



Section 03 01 00 Maintenance of concrete

SIKA SPECIFICATION NOTE: *This guide specification includes test methods, materials and installation procedures for SikaCrete®-421 CI Rapid, a one component, early strength-gaining concrete containing factory-blended coarse aggregate and a migrating corrosion inhibitor. SikaCrete®-421 CI Rapid is a structural repair material for quick-turnaround applications on parking facilities, industrial plants, walkways, bridges, tunnels, dams and balconies. This guide specification should be adapted to suit the needs and conditions of individual projects. It is prepared in CSI Master Format and should be included as a separate section under Division 3 - Concrete.*

Part 1 - General

1.01 Summary

This Specification shall be read as a whole by all parties concerned. Each Section may contain more or less the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractors the extent of their Work and coordinate overlapping Work.

1.02 System description

This specification describes the patching or overlay of interior and exterior horizontal surfaces and formed vertical and overhead surfaces with Portland Cement Concrete.

1.03 Related sections

- A. Maintenance of Cast-in-Place Concrete: Section 03 01 30
- B. Maintenance of Precast Concrete: Section 03 01 40
- C. Maintenance of Cast Decks and Underlayment: Section 03 01 50
- D. Maintenance of Mass Concrete: Section 03 01 70
- E. Structural Concrete: Section 03 33 00

1.04 References

The following standards are applicable to this section:

- ASTM C-39 - Compressive Strength
- ASTM C-496 - Splitting Tensile Strength
- ASTM C-882 Modified- Slant Shear Bond Strength
- ASTM C-469 - Modulus of Elasticity
- ASTM C-157 Modified- Shrinkage
- ASTM C-293 - Flexural Strength

1.05 Quality Assurance

- A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- B. Contractor qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
- C. Store and apply materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.06 Delivery, Storage, and Handling

- A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- C. Condition the specified product as recommended by the manufacturer.

1.07 Job Conditions

- A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 45°F (5°C) and rising.
- B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

1.08 Submittals

- A. Submit two copies of manufacturer's literature, to include: Product Data Sheets (PDS), and appropriate Safety Data Sheets (SDS).
- B. Submit copy of Certificate of Approved Contractor status by manufacturer.

1.09 Warranty

Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project.

Part 2 - Products

2.01 Manufacturer

SikaCrete®-421 CI Rapid, as manufactured by Sika® Corporation, is considered to conform to the requirements of this specification.

2.02 Materials

- A. The repair concrete shall be a blend of selected portland cements, specially graded aggregates, admixtures for controlling setting time, and water reducers for workability.
- B. The material shall include prepackaged coarse aggregate and be supplied as a factory-blended unit.
- C. The Portland Cement Concrete must be placeable from 1" to 8" depth and appropriate for full-slab depth repair and replacement.
- D. The material shall contain a corrosion inhibitor.

2.03 Performance Criteria

Typical Properties of the mixed polymer-modified, portland cement mortar:

1. Yield	0.5 ft ³ (0.01 m ³) per bag
2. Color	Concrete gray
3. Mixing Ratio	5.5-6 pints (2.6-2.8 L)
4. Application Thickness	Min 1" (25 mm) Max 8" (208 mm)
5. Application Temp	> 40 °F (4 °C)
6. Working Time	10 min.
7. Compressive Strength (ASTM C-39)	2 hours - 3,000 psi (20.7 MPa) 1 day - 4,500 psi (31.0 MPa) 28 days - 6,500 psi (44.8 MPa)
8. Flexural Strength (ASTM C-293)	28 days - 1,000 psi (6.9 MPa)
9. Slant shear (ASTM C-882 Modified)	28 days - 3,000 psi (20.7 MPa)
10. Splitting Tensile Strength @ 28 days (ASTM C-496)	28 days - 650 psi (4.5 MPa)
11. Permeability (ASTM C-1202 & AASHTO T-277)	< 600 Coulombs

Note: Tests above were performed with the material and curing conditions @ 71°F – 75°F and 45 - 55% relative humidity.

