sheet 3 of 5.

c) Hinge Area Leakage Protection, 24-in Clear Opening Cover: Flat neoprene sheet gasket pre-installed by the manufacturer to the underside of the single hinge pocket with quick-set epoxy glue.

d) Hinge Area Leakage Protection, 30-in Clear Opening Cover: Insertion plug beneath each hinge shall be low density polyethylene (LDPE), pre-installed by the manufacturer with silicone sealant. The plug shall be held firmly in place by direct contact of the hinge upon closure and bolting down of the cover.

b. Cover Gasket. The underside of the cover shall be equipped with a continuous (one piece) vulcanized “T-shaped” gasket for perimeter leakage sealing. The gasket shall either be of nitrile, neoprene, or EPDM construction and pre-inserted into the perimeter retainer slot by the manufacturer as shown by the above referenced drawings. If the gasket is damaged in any way through shipping or through on-site storage or handling by the Contractor, a completely new manhole cover must be provided. Field repairs of a damaged gasket shall not be attempted or allowed.

c. Machined Metal Surfaces: Prior to gasket insertion, the underside of the metal mating surfaces on the underside of the cover and the inner frame ledge supporting the cover shall have been machined smooth to allow uniform seating of the cover gasket.

d. Cover Labeling: All covers shall have the words "SAN ANTONIO WATER SYSTEM Sanitary Sewer" cast thereon. Ring and cover shall have the specified foundry’s name, part number, country of origin preceded by “Made in” (example: MADE IN USA) in compliance with the country of origin law of 1984, and production date (example: mm/dd/yy) for tracking purposes. Each casting must be marked with DI (ductile iron) and ASTM A536 or A536 80-55-06 or CI (cast iron) and ASTM A-48, Class 35B to verify the materials used. Castings without proper markings shall be rejected.
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e. **Cover Bolts.** Four (4) bolts of 1/2-IN diameter x 13 thread pitch shall be used to secure the cover. Bolts shall be of stainless steel, grade 304 or better. The top of the cover shall have a recessed area around each bolt assembly to accommodate the washer diameter and thickness and bolt head height so that the bolting assembly does not exceed the top of the manhole cover. Where cover bolts directly thread into the underlying cast iron frame, the bolt threads shall be thoroughly coated with Nikal Jet Lube product, as manufactured by CSW Industrials Company or approved alternate before insertion to avoid subsequent “seize up” from dissimilar metals. If such bolts are removed for any purpose, the threads must be recoated. Stainless steel bolts that are threaded into stainless steel nuts within recessed slots in the underlying frame optionally do not require an anti-seize coating of the bolt threads.

4. **“Throat Rings”:** “Throat rings” shall be made of reinforced concrete and have a maximum thickness of 2 inches. The internal diameter shall match that of the ring and cover’s opening. Concrete shall conform to the provisions of Item No. 300 "Concrete (Natural Aggregate)." Concrete “throat rings” are to be used in conjunction with a UV stabilized internal polyethylene liner for the purpose of providing an infiltration/inflow (I/I) barrier. The I/I Barrier shall be as manufactured by Strike Tool Products of Cannon Falls, MN and must meet the following ASTM standards: ASTM D790 for flexural properties; ASTM D1505 for density; ASTM D1238 for Melt Flow Index; ASTM D638 for tensile strength at yield (50mm/mm); ASTM D790 for flexural modulus; ASTM D648 for heat deflection temperature at IGEPAL; and ASTM D693 for EsCR, 100% IGEPAL/10% IGEPAL. A minimum of two and a maximum of four throat rings may be used at each manhole reconstructed.

5. **Bitumastic Joint Sealant.** To be applied between cones, risers, adjustment rings, flat tops, and between the ductile cast iron ring and the uppermost adjustment ring or flat top: RAM-NEK, as manufactured by Henry, Inc.; Kent Seal, as manufactured by Hamilton-Kent, Inc.; Encapseal, as manufactured by Miller Pipeline Corporation; or approved alternate.

6. **Interior Coating:** The interior of all reconstructed manholes shall be rendered watertight, chemically resistant, and abrasion resistant through the use of a SAWs-approved sewer coating system. Prior to coating, all manholes shall be hydrostatic and/or vacuum tested, and approved by Inspector or Engineer.

For reconstructed manholes, apply a combination of both products with the cementitious coating first, followed by the epoxy coating. Kerneos SewperCoat 2000 HS and PG, applied at the required one inch thick
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application, is the only product approved which does not require a subsequent epoxy coating. Other approved materials are as follows:

a. Cementitious coating: With required one inch thick application:
   (1) Permaform CR-5000;
   (2) Strong - Seal MS-2C;
   (3) Standard Cement Material Inc. Reliner;
   (4) Quadex Aluminaliner;
   (5) ConShield Biotech Armor.

b. Epoxy coating: With specified thickness application:
   (1) Carboline “Plasite 4500” System: Min required thickness – 125 mils.
   (2) Carboline Reactamine ET: Min required thickness – 125 mils.

