

CONSTRUCTION STANDARD SPECIFICATION

SECTION 02958

MANHOLE REHABILITATION

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CONSTRUCTION STANDARD SPECIFICATION

SECTION 02958

MANHOLE REHABILITATION

PART 1 - GENERAL{tc \l 1 "PART I - GENERAL"}

1.01 SUMMARY

- A. Section includes requirements for refurbishing of sewer manholes.
- B. Related Sections: Refer to the following sections for related work:
 - 1. Section 02725, "Sewer Manholes".
 - 2. Section 02955, "Sewer Flow Control".
 - 3. Section 02956, "Sewer Cleaning".

1.02 REFERENCES

American Society of Testing and Materials (ASTM)

- C78 Flexural Strength of Concrete
- C109 Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- C293 Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
- C321 Bond Strength of Chemical-Resistant Mortars
- C348 Flexural Strength of Hydraulic Cement Mortars
- C496 Splitting Tensile Strength of Cylindrical Concrete Specimens
- C596 Drying Shrinkage of Mortar Containing Portland Cement
- C666 Resistance of Concrete to Rapid Freezing and Thawing
- C882 Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear

- C952 Bond Strength of Mortar to Masonry Units
- C1012 Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
- C1202 Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

1.03 SUBMITTALS

- A. Manufacturer's Data: Manufacturer's technical literature on coating material, and description of installation method that includes the following:
 - 1. Environmental requirements for application and worker safety, including ventilation, humidity, and temperature ranges.
 - 2. Maximum storage life and storage requirements.
 - 3. Mixing and proportioning requirements (as applicable).
 - 4. Application film thickness per coat of primer and finish coat.
 - 5. Curing time required.
- B. Method for finishing anticipated connections to modified manhole and sewer, including detail drawings.

1.04 QUALITY ASSURANCE

- A. Product application shall be performed only by workmen trained and experienced with specified material.
- B. Certification: Applicators to perform coating installation work, including spray operators as applicable, shall be certified by manufacturer.
- C. Contractor Experience: Minimum of three projects with similar applications of specified material.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:

Strong Systems, Inc.
Master Builders, Inc.

2.02 MATERIALS

Provide manhole coating system that complies with requirements specified for one of the following two systems.

A. Strong-Seal System: Manufactured by Strong Systems, Inc.

1. Strong-Seal QSR

a. Compressive Strength: ASTM C109.

1) 200 psi (1.4 MPa) in 15 minutes.

2) 1,400 psi (10 MPa) in 6 hours.

b. Shrinkage: ASTM C596; Zero percent when cured at 90 percent relative humidity.

c. Bond: ASTM C321; 150 psi (1.0 MPa) at 28 days.

d. Cement: Sulfate-resistant.

e. Density (when applied): 105 pcf (1680 kg/cubic meter) plus or minus 5 pcf (80 kg/cubic meter).

2. Strong-Seal MS-2C: Made with calcium aluminate cement, and the following minimum characteristics in 28 days.

a. Compressive Strength: ASTM C109; 5,000 psi (34 MPa).

b. Tensile Strength: ASTM C496; 300 psi (2.1 MPa)

c. Flexural Strength: ASTM C78; 780 psi (5.4 MPa).

d. Shrinkage: ASTM C596; Zero percent at 90 percent relative humidity.

e. Bond: ASTM C952; 130 psi (900 kPa).

f. Density (when applied): 120 pcf (1920 kg/cubic meter) plus or minus 5 pcf (80 kg/cubic meter).

B. EMACO S 88-CA Repair Mortar System: Manufactured by Master Builders, Inc.

1. Compressive Strength: ASTM C109.

a. 4,500 psi (31 MPa) in 24 hours.

b. 10,000 psi (70 MPa) in 28 days.

2. Flexural Strength: ASTM C348; 1,250 psi (8.62 MPa) in 28 days.

3. Slant Shear Bond Strength: ASTM C882 modified; 3,000 psi (21 MPa) in 28 days.

4. Permeability: ASTM C1202; 1,000 Coulombs maximum.
5. Freeze-Thaw Resistance: ASTM C666, Procedure A; 300 cycles - Minimum Durability Factor - 98 percent.
6. Sulfate Resistance: ASTM C1012; 15 weeks - 0.1 percent expansion.

