

SECTION 03740 – CONCRETE REHABILITATION

PART 1 – GENERAL

1.1 WORK OF THIS SECTION

- A. The Contractor shall perform all concrete rehabilitation work necessary to provide an acceptable substrate for the protective lining or to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the AGENCY. In addition, the Contractor shall perform all related work including surface preparation, reinforcing corrosion protection, priming, finishing and curing of the rehabilitation work.

1.2 RELATED SECTIONS

- A. Section 01300 –Record Drawings and Submittals
- B. Section 03760 – Manhole Rehabilitation
- C. Section 09801 – Manhole Lining

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:
 - 1. References herein to “SSPC Specifications” or “SSPC” shall mean the published standards of SSPC, the Society for Protective Coatings.
 - 2. References herein to “NACE” shall mean the published standards of the National Association of Corrosion Engineers.
 - 3. SSPC (Society for Protective Coatings)
 - 4. NACE (National Association of Corrosion Engineers)
 - 5. ASTM (American Society for Testing and Materials)
 - a. ASTM C109 – Test Method for Compressive Strength of Hydraulic Cement Mortars
 - b. ASTM C882 – Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete
 - c. ASTM C496 – Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
 - d. ASTM C88 – Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - e. ASTM D638 – Tensile Properties of Plastics
 - f. ASTM D790 – Flexural Properties of Unreinforced and Reinforced Plastics
 - g. ASTM D695 – Compressive Properties of Rigid Plastics
 - h. ASTM D4541 – Pull-off Strength of Coatings Using a Portable Adhesion Tester
 - i. ASTM D2584 – Volatile Matter Content
 - j. ASTM D2240 – Durometer Hardness, Type D
 - k. ASTM D543 – Resistance of Plastics to Chemical Reagents
 - l. ASTM C579 – Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars

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6. American Concrete Institute (ACI)
 - a. ACI 506.2 – Specifications for Material, Proportioning, and Application of Shotcrete
7. SSPWC 210-2.3.3 – Chemical resistance testing published in the SSPWC, current edition

1.4 CONTRACTOR SUBMITTALS

- A. Submittals shall be made in accordance with the standard specifications.
- B. Technical Data: The Contractor shall submit technical data for materials which document compliance with the requirements of this section, including application, cure time, surface preparation procedures, and certification from coating product manufacturer as to the compatibility of the repair material(s) and coating system.
- C. Installation Recommendations: The Contractor shall provide written installation recommendations from the manufacturer for each of the products to be used in the work covered by this section of the specifications including application, cure time, and surface preparation procedures which permit optimum bond strength with coatings. Specific procedures for the application of an epoxy coating shall be included.
- D. The Contractor shall provide certification of compatibility from all product manufacturers of protective linings, concrete rehabilitation products, grouts, sealants, or other materials used in the manhole rehabilitation process.
- E. The Contractor shall provide Material Safety and Data Sheets and Technical Data Sheets for all compounds utilized in Concrete Rehabilitation.
- F. Five (5) references of manufacturer indicating successful coating system performance greater than five (5) years in age of the submitted coating product(s) within the municipal wastewater environment.
- G. The Contractor shall provide a written warranty from all manufacturers against defects of materials for a period of one (1) year following AGENCY acceptance of the installation.

1.5 QUALITY ASSURANCE

- A. Packaging: The Contractor shall store all products to be used in their original, unopened packaging displaying the manufacturer's name, labels, product identification and batch numbers as applicable. Damaged material must be removed from the site immediately.
- B. All products to be used in the work covered by this Section shall be delivered, stored, and handled in accordance with the product manufacturer's written recommendations.

PART 2 – PRODUCTS

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2.1 GENERAL

- A. All products proposed for use for all rehabilitation and protective lining work covered in these Contract Documents shall be compatible and be manufactured from the same company or a statement shall be provided from the concrete patch material and protective lining manufacturers certifying their products are mutually compatible with the other products used for this work.
- B. Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined by the AGENCY.

2.2 BONDING AGENT

- A. Bonding agent shall be a solvent-free, moisture-tolerant, epoxy-modified, cementitious product specifically formulated as a bonding agent containing an anti-corrosion agent that is compatible with the concrete patch material and manhole protective lining material.
- B. The need for a bonding agent shall be based on the requirements of the concrete patch manufacturer. If it is determined that a bonding agent is not required, the concrete patch manufacturer shall submit a certification to the AGENCY stating such prior to installation of the project.
- C. Bonding agent material shall meet the following requirements (@ 73 degrees F and 50 percent relative humidity):

Work Life	45 - 120 minutes
Compressive Strength	6,000 psi @ 7 days
Bonding Strength (ASTM C 882)	2,500 psi @ 14 days (moist cure)

- D. All bonding agents for concrete shall conform to the following requirements:
 - 1. Bonding agent shall have a coat window (time until the repair mortar is required to be placed) of at least 8 hours at 68 degrees F.
 - 2. The bonding agent shall not create a vapor barrier.
- E. If the bonding agent is not manufactured by the same company as the protective lining and concrete mortar manufacturer, all manufacturers must certify in writing that their products are compatible. Concrete mortar manufacturer shall certify in writing that the bonding agent used for the project is in accordance with their recommendations for this application and for use with the concrete patch mortar materials.

