



Product Specification for:  
**Rapid Set® D.O.T. Cement**

SECTION 03 01 30 MAINTENANCE OF CAST-IN-PLACE CONCRETE  
SECTION 03 01 40 MAINTENANCE OF PRECAST CONCRETE  
SECTION 03 01 50 MAINTENANCE OF CAST DECKS AND UNDERLAYMENT  
SECTION 03 01 70 MAINTENANCE OF MASS CONCRETE

(The above were formerly Section 03930)

SECTION 03 62 13 NON-METALLIC NON-SHRINK GROUTING

(The above was formerly Section 03600)

[Note to specifier: Delete unnecessary Sections.]

## **PART I GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions, apply to this section.

### **1.2 SUMMARY**

- A. This section specifies material for very rapid concrete repairs from 1/2 inch to 24 inches thick and material for very rapid non-shrink grouting.

### **1.3 SUBMITTALS**

- A. Substitutions:  
[Note to specifier: While this does not belong here, it is shown for your review and inclusion in section 01 25 13.] Requests for substitution must be received by Architect at least 14 days prior to bid opening and shall be accepted only from prime bidders. Request shall include: documentation from an approved independent testing laboratory showing compliance with this specification, record of past performance, list of similar installations, detailed comparison of the qualities of the proposed substitute with the specified product, statement of product costs showing all savings passed to owner if approved, and certification by the contractor that the proposed substitute is in every significant way equal to or better than the specified product.
- B. Submit 2 copies of product manufacturer's literature and Material Safety Data Sheets (MSDS). [Note to specifier: Add any other required submissions.]

## 1.4 QUALITY ASSURANCE

A. References: Comply with the following unless modified by this specification.

1. ASTM C33-03 Standard Specification for Concrete Aggregates
2. ASTM C78-02 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
3. ASTM C109/C109M-02 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)
4. ASTM C191-04 Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
5. ASTM C666/C666M-03 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
6. ASTM C882-99 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear
7. CRD 621-82A Corps of Engineers Non-Shrink Grout

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to jobsite in original, unopened, undamaged containers that clearly show the manufacturer's name, product name, and batch number.
- B. Storage: Store material in a dry area off the ground protected from rain, snow, and other sources of moisture. Protect material from temperature extremes. Store bulk sand and coarse aggregate in a well drained area on a clean, solid surface and cover to prevent contamination with foreign matter.

## PART 2 PRODUCTS

### 2.1 CEMENT

- A. Shall be manufactured by CTS Cement Manufacturing Corp., 11065 Knott Avenue, Suite A, Cypress, CA, 90630. Phone: 800-929-3030 Website: [www.ctscement.com](http://www.ctscement.com)
- B. Rapid Set® D.O.T. Cement: Rapid-setting, low shrinkage, extendable, cement that can be used from 1/2 inch to 6 inches thick when mixed with sand and from 2 inches to 24 inches thick when mixed with sand and stone.
1. Set time per ASTM C191 (Mod.) at 70°F:  
Initial set 17 minutes. Final set 20 minutes.
  2. Compressive strength per ASTM C109 (Mod.):

1 hour\* 3140 psi  
3 hour 3725 psi  
1 day 4650 psi  
28 day 5500 psi

\* after final set

3. Flexural strength per ASTM C78 (Mod.):

4 hour 500 psi  
1 day 650 psi  
28 day 1200 psi

4. Bond strength of per ASTM C882 (Mod.):

1 day 2000 psi  
20 day 2200 psi

5. Freeze/thaw of per ASTM C666:

1000 cycles 1.07% loss

Dynamic modulus 91%

In 10% sodium-chloride solution

10 cycles 0.0% loss

15 cycles 0.0% loss

25 cycles 0.3% loss

6. Shall meet CRD C621 for non-shrink grouting.

7. Shall be non-metallic with no added chlorides.

C. Rapid Set® Concrete Pharmacy®: Add these small, pre-measured packets to the repair material per manufacturer's recommendations to change the properties as shown. [Note to specifier: List only the products that you want to be used on your job.]

