

ADDENDUM #1
T-08
PROVISION OF FTTP NETWORK
SEPTEMBER 7, 2017

The attached specification section below should be inserted in the bid documents.

SECTION 02763

INTERIOR MANHOLE REHABILITATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment and incidentals required and eliminate infiltration from and rehabilitate the manholes on the Drawings in accordance with these specifications.
- B. All materials must be approved by the engineer or owner prior to job bid.

1.2 RELATED WORK

- A. DIVISION 1 – GENERAL REQUIREMENTS
- B. Section 02652 – EXTERNAL CHEMICAL SEALING FOR MANHOLES
- C. Section 02765 – SEWER LINE AND MANHOLE CLEANING
- D. Section 03315 – GROUT

1.3 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Section 01300 – SUBMITTALS.
 - 1. All materials used to have proper submittals including manufacturer's recommendations for proper application, material data sheets and MSDS sheets.
 - 2. Submit manufacturer's recommended installation procedures for informational purposes.

PART 2 – DEFINITIONS

- 2.1 The term "approved" shall mean that the proposed material shall meet or exceed each of the performance criteria set forth in this specification. Manufacturers and vendors of various name brand materials must submit proof that any proposal material will meet the guidelines and requirements of this specification. The engineer or owner will make final approval of any proposed material.

PART 3 – APPROVED MATERIALS

3.1 INFILTRATION CONTROL

- A. All fast setting materials furnished shall be designed to be applied in dry powder form, with no prior mixing of water, directly to active leaks under hydrostatic pressure in manholes or related structures. Materials shall consist of rapid setting cements, silicious aggregates, and various accelerating agents. Materials shall not contain chlorides or metallic particles. Approved infiltration control material shall be Quadex Quad-Plug as manufactured by Quadex, Inc., Maumelle, Arkansas or equivalent.
- B. Specification Infiltration Control Materials
 - a. Compressive Strength (ASTM C109)
30 mins: 1850 psi; 3 days: 4000 psi; 7 days: 5000 psi; 28 days: 5890 psi
 - b. Bond Strength (ASTM C321)
30 min: 50 psi; 1 day: 50.85 psi
 - c. Set Time 30 seconds

3.2 INVERT REPAIR AND PATCHING

- A. All material furnished shall be designed to fill large voids in manhole walls and to repair or reconstruct inverts where no hydrostatic pressure exists. Materials shall consist of rapid setting cements, monocrycystalline quartz aggregates, and various accelerating agents. Material shall not contain chlorides or metallic particles. Approved invert repair and patching materials shall be Quadrex Hyperform as manufactured by Quadrex, Inc., Maumelle, Arkansas or equivalent.
- B. Specifications: Repair and Patching Materials
 - a. Compressive Strength (ASTM C109) 1 hour: 4170 psi, 3 hours: 5840 psi, 24 hours: 7660 psi.
 - b. Flexural Strength (ASTM C384) 1 hour: 450 psi, 3 hours: 625 psi, 24 hours: 820 psi.
 - c. Freeze-Thaw (ASTM C666) 300 cycles with no damage
 - d. Setting time (Gillmore ASTM C266) Initial 15-18 minutes; Final 22-25 minutes

3.3 CEMENTITIOUS COATING (LINER) MATERIALS FOR MANHOLE WALLS AND BENCHES

- A. All cementitious coating (liner) materials shall be specifically designed for the rehabilitation of manholes and other related wastewater structures. Liner materials shall be cement based, poly-fiber reinforced, shrinkage compensated, and enhanced with chemical admixtures and siliceous aggregates. Liner materials shall be mixed with water per manufacturer's written specifications and applied using equipment specifically designed for either low-pressure spray or centrifugal spin casting application of cement mortars. All cement liner materials must be capable of a placement thickness of ½" to 4" in a one pass monolithic application.
- B. Specifications: Cementitious Coating Materials
- C. Physical Properties: All cementitious coating materials shall conform to the following 28-day minimum physical properties.
 - a. Compressive Strength (ASTM C109) 9500 psi
 - b. Flexural strength (ASTM C293) 1400 psi
 - c. Bond Strength (ASTM C882) 1500 psi
 - d. Permeability (AASHTO T-277) Not to exceed 400 coulombs
 - e. Freeze-Thaw (ASTM C666) No damage in minimum 300 cycles
 - f. Material Wet Density Minimum 140 PCF
- D. All cementitious coating materials shall be approved for use based upon the following design conditions.
 - a. Low to mild hydrogen sulfide environments (pH > 2.0)
 - i. Cementitious coating materials shall be manufactured from 100% pure calcium aluminate cement and enhanced with high-density chemically stable aggregates. Materials shall contain poly fiber reinforcement and chemical admixtures. Approved material shall be Quadex Aluminaliner as manufactured by Quadex, Inc., Maumelle, Arkansas; or equivalent.

PART 4 – INTERIOR MANHOLE REHABILITATION

4.1 MANHOLE CLEANING AND PREPARATION

- A. The floor and interior wall of the manhole shall be thoroughly cleaned and made free of all foreign materials including dirt, grit, roots, grease, sludge and all debris or materials that may be attached to the wall or bottom of the manhole.
 - a. High pressure water blasting with a minimum of 3500 psi shall be used to clean and free all foreign materials within the manhole.
 - b. When grease and oil are present within the manhole, an approved detergent or muriatic acid shall be used integrally with the high pressure cleaning water.
 - c. All materials resulting from the cleaning of the manholes shall be removed prior to application of the cement based coating.
 - d. All loose or defective brick, grout, ledges, steps and protruding ledges shall be removed to provide an even surface prior to application of cement based coating.