2.3 CONCRETE PATCH MORTAR

- A. Concrete repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces as determined necessary by the AGENCY and the protective lining applicator.

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- B. Patch material shall be either of the following and shall be on the written approved list of patch materials provided by the manhole protective lining manufacturer:
1. 100-percent solids, solvent-free epoxy grout specifically formulated for epoxy top coating compatibility that meets the performance requirements specified herein and that has corrosion inhibitor properties and is recommended by the manufacturer for use in sewer manhole repairs. The epoxy grout manufacturer shall provide instructions for trowel or spray application and for epoxy top coating procedures.
 2. Factory blended, rapid setting, high early strength, non-shrink and non-sag repair mortar that is specifically formulated to be suitable for epoxy topcoating. Repair mortar shall have corrosion inhibitor properties and shall be recommended by the manufacturer for use in sewer manhole repairs.
- C. Patch material shall meet the following minimum requirements (@ 73 degrees F and 50 percent relative humidity):
- | | |
|-------------------------------|---------------------|
| Work Life | 15 minutes minimum |
| Compressive Strength | 4,000 psi @ 7 days |
| Bonding Strength (ASTM C 882) | 2,200 psi @ 28 days |
- D. The patch material shall be designed for vertical and overhead applications.
- E. The patch material shall be capable of meeting the minimum and maximum application thicknesses required for rebuilding or repairing the manholes and as determined by the AGENCY.
- F. If the concrete repair material is not manufactured by the same company as the protective lining and bonding agent manufacturer, all manufacturers must certify in writing that their products are compatible.
- G. Repair mortar applicators shall be trained to properly apply the mortar according to manufacturer's recommendations.

2.4 LEAK REPAIR

- A. The CONTRACTOR shall stop infiltration/leaks prior to applying protective lining in accordance with this Section. The manufacturers of all materials used, including the protective lining manufacturer, shall provide written certification stating that their products are mutually compatible.
- B. Leak repair shall be achieved by use of a Portland cement mortar waterstop. The waterstop shall be a blend of selected Portland cements and specially graded aggregates. The materials shall be non-combustible, either before or after cure. The materials shall be supplied in a factory-proportioned unit. The Portland cement mortar shall not produce a vapor barrier.
- C. Leak repair material shall meet the following minimum requirements.

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1. Compressive Strength (ASTM C109)
 - 1 day 4,200 psi
 - 7 days 6,800 psi
 2. Splitting Tensile Strength (ASTM C496)
 - 1 day 600 psi
 - 7 days 700 psi
 3. Sulfate Resistance Test (ASTM C88): no deterioration
- D. Portland cement mortar water stop shall be SikaSet Plug as manufactured by Sika Corporation, or approved equal.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- A. Remove all loose material to expose sound concrete at the repair area. Steel brush any exposed reinforcing steel to remove any protective lining or loose material. The surface shall be clean and have an open texture surface by blast-cleaning or equivalent mechanical means. The surface shall be saturated surface dry, but with no standing water.

3.2 BONDING AGENT APPLICATION

- A. The bonding agent material shall be applied, stored, handled, and transported in strict accordance with the manufacturer's written recommendations.
- B. Mix manufacturer's pre-measured components for bonding agent as recommended by manufacturer. Mix only the quantity of materials that can be applied within the specified pot life of the product. Do not apply bonding agent of any batch after the recommend pot life has elapsed.
- C. The bonding agent slurry shall be worked into the substrate surface with a stiff bristle brush or broom. Work slurry into all surface irregularities to achieve complete coverage.
- D. Apply patch material to bonding agent wet-on-wet or within the manufacturer's recommended open time for bonding agent.

3.3 PATCH MATERIAL APPLICATION

- A. The concrete patch material shall be applied, stored, handled, and transported in strict accordance with the manufacturer's written recommendations.
- B. Mix manufacturer's pre-measured components of patch material as recommended by manufacturer. Mix only the quantity of materials that can be applied within the specified pot life of the product. If patch material is being extended with fine aggregate, mix the aggregate into the material as recommended by manufacturer.

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- C. The Contractor shall apply the patch material into the substrate and around any exposed reinforcing bars. The patch material shall be consolidated eliminating any voids. It shall be built-up from the edges of the repair area towards the center. After filling, consolidate patch material and screed surface to match original shape of member as close as possible.
- D. The vertical face of the wall or column shall be cleaned of any fins or burrs on the surface.
- E. The patch material finish shall be “broom finish”
- F. The thickness of the patch shall be in accordance with the minimum and maximum allowable thickness limits as recommended by manufacturer.

3.4 LEAK REPAIR APPLICATION

- A. Prepare surface and apply materials per the manufacturer’s written instructions.
- B. Adhere to all limitations and precautions for the instant setting of Portland cement water stop systems stated in the manufacturers technical data sheet and literature.
- C. Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature is 40 degrees Fahrenheit.
- D. Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

3.5 CURING

- A. After the repair is completed, the Contractor shall be responsible for maintaining a humid environment to allow for proper curing of all surfaces. If necessary, the Contractor shall cover the surface with polyethylene sheet to trap moisture to the surface.
- B. Cure all repair surfaces as specified by the patch material and protective lining manufacturers to ensure compatibility and long term lining performance.

****END OF SECTION****