



By CTS Cement Manufacturing Corp.

## CSI SECTION 03 01 00 – MAINTENANCE OF CONCRETE

*Repair with Rapid Hardening, High Strength, Non-Metallic Cementitious Concrete Material*

*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.
- C. Scope of Work as indicated on drawings, including:
  - [1. Repair of deteriorated concrete.
  - [2. Repair of internal concrete reinforcement.
  - [3. Resurfacing of damaged or spalled concrete surfaces.

#### 1.2 RELATED SECTIONS

- [A. Section 03 30 00 - Cast-in-Place Concrete
- [B. Section 03 40 00 - Precast Concrete
- [C. Section 03 50 00 - Cast Decks and Underlayment
- [D. Section 03 70 00 - Mass Concrete
- [E. Section 04 01 00 - Maintenance of Masonry
- [F. Section 04 20 00 - Unit Masonry
- [G. Section 32 13 00 - Rigid Paving
- [H. Section 32 14 00 - Unit Paving
- [I. Section 32 16 00 - Curbs, Gutters, Sidewalks, and Driveways
- [J. Section 32 32 00 - Retaining Walls

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

#### 1.3 REFERENCES

- A. ASTM C33 Standard Specification for Concrete Aggregates
- B. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- C. ASTM C78 Test Method for Flexural Strength of Concrete
  
- D. ASTM C157 Standard Test Method for Length Change of Hardened Hydraulic Cement



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|--------------|---|
|              | Mortar and Concrete   |
| E. ASTM C469 | Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression  |
| F. ASTM C496 | Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens                 |
| G. ASTM C882 | Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear       |
| H. ASTM C928 | Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs |
| I. ACI 301   | Specification for Structural Concrete   |
| J. ACI 318   | Building Code Requirements for Structural Concrete  |

#### 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. Test each type of maintenance procedure required on each type of existing construction to determine the most appropriate procedures to use and as a record of expected results.
- B. Crack Injection: Prepare one (1) sample of each type of injection.
- C. Horizontal Surface Repair: [\_\_\_\_\_] total square area demonstrating each type of repair.
- D. Vertical Surface Repair: [\_\_\_\_\_] total square area demonstrating each type of repair.
- E. Where color or texture matching is required, prepare a [\_\_\_\_\_] total square area sample on cementitious board for acceptance.
- F. 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



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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) to 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 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 Materials – General
  - 1. Rapid Set® Concrete Mix: a pre-packaged, high-performance, fast-setting, multi-purpose, non-metallic, cementitious repair material [with integral air entrainment] mixed with water on site. Suitable for indoor and outdoor use, use in wet environments, and for any application where high durability, rapid strength gain and low shrinkage are desired. Structural strength is achieved in one (1) hour. Suitable for structural and non-structural applications from 2 in. to 24 in. depths.  
  
*EDITOR NOTE: Integral air-entraining admixture formulations are available in geographical regions requiring enhanced freeze/thaw durability replacement.*
  - 2. Additives and admixture materials must be approved for use by CTS Cement Manufacturing Corp. prior to use. (800-929-3030, www.CTScement.com)



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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® Concrete Mix:

a. Compliance with: ASTM C928, ASTM C387

b. Minimum performance requirements:

<b>Set Time (ASTM C403)</b>	Initial Set Final Set	15 minutes 35 minutes
<b>Compressive Strength (ASTM C39)</b>	1 Hour* 3 Hours 24 Hours 7 Days 28 Days	3,000 psi 3,600 psi 4,500 psi 5,500 psi 6,000 psi

*\*After final set*

*Data obtained at slump consistency of 4" by ASTM C143 at 70°F (21°C)*

**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 against overspray, water or other harmful debris.
- E. Advise Contractor of discrepancies preventing proper installation of materials. Do not proceed with the work until unsatisfactory conditions are corrected.



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### 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 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 surfaces and remove all loose, unsound, contaminated material.
- B. For structural member repairs, remove broken and soft concrete at least [1/4 inch (6mm)] deep.
- C. Bonding surfaces must be clean, sound, and free from any materials that may inhibit bond such as oil, dirt, asphalt, sealing compounds, acids, wax and loose dust and debris.
- D. Reinforcing steel must be free from rust and all other materials that may inhibit bond.

*EDITOR NOTE: Add special requirements related to the replacement of reinforcement that has lost too much cross sectional area.*

- E. Thoroughly saturate the area to receive repair and resurfacing materials with water before placement. Remove any standing water before material placement.
- F. Minimum substrate temperature must be 45°F (7°C) and maximum substrate temperature 90°F (32°C).

### 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.
- D. Extend with aggregate as indicated on manufacturer's printed instructions.
- E. 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))



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- F. Do not re-temper, add water, or remix after material stiffens. Material that stiffens before use must be discarded.

### **3.5 APPLICATION**

- A. Apply bonding primer as required by the manufacturer for selected repair and resurfacing materials.
- B. Comply with manufacturer's printed instructions.
- C. Build up the materials to completely cover/fill the repair area flush with the existing surface. Feather edges of repairs flush to sound surface and to match the surrounding area.
- D. 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 surfaces.

### **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.
- 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

*Rev. March 2019*

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