



By CTS Cement Manufacturing Corp.

## **CSI SECTION 03 01 00 – MAINTENANCE OF CONCRETE**

*Repair, with Rapid Set UHPC Mortar*

*EDITOR NOTE: The following guideline specification has been prepared to assist architects and design professionals in the preparation of project master specifications. It is intended for use by qualified design professionals and is not intended to be used verbatim. Appropriate modifications to meet specific project requirements are required. Make appropriate [selections] where options are provided and delete items that are not applicable to the project. Contact CTS Cement Technical Service for additional information or project specification assistance.*

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Cleaning of existing concrete surface.
- B. Supply and installation of non-metallic, high strength, cementitious repair and resurfacing materials for concrete substrates in structural and non-structural applications.
  - 1. Repair or deteriorated concrete.
  - 2. Repair or internal concrete reinforcement.
  - 3. Resurfacing of damaged or spalled concrete.

#### **1.2 RELATED SECTIONS**

- [A. Section 03 01 30 – Maintenance of Cast-in-Place Concrete
- [B. Section 03 01 40 – Maintenance of Precast Concrete
- [C. Section 03 01 50 – Maintenance of Cast Decks and Underlayment
- [D. Section 03 01 70 – Maintenance of Mass Concrete
- [E. Section 03 31 24 – Ultra-High Performance Structural Concrete
- [F. Section 03 41 00 – Precast Structural Concrete
- [G. Section 03 53 19 – Concrete Overlayment
- [H. Section 03 53 16 – Hydraulic Cement Underlayment
- [I. Section 03 61 00 – Cementitious Grouting

*EDITOR NOTE: Modify References as needed for the project. Include appropriate standards related to concrete reinforcement repair or replacement.*

#### **1.3 REFERENCES**

- A. ASTM C109/C109 M - 13 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- B. ASTM C191 - 13 Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
- C. ASTM C348 – 08 Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
- D. ASTM C882/C882M – 13 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear
- E. ASTM C666/C666M – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing



By CTS Cement Manufacturing Corp.

- F. ASTM C944/C944M – 12 Standard Test Method for Abrasion Resistance of Concrete or Mortar Surfaces by the Rotating-Cutter Method

#### 1.4 SUBMITTALS

- A. General: Submit samples and manufacturer's product data sheets, installation instructions, etc. in accordance with Division 01 General Requirements Submittal Section.
- B. Test Data: Submit qualified testing data that confirms compliance with specified performance requirements.
- C. Project Record Documents: Submit accurate records of locations of structural reinforcement repairs indicating type of repair and material(s) used.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer:
    - a. Must have marketed rapid hardening, high-strength cementitious materials in the United States for at least five years and must have completed projects of the same general scope and complexity.
    - b. Repair and resurfacing materials and complementary admixture or bonding agents materials must be manufactured by or approved for use by CTS Cement Manufacturing Corp. (800-929-3030, [www.CTScement.com](http://www.CTScement.com)) and distributed by the same or an authorized CTS Cement dealer.

#### 1.6 MOCK-UP(S)

- A. Horizontal Surface Repair: [\_\_\_\_\_] total square area demonstrating each type of repair.
- B. All mock-ups must be approved by the [Architect,] [Owner,] [Engineer] prior to proceeding with work. Mock-ups and samples must remain on site until project completion and final acceptance.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver products in original, unopened, undamaged packaging with manufacturer's identification (i.e., brand logo, product name, weight of packaged unit, lot number).
- B. Storage: Store products in a dry location, covered, out of direct sunlight, off the ground, and protected from moisture. Maintain storage temperature required by the manufacturer. Keep materials dry until used. Store bulk sand in a well-drained area on a clean, solid surface. Cover sand to prevent contamination.
- C. Handling: Handle products in accordance with manufacturer's published recommendations.

#### 1.8 SITE / ENVIRONMENTAL CONDITIONS

- A. Temperature: Maintain ambient and surface temperatures between 45°F (7°C) and 90°F (32°C). Do not apply materials if ambient temperature falls below 45°F (7°C) within 24 hours of application. Protect from uneven and excessive evaporation during dry weather, windy conditions and strong blasts of dry air.
- B. Inclement Weather: Do not apply repair or resurfacing materials during inclement weather unless appropriate protection is employed.
- C. Sunlight Exposure: Avoid, whenever possible, installation of repair or resurfacing materials in direct sunlight which could adversely affect aesthetics.
- D. Substrate: Prior to installation, the substrates must be properly cleaned and prepared to receive



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repair or resurfacing materials, then inspected for proper preparation and any surface contamination or other conditions that may adversely affect the performance of the materials. Substrate must be free of residual moisture.

**1.9 COORDINATION AND SCHEDULING**

- A. Coordinate installation of repair or resurfacing materials with all other trades to avoid impeding other construction.
- B. Sufficient manpower must be provided to ensure continuous application and timely finishing.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. Basis of Design: CTS Cement Manufacturing Corp., 12442 Knott Street, Garden Grove, CA 92841 (800-929-3030, www.CTScement.com).
- B. Components: Obtain repair or resurfacing materials, complementary admixtures and bonding agents manufactured by CTS Cement from authorized distributors. No substitutions or additions of other materials are permitted without prior written permission from the manufacturer for this project.