4.2 SEALING ACTIVE LEAKS

- A. The work consists of hand applying a dry quick-setting cementitious mix designed to instantly stop running water or seepage in all types of concrete and masonry structures. The applicator shall apply material in accordance with manufacturer's recommendations and follow specifications. Drilling and pumping leaks with grout material will also be preformed (Refer to Section 02652 – EXTERNAL CHEMICAL SEALING FOR MANHOLES).
 - a. The area to be repaired must be clean and free of all debris per the guidelines set forth in Section 4.1 – Manhole Cleaning and Preparation.
 - b. Once cleaned, prepare crack or hole by chipping out loose material to a minimum depth and width of ¾ inches.
 - c. With gloved hand, place a generous amount of the dry quick-setting cementitious material to the active leak, with a smooth fast motion, maintaining external pressure for 30 seconds, repeat until leak is stopped.
 - d. Proper application should not require any special mixing of product or special curing requirements after application.

4.3 INVERT REPAIR

- A. The work consists of hand mixing and applying a rapid setting, high early strength, non-shrink patching material to fill all voids and repair inverts prior to spray lining of the manhole. For invert repairs, flow must be temporarily restricted by inflatable or mechanical plugs prior to cleaning.

- a. The area to be repaired must be cleaned and free of all debris per the guidelines set forth in Section 4.1 – Manhole Cleaning and Preparation.
- b. Mix water shall be clean potable water and require no additives or admixtures for use with cementitious patch materials.
- c. Cementitious material shall be mixed in a mortar tub or 5 gallon pail with water per manufacturer's specifications. Material should be mixed in small quantities, to avoid setting prior to placement in voids or inverts.
- d. Bricks shall be cleaned and thoroughly wetted shortly before they are put into the work and each brick shall be laid in a full bed and joint of mortar
- e. Flows in invert can be reestablished within 30 minutes of material placement.

4.4 APPLICATION OF CEMENTITIOUS MANHOLE LINER

- A. The work consists of spray applying and/or centrifugally spin casting a cementitious based liner to the inside of the existing manhole. The necessary equipment and application methods to apply the cementitious based liner materials shall be only as approved by the material manufacturer.
 - a. Material shall be mixed with water in accordance with manufacturer's specifications. Once mixed to proper consistency, the material shall be pumped via a rotor-stator style progressive cavity pump through a material plaster hose for delivery to the appropriate and/or selected application device.
 - b. Spray application of the cementitious material.
 - i. Material hose shall be coupled to a low-velocity spray application nozzle. Pumping of the material shall commence and the mortar shall be atomized by the introduction of air at the nozzle, creating a low-velocity spray pattern for material application.
 - ii. Spraying shall be performed by starting at the manhole invert and progressing up the wall to the corbel and chimney areas.
 - iii. Material shall be applied to a specified uniform minimum thickness no less than ½ inch. Material shall be applied to the bench area in such a manner as to provide for proper drainage without ponding.
 - c. Centrifugal spin casting application of the cementitious material.

- i. Material hose shall be coupled to a high speed rotating applicator device. The rotating casting applicator shall then be positioned within the center of the manhole at either the top of the manhole chimney or the lowest point elevation corresponding to the junction of the manhole bench walls.
 - ii. The high speed rotating applicator shall then be initialized, and pumping of the material shall commence. As the mortar begins to be centrifugally cast evenly around the interior of the manhole, the rotating applicator head shall be raised and/or lowered at a controlled retrieval speed conducive to providing a uniform material thickness on the manhole walls.
 - iii. Controlled multiple passes are then made until the specified minimum finished thickness is attained. If the procedure is interrupted for any reason, simply arrest the retrieval of the applicator head until flows are recommenced.
 - iv. Material thickness may be verified at any point with a depth gauge and shall be no less than a uniform ½ inch. If additional material is required at any level, the rotating applicator head shall be placed at that level and application shall recommence until that area is thickened.
- d. Material shall be applied only when manhole is in a damp state, with no visible water dripping or running over the manhole walls.
 - e. The low-velocity spray nozzle and the centrifugal spin casting head may be used in conjunction to facilitate uniform application of the mortar material to irregularities in the contour of the manhole walls and bench areas.
 - f. Troweling of materials shall begin immediately following the spray application. Initial troweling shall be in an upward motion, to compress the material into voids and solidify manhole wall. Precautions should be taken not to over trowel.
 - g. Curing will take place once the manhole cover has been replaced. It is important that the manhole cover is replaced no more than 10-20 minutes after troweling is completed to avoid moisture loss in the material due to sunlight and winds.
 - h. Material shall not be applied during freezing weather conditions. Material shall not be placed when the ambient temperature is 37 degrees Fahrenheit and falling or when the temperature is anticipated to fall below 32 degrees Fahrenheit during 24 hours.

PART 5 – QUALITY CONTROL

5.1 The quality and performance of the material shall be maintained by one or all of the following measures to be determined and specified by the engineer or owner.

5.2 PERFORMANCE TESTING

- A. Vacuum Testing
- B. Exfiltration Testing
- C. Visual Inspection

5.3 MATERIAL TESTING

- A. One 2x2 inch sample cube shall be taken for every 50 bags of material used. Sample shall be sprayed from nozzle, identified and sent to an independent test laboratory for compression strength testing as described in ASTM C-109.

PART 6 – WARRANTY

- A. Product manufacturers shall warrant all materials to be free of defects product design and workmanship for a period of one year from date of Substantial Completion. Manufacturer will provide complete replacement of any product proven to be defective when applied in accordance with manufacturer's recommendations.

END OF SECTION 02763