



By CTS Cement Manufacturing Corp.

CSI SECTION 03 01 00 – MAINTENANCE OF CONCRETE

Repair with Rapid Set DOT Repair Mix

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 C109 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 Mortar and Concrete



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- 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 C666 Resistance of Concrete to Rapid Freezing and Thawing
- H. ASTM C882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear
- I. ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
- J. ACI 301 Specification for Structural Concrete
- K. 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) 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® DOT REPAIR MIX is a high performance, fast setting, multi-purpose repair material. Durable in wet environments, DOT REPAIR MIX is a blend of Rapid Set hydraulic cement, high performance additives and ASTM C33 concrete sand. DOT REPAIR MIX is non-metallic and no chlorides are added. Mix DOT REPAIR MIX with water to produce a flowable, quality repair material that is ideal where fast strength gain, high durability and low shrinkage are desired. DOT REPAIR MIX is ready for traffic and loading within 1 hour.*
 - 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



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A. Fast Setting, Cementitious Repair Materials – General

1. Rapid Set® DOT REPAIR MIX:

- a. Compliance with: ASTM C928, ASTM C387
- b. Minimum performance requirements:

	Neat Bag	100% Extension
Compressive Strength		
	ASTM C109 Mod.	ASTCM C39
1 hour	3300 psi	2500 psi
3 hours	5000 psi	4200 psi
1 day	7000 psi	6500 psi
7 days	7500 psi	7000 psi
28 days	9500 psi	8500 psi
Length Change, ASTM C157 modified per ASTM C928		
Air Cure	-0.08%	-0.05%
Water Cure	0.02%	0.05%
Flexural Strength, ASTM C78		
4 hours	450 psi	400 psi
7 days	700 psi	600 psi
28 days	900 psi	800 psi
Modulus of Elasticity, ASTM C469		
7 days	4.4 x 10 ⁶ psi	3.9 x 10 ⁶ psi
28 days	5.1 x 10 ⁶ psi	4.0 x 10 ⁶ psi
Splitting Tensile Strength, ASTM C496		
7 days	700 psi	390 psi
28 days	900 psi	415 psi
Slant Shear Bond Strength, ASTM C882 per C928		
1 day	1500 psi	1100 psi
7 days	2000 psi	1700 psi
Resistance of Concrete to Rapid Freezing and Thawing, ASTM C666 Procedure A		
Durability factor after 300 cycles	95%	95%
	95%	95%

c. Data obtained at (Neat) flow consistency of 100 (at 5 drops) by ASTM C1437 & (Extended) 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



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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.

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).



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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)
- 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

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This sample guideline specification is intended for use by a qualified design professional. The sample guideline specification is not intended to be used verbatim as an actual specification without appropriate modifications for the specific project requirements.