2.03 EQUIPMENT

- A. Strong Seal System: Apply sprayed-on concrete lining with specially designed machine consisting of the following:
 1. Optimized progressive cavity pump capable of producing minimum of 250 psi (1.7 MPa) pumping pressure.
 2. Contrablend mixer with twin ribbon paddle with end discharge.
 3. Air system for spray application of concrete.
 4. Equipment shall be complete with water storage and metering systems.
- B. Repair Mortar System: Apply repair mortar with low pressure spray using Moyno Pump plastering-type machine.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protection: Place covers over sewer line inverts to prevent extraneous materials from entering sewer lines.
- B. Manhole Ring and Cover Adjustment: If identified in Contract documents, adjust manhole cover to match existing grade in accordance with Drawings.
- C. Surface Preparation: Remove foreign material from manhole walls and bench using high-pressure water spray with minimum pressure of 1200 psi (8.3 MPa).
 1. Remove loose and protruding brick, mortar, and concrete using mason's hammer and chisel, or scraper.
 2. Pull out existing manhole steps, or cut off flush with inside manhole barrel.
 3. Fill large voids.
- D. Sewer Flow Control: Prior to rebuilding manhole invert or bench, divert or bypass sewer flows in accordance with Section 02955, "Sewer Flow Control".

3.02 APPLICATION

- A. Strong Seal System.: Apply patching mix in accordance with manufacturer's recommendations to manhole invert, bench and large voids in wall.
1. Rebuild manhole benches with patching mix in accordance with Drawings.
 - a. Repair inverts with visible damage or infiltration. After blocking flow through manhole and thoroughly cleaning invert, apply patching mix to invert in expeditious manner.
 - b. Trowel mix uniformly onto damaged invert, extending out onto base of manhole sufficiently to tie into liner to be applied.
 - c. Finished invert surfaces shall be smooth and free of ridges.
 - d. Flow may be re-established in manhole within 30 minutes after placement of mix.
 2. Apply sprayed-on concrete lining with specially designed machine specified in Article 2.02.
 - a. Surface prior to spraying on concrete shall be damp without noticeable free water droplets or running water.
 - b. No applications shall be made if temperature within manhole are below 40 degrees F (4 degrees C), or above 95 degrees F (35 degrees C) for 24 hours after application.
 - c. Apply materials to minimum uniform thickness to insure that cracks, crevices, and voids are filled, and somewhat smooth surface remains after light troweling.
 - c. After initial set of first coat (normally 15 minutes to 1 hour), apply second coat. Minimum combined thickness of two coats shall be 1/2 inch (13 mm).
 - d. Trowel surface again to smooth finish. Avoid over-troweling that will bring water to surface and weaken it.
 - e. Remove bench cover and spray bench so that finished configuration is in accordance with the Drawings.
 - f. Cure final application minimum 4 hours before being subjected to active sewage flow.
- B. Repair Mortar System: Mix repair mortar in accordance with manufacturer's recommendations.
1. Manhole surfaces receiving repair mortar shall be saturated and in surface-dry condition.
 2. Spray mortar lining on manhole walls minimum 1/2-inch (13-mm) thickness, and smoothly finish by hand-troweling.

- a. Start finishing when finger pressure does not penetrate surface, but marks it lightly.
 - b. Use evaporation retarder, "Confilm", as manufactured by Master Builders, to aid in finishing.
3. Rebuild manhole benches with repair mix in accordance with Drawings.
- a. Repair inverts with visible damage or infiltration.
 - b. After blocking flow through manhole and thoroughly cleaning invert, apply repair mix to invert.
 - c. Trowel mix uniformly onto damaged invert, extending out onto base of manhole sufficiently to tie into lines to be applied.
 - d. Finished invert surfaces shall be smooth and free of ridges.
 - e. Flow may be re-established in manhole within 30 minutes after placement of mix.

3.03 MANHOLE STEPS

If identified on Contract documents, install manhole steps in accordance with Section 02725 "Sewer Manholes" and Drawings.

3.04 FIELD QUALITY CONTROL

Test manholes in accordance with requirements of Section 02725, "Sewer Manholes"

3.05 CLEANING

- A. Keep premises free from accumulations of waste materials, rubbish and other debris resulting from Work.
- B. Remove waste materials, rubbish, and debris from and about premises.
- C. Remove tools, construction equipment and machinery, and surplus materials.
- D. Restore to original condition portions of site not designated for alteration by Contract documents.

END OF SECTION