855.5 CONSTRUCTION:

1. Manholes shall be raised or lowered by replacing the existing cone and manhole section or sections as required for installation to the finished surface course. All openings shall be protected by hatch covers or the necessary steel plates. The Contractor shall be required to backfill all manholes with an approved flowable fill (in accordance with all requirements of the right-of-way owner having jurisdiction over the project scope) up to 1 foot above the cone section. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, “Excavation, Trenching and Backfill.” All excess materials (of any type) shall be disposed of by the Contractor at his own expense, and in an approved location.

2. Reconstructed manholes shall also be cleaned of any debris as required by the Inspector. If a new manhole cover, ring, or reconstructed manhole is damaged by the Contractor, it shall be replaced (as directed by Inspector) by the Contractor at his own expense. All installed concrete throat rings must be used in conjunction with a UV stabilized polyethylene liner and I/I barrier as specified above. Coat all interior concrete surfaces with a SAWS-approved coating system as specified above.

3. Voids between exterior pipe walls and manhole walls at all pipe connections in manholes shall be filled with a non-shrink grout, as specified above, or as approved by the Engineer, or as shown in the contract documents and inspected prior to backfilling.

4. Joints between cones, risers, adjustment rings, flat tops, and between the ductile cast iron ring and the uppermost adjustment ring or flat top, as
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ductile cast iron ring and the uppermost adjustment ring or flat top, as applicable, shall be thoroughly sealed in accordance with manufacturer’s recommendations with strongly adhesive bitumastic products as specified above. Where precast concrete risers are used, any gaps in the outer joint surfaces shall be additionally coated with non-shrink grout to a minimum thickness of ¼ inch.

5. Manhole Ring Encasement. All manhole rings shall be encased with 4,000 psi reinforced concrete as shown in the contract documents or as approved by the Engineer.

a. Concrete manhole ring encasement shall extend 6 inches below the top of the cone and have a minimum width when measured at the manhole ring of 1 foot. The surface of the encasement shall be flush with the top of the manhole ring.

b. Where manholes are reconstructed in existing streets and where directed by the Engineer or shown in the contract documents, the exterior exposed surfaces of the ring, mortar; throat rings and manhole surface shall be coated with a ¼ inch minimum thickness of heat shrink wrap plastic prior to placement of concrete.

855.6 TESTING: The Contractor shall perform the testing for all sanitary sewer manholes in accordance with the following.

1. Leakage Testing: All manholes must pass a leakage test. The contractor shall test each manhole (after reconstruction and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer. The Contractor is hereby instructed to conduct either of the two identified tests in the following manner:

a. Hydrostatic Testing: Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the manhole and filling the manhole to the top of the cone with water. Additional water may be added over a 24-hour period to compensate for absorption and evaporation losses. At the conclusion of the 24-hour saturation period, the manhole shall be filled to the top and observed. Any measureable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed. All effort, materials, or other costs shall be solely at the Contractor’s expense.
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b. Vacuum Testing:

(1) General: Manholes shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place. Drop-connections and gas sealing connections shall be installed prior to testing.

(2) Test Procedure: The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. Prior to performing the test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering the manhole. No grout shall be placed in horizontal joints prior to testing. Contractor shall use a minimum 60 inch-lb. torque wrench to tighten the external clamps that secure the test cover to the top of the manhole. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test. The required test time is 2 minutes.

(3) Acceptance: Manholes will be accepted with relation to hydrostatic/vacuum test requirements, if they meet the criteria above. Any manhole which fails the initial test must be repaired with non-shrink grout or other suitable material based on the material of which the manhole is constructed. The manhole shall be retested as described above until a successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.

(4) Repairs to Existing Manholes: Any existing manhole which fails to pass the hydrostatic and/or vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired. Thereafter, the Contractor shall either repair or remove and replace the manhole as directed. The manhole shall then be retested and coated with a SAWS-approved sewer coating as stated above. The Owner may elect to
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simply remove and replace the existing manhole with a new one. Any manhole excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the cone. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, “Excavation, Trenching and Backfill.”

(5) Measurement and Payment: Hydrostatic/Vacuum testing of new structures will not be a pay item. The cost of this work will be included in the bid price for the new manhole. Each hydrostatic/vacuum test of an existing manhole shall be a separate pay item. Repairs to existing manholes shall be a separate pay item when authorized.

2. Holiday Testing: Inspect each sanitary sewer manhole using high-voltage holiday detection equipment. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method. After abrading and cleaning, additional protective coating material shall be applied to the repair area. All touch-up repair procedures shall follow the protective coating manufacturer’s recommendations.

3. If a sanitary sewer manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer’s recommendations and re-tested. It shall not be accepted until it passes all tests. All repairs and re-testing shall be at no additional cost to SAWS.

855.7 MEASUREMENT: All reconstructed manholes will be measured by the unit of each manhole (any type or size) regardless of the type shown in the contract documents.

855.8 PAYMENT: The work performed as prescribed by this item will be paid for at the contract unit price bid per manhole for “Reconstruction of Existing Manholes,” which price shall be full compensation for all excavation, backfill material including select backfill, flowable fill, saw cutting of surfaces as required, reinforced concrete/concrete, diversion of flow, bypass pumping, trench protection, special shoring and disposal of material excavated, sewer coating, and all testing; for furnishing and placing all materials and for all labor, tools, equipment and incidentals necessary to complete the work.

- End of specification -