



By CTS Cement Manufacturing Corp.

## CSI SECTION 03 03 00 – Cast-in-Place Concrete

Repair with Rapid Set LOW-P Shotcrete

*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 Rapid Set LOW-P Shotcrete 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.

#### 1.2 RELATED SECTIONS

- [A. Section 03 30 00 - Cast-in-Place Concrete
- [B. Section 03 37 13 - Shotcrete
- [C. Section 04 01 00 - Maintenance of Masonry
- [D. Section 04 20 00 - Unit Masonry
- [E. 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 C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- B. ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- C. ASTM C882 Standard Test Method for Bond Strength with Concrete By Slant Shear (Modified by C928)
- D. ASTM C1202 Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- E. ASTM C1604 Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete
- F. AASHTO T277 Standard Method of Test for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration



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#### **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 shotcrete materials in the United States for at least five years and must have completed projects of the same general scope and complexity.
    - b. Shotcrete 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 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.

#### **1.7 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. Substrate: Prior to installation, the substrates must be properly cleaned and prepared to receive repair 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.

#### **1.8 COORDINATION AND SCHEDULING**

- A. Coordinate installation of repair 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](http://www.CTScement.com)).



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- B. Components: Obtain shotcrete materials 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, Low Permeability Dry Process Shotcrete – General

- 1. Rapid Set® LOW-P SHOTCRETE is a fast-setting, Low Permeability shotcrete formulation based on advanced CSA cement technology. LOW-P SHOTCRETE produces shotcrete mixtures with unparalleled performance and ease of use without the need for an accelerator. Finished LOW-P SHOTCRETE exhibits exceptional durability for mining and tunneling environments.
- 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, Low Permeability Dry Process Shotcrete – General

- 1. Rapid Set® LOW-P Shotcrete:
  - a. Minimum performance requirements:

<b>Compressive Strength (ASTM C39)</b>	1 Hour* 3 Hours 24 Hours 28 Days	1,500 psi 2,500 psi 4,000 psi 5,000 psi
<b>Slant Shear Bond Strength (ASTM C882 Mod per C928)</b>	28 Days	750 psi
<b>Rapid Chloride Ion Penetration (ASTM C1202/ AASHTO T277)</b>	28 Days	< 500 coulombs
<b>Freeze Thaw Resistance (ASTM C666)</b>	Durability Factor (30 cycles)	> 90

*\*After final set*

*Data obtained at 70°F (21°C)*

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Compliance: Comply with manufacturer's instructions for installation of shotcrete materials.
- B. Coordinate installation with adjacent work to ensure proper sequencing of construction.
- C. Protect adjacent and surrounding surfaces not specified to receive materials with necessary means to ensure protection against overspray, water or other harmful debris.
- D. Advise Contractor of discrepancies preventing proper installation of materials. Do not proceed



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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 manufacturer's recommendations.

### **3.3 PREPARATION**

- A. Mechanically cut away damaged portions of concrete, roughen surfaces and remove all loose, unsound, contaminated material.
- B. 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.
- C. Thoroughly saturate the area to receive shotcrete materials with water before placement. Remove any standing water before material placement.
- D. 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))
- F. 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.

### **3.6 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

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