Part 3 – Execution

3.01 Surface Preparation

- A. Areas to be repaired must be clean, sound, and free of contaminants. All loose and deteriorated concrete shall be removed by mechanical means. Mechanically prepare concrete substrate to obtain a surface profile of $\pm 1/8''$ (CSP 6 or greater as per ICRI Guidelines) with a new exposed aggregate surface. Area to be patched shall not be less than $1/4''$ in depth.
- B. Where reinforcing steel with active corrosion is encountered, sandblast the steel to a white metal finish to remove all contaminants and rust. Where corrosion has occurred due to the presence of chlorides, the steel shall be high pressure washed after mechanical cleaning. Prime steel with 2 coats of Sika® Armatec® 110 EpoCem as per the Product Data Sheet (PDS).

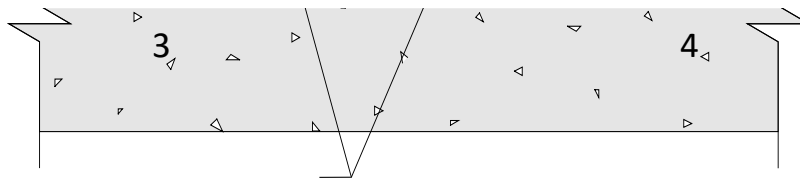
3.02 Mixing and Application

- A. Mechanically mix in an appropriate sized mortar mixer or with a Sika mud paddle and low speed (400-600 rpm) drill. Pour approximately 5.5 pints of water into the mixing container. Add the powder while continuing to mix. Mix to a uniform consistency for a maximum of three minutes. Add up to $1/2$ pints of water to mix for desired consistency. Should smaller quantities be needed, be sure the components are measured in the correct ratio and that the component is uniformly blended before mixing the components together. Mix only that amount of material that can be placed in 10 - 15 minutes. Do not retemper material.
- B. Mixing of the rapid-setting portland cement concrete: Pour 5.5 to 6 pints of water into the mixing container. Add the powder while continuing to mix. Add correct amount of the pre-approved coarse aggregate, and continue mixing to a uniform consistency. Mixing time should be 3 minutes maximum.
- C. Placement Procedure: At the time of application, the substrate shall be saturated surface dry with no standing water. Mortar must be scrubbed into substrate filling all pores and voids. While the scrub coat is still plastic, force material against edge of repair, working toward center. If repair area is too large to fill while scrub coat is still wet use Sika® Armatec® 110 EpoCem in lieu of scrub coat. (See spec component SC-200-0699) After filling, consolidate then screed. Allow mortar to set to desired stiffness then finish with trowel for smooth surface. Wood float or sponge float for a rough surface. Areas where the depth of the repair area to sound concrete is less than 2-inches over head and 3-inches vertical shall be repaired with one lift of the rapid setting portland cement mortar. Areas that exceed these depths must be repaired with multiple lifts.
- D. As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water-based* compatible curing compound. Moist curing should commence immediately after finishing and continue for 48 hours. Protect newly applied material from rain, sun, and wind until compressive strength is 70% of the 28 day compressive strength. To prevent from freezing cover with insulating material. Setting time is dependent on temperature and humidity.
 - *Pretesting of curing compound is recommended.
- E. Adhere to all procedures, limitations and cautions for the polymer-modified portland cement mortar in the manufacturers current printed Product Data Sheet (PDS and literature).