**2.2 MATERIALS**

- A. Fast Setting, Cementitious Repair and Resurfacing Materials – General
  - 1. Rapid Set® UHPC Mortar is an ultra-high performance, rapid-hardening mortar with excellent abrasion resistance. Durable in wet environments, UHPC Mortar is a blend of Rapid Set calcium sulfoaluminate cement, high-performance additives, and high-density aggregate.
  - 2. Additives and admixture materials must be approved for use by CTS Cement Manufacturing Corp. prior to use. (800-929-3030, www.CTScement.com)
- B. Water: Clean, potable water free of deleterious amounts of silt and dissolved salts.

**2.3 MATERIAL PROPERTIES**

- A. Fast Setting, Cementitious Repair Materials – General
  - 1. Rapid Set® UHPC Mortar:
    - a. Compliance with: ASTM C928, ASTM C1856
    - b. Minimum performance requirements:

<b>Compressive Strength, Neat bag. (ASTM C109)</b>	
<b>2 hours</b>	3,000 psi
<b>4 hours</b>	8,000 psi
<b>24 hours</b>	11,000 psi
<b>7 days</b>	14,000 psi
<b>28 days</b>	17,000



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<b>Flexural Strength, Neat bag. (ASTM C348)</b>		
<b>4 hours</b>	1,200 psi	
<b>24 hours</b>	2,500 psi	
<b>Slant Shear Bond, Neat bag. (ASTM C882)</b>		
<b>4 hours</b>	2,000 psi	
<b>7 days</b>	2,500 psi	
<b>28 days</b>	3,500 psi	
<b>Freeze-Thaw Resistance, Neat bag. (ASTM C666 Procedure A)</b>		
<b>300 cycles, Durability</b>	>99%	
<b>Abrasion Resistance, Neat bag. (ASTM C944)</b>		
<b>7 days</b>	1.46g (Single load)	3.40 g (Double load)
<b>28 days</b>	0.63 (Single load)	1.99 g (Double load)

*Data obtained at 3.6 quarts of water per 60 lbs., neat*

## 2.4 RELATED MATERIALS

- A. Admixtures: Do not add additional dry materials such as cement, sand, additives or admixtures. Mix only with water. All additives and admixture materials must be approved for use by CTS Cement Manufacturing Corp. prior to use. (800-929-3030, www.CTScement.com)
- B. Curing: Prevent rapid water loss from materials as directed in the manufacturer's product data by use of:
  - 1. Water Curing
  - 2. Wet Burlap Method
  - 3. Curing Compound compliant with ASTM C309

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify project site conditions under provisions of Section 01 00 00.
- B. Compliance: Comply with manufacturer's instructions for installation of repair and resurfacing materials.
- C. Coordinate installation with adjacent work to ensure proper sequencing of construction.
- D. Protect adjacent and surrounding surfaces not specified to receive materials with necessary means to ensure protection.
- E. Advise Contractor of discrepancies preventing proper installation of materials. Do not proceed with the work until unsatisfactory conditions are corrected.

### 3.2 CLEANING

- A. Protect surrounding area by providing enclosures, barricades and other temporary construction as required to protect adjacent work from damage.
- B. Clean concrete surfaces, cracks and voids of dirt or other contamination using the most appropriate method for proper preparation. Ensure methods are in compliance with material



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manufacturer's recommendations.

- C. Do not use any of the following cleaning methods unless approved by the [Architect,] [Engineer,] and the repair and resurfacing materials manufacturer:
  - 1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
  - 2. Soap or detergent that is not non-ionic.
  - 3. Water washing pressure over 100 psi.
  - 4. Steam-cleaning or steam-generated hot-water washing.
  - 5. Alkaline cleaning agents.
  - 6. Acidic cleaning agents.
  - 7. Abrasive blasting.

### **3.3 PREPARATION**

- A. Mechanically cut away damaged portions of concrete, roughen surface and remove all loose, unsound, contaminated material.
- B. Bonding surfaces must be clean, sound, and free from any materials that may inhibit bonds, such as oil, dirt, asphalt, sealing compounds, acids, wax, and loose dust and debris. Substrate should be saturated surface dry (SSD) with no standing water during application.

### **3.4 MIXING**

- A. Organize installation personnel and equipment before mixing begins.
- B. Comply with manufacturer's printed instructions.
- C. Adjust water to achieve the desired consistency. Do not exceed manufacturer's recommendations of 3.6 quarts per 60 lb. bag. The use of a power-driven mechanical mixer, such as a mortar mixer, grout mixer, pan mixer or drill-mounted mixer to achieve uniform consistency and proper mixing of product.
- D. All additives and admixture materials must be approved for use by CTS Cement Manufacturing Corp. prior to use. (800-929-3030, [www.CTScement.com](http://www.CTScement.com))
- E. Do not re-temper, add water, or remix after material stiffens. Material that stiffens before use must be discarded.

### **3.5 APPLICATION**

- A. Comply with manufacturer's printed instructions.
- B. Build up the material to completely cover/fill the repair area flush with the existing surface.
- C. Limit the amount of vibration during placement to prevent segregation.

### **3.6 CURING**

- A. Comply with manufacturer's printed instructions for appropriate curing methods.
- B. When curing compounds are used, apply in accordance with ASTM C309 immediately after finishing or upon final set. Apply curing compound to all exposed surface

### **3.7 CLEAN-UP**

- A. Remove and legally dispose of concrete repair and resurfacing debris material from job site.
- B. Clean excess material from surrounding areas and all tools immediately, before material cures. If materials have cured, remove using mechanical methods that will not damage the substrate.



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- C. Clean adjacent surfaces as needed using materials and methods recommended by the manufacturer of the material being cleaned. Remove and replace work that cannot be cleaned to the satisfaction of the Project Designer/Owner.

END OF SECTION

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