1. Set Control® – slows down the set time
2. Flow Control® – increases fluidity and strength
3. Fast – speeds up the set time
4. Bond – increases bond strength
5. Fiber – reduces plastic and crazing cracks
6. Light – lightens the color of the repair material
7. Dark – darkens the color of the repair material

2.2 Sand: Meeting ASTM C33.

2.3 Course Aggregate: 3/8 to 3/4 inch meeting ASTM C33.

2.4 Water: Potable.

### **PART 3 EXECUTION**

### 3.1 SURFACE PREPARATION

- A. The perimeter of the area to be repaired shall be sawcut slightly undercutting the sound concrete (without cutting reinforcing steel) or chipped perpendicular to the surface to a minimum depth of 2 inches.
- B. Mechanically remove unsound, contaminated concrete to a minimum depth of 2 inches.
- C. The aggregate fractured surface shall have a minimum profile of 1/8 inch.
- D. Concrete must be free of materials such as paint, oil, curing compound, bond breaker, etc. that will inhibit bonding.
- E. If placed directly on the subgrade, the subgrade must be well compacted. [Note to specifier: State the compaction you require.]
- F. Clean reinforcing steel by sandblasting or other mechanical means to achieve a white metal finish. [Note to specifier: Add special requirements concerning replacement of reinforcing that has lost too much cross-sectional area.]
- G. Thoroughly clean extraneous material such as dirt, loose chips, and dust from concrete surface. If compressed air is used, it shall be free of oil.
- H. Concrete surface shall be saturated with potable water and standing water shall be removed from surface to achieve a Saturated, Surface Dry (SSD) condition.
- I. For grouting applications, build watertight non-absorbant forms leaving sufficient room to pour the grout.

### 3.2 MIXING

- A. Organize personnel and equipment before mixing.
- B. Use 3 to 5 quarts of water per 50 pound bag of repair material. [Note to specifier: Less water means more strength and more water means a more flowable consistency.]
- C. Mixed material should have a temperature of about 70°F. Warmer material will set faster than expected and cooler material will have slower strength gain. Control the mixed temperature by protecting the bags of repair material from temperature extremes and adjust the mixed temperature by using hot or cold water.

- D. Place 100 pounds of sand and 100 pounds of coarse aggregate in the mixer. Mix Concrete Pharmacy packets if necessary into 1.4 gallons of water and add that water to the mixer. Add cement then mix for 2 to 3 minutes to achieve a uniform, lump-free consistency.
- E. Add as much as .6 gallons of water to bring the mix to a slump of 6 inches  $\pm$  1 inch.
- F. Do not add any other admixtures. Do not add sand, aggregate, or cement.
- G. Do not re-temper.

### 3.3 PLACEMENT

- A. Place repair material onto the Saturated, Surface Dry (SSD) substrate.
- B. Place repair material only if surface and ambient temperatures are above 45°F and rising.
- C. Protect adjacent surfaces with drop cloths, waterproof paper, or other means to maintain them free of material splashes, water, and debris.
- D. Place repair material immediately after mixing.
- E. Work repair material firmly into sides and bottom of repair area to achieve good bond.
- F. Do not feather edge repair material.
- G. For grouting applications, pour the grout from one direction only allowing it to fill the space completely.
- H. Do not wait for bleed water, since there will probably be none. Begin final finishing as soon as possible.

### 3.4 CURING

- A. Begin water cure when repair area begins to lose its moist sheen and keep continuously wet until 1 hour after final set.

### 3.5 CLEAN UP

- A. Clean mixer immediately after use or add mix water and begin mixing immediately for the next batch. Do not allow buildup of hardened repair material in the mixer, since this creates inefficient mixing and the heat

generated accelerates later batches.

- B. Clean all tools immediately after use.
- C. Clean excess material from surrounding areas immediately.

**END OF SECTION**