3.02 Cleaning

- A. The uncured polymer-modified portland cement mortar can be cleaned from tools with water. The cured polymer modified portland cement mortar can only be removed mechanically.
- B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

a) Pourable repair



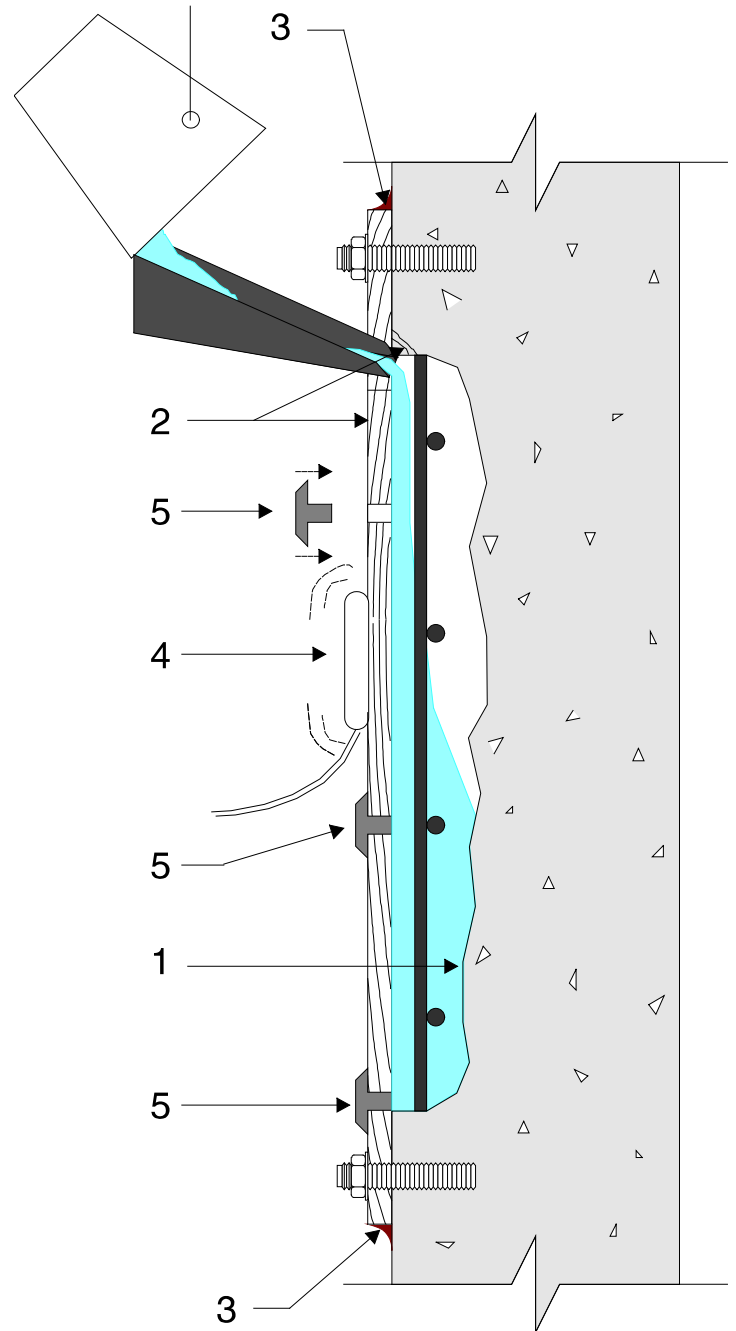
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1. Repair area should not be less than 1" in depth.
2. Substrate should be Saturated Surface Dry (SSD) with no standing water.
3. Apply scrub coat to substrate, filling all pores and voids.
4. While scrub coat is still wet pour SikaCrete®-421.

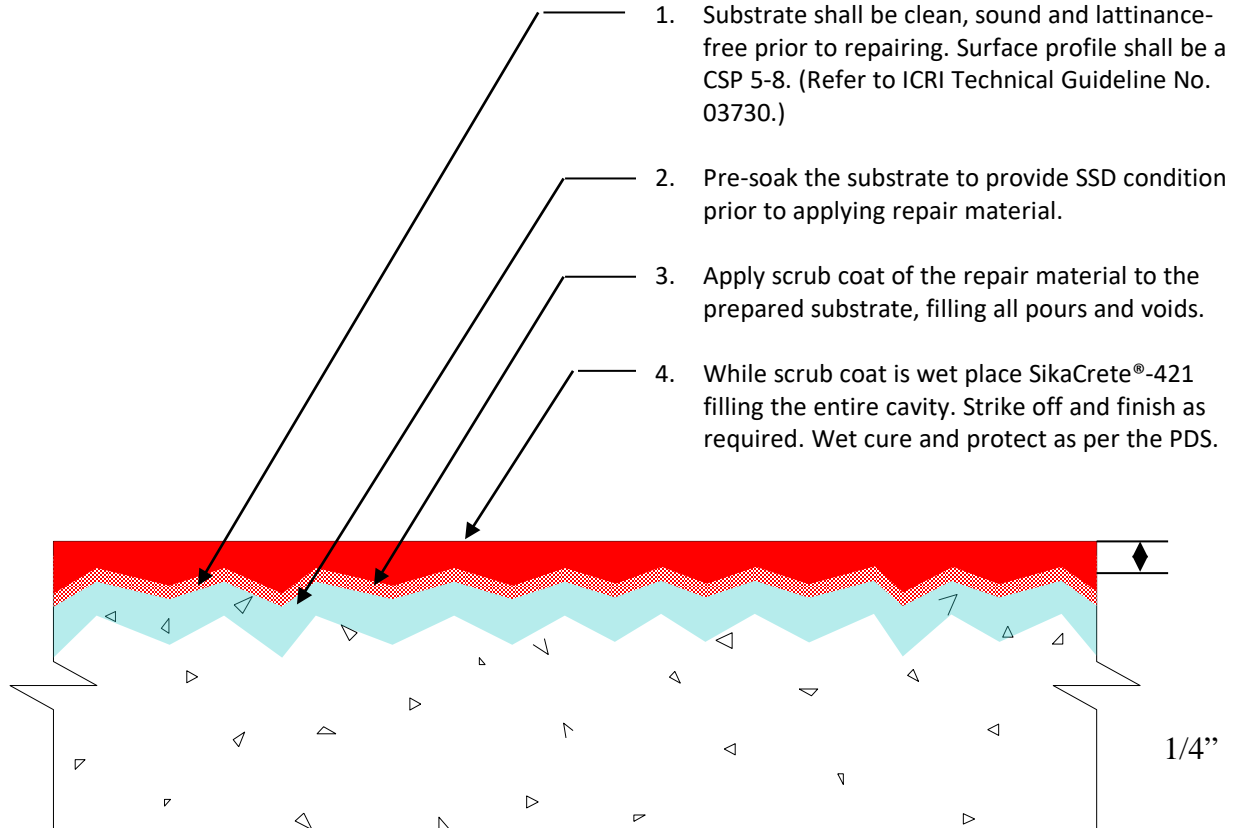
Note: If repair area is too large to fill while scrub coat is still wet, use Sika Armatec 110 EpoCem in lieu of the scrub coat.
(See Spec Component SC-200)

b) Form and Pour

1. Pre-wet surface to SSD.
2. Apply release agent to form or use plastic lined plywood.
3. Run bead of Sikaflex 1a around edge of form to prevent leakage, let cure, then anchor form. Fill with water to check for water tightness. Let drain to no free standing water.
4. Pump SikaCrete®-421 with a variable pressure pump. Continue pumping until a 3 to 5 psi increase in normal line pressure is evident then STOP pumping. Form should not deflect.
5. Vibrate form while pumping.
6. Vent to be capped when steady flow is evident.
7. Strip form when appropriate.
8. Dry pack anchor holes with additional SikaCrete®-421 material



c) Overlay



Note:

If repair area is too large to fill while scrub coat is still wet, use Sika® Armatec® 110 EpoCem in lieu of the scrub coat.
If reinforcing steel is located within the repair location refer to Spec Component SC-201
For applications greater than 1" in depth, add 3/8" coarse aggregate in accordance to the PDS.

Concrete Restoration Systems by Sika Corporation, 201 Polito Avenue, Lyndhurst, NJ 07071

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