DMS-4655
Concrete Repair Materials
Effective Date: April 2017

1. DESCRIPTION

This Specification governs the pre-qualification procedure, material properties, and packaging of inorganic cementing material for concrete repair. DMS-6170 covers polymeric materials, and Item 431 covers pneumatically placed materials.

2. UNITS OF MEASUREMENTS

The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

3. MATERIAL PRODUCER LIST

The Materials and Pavements Section of the Construction Division (CST/M&P) maintains the Material Producer List (MPL) of all materials conforming to the requirements of this Specification. Materials appearing on the MPL, entitled “Concrete Repair Materials,” require no further sampling and testing before use, unless deemed necessary by the Project Engineer or CST/M&P. Materials listed on the MPL have been tested as received and do not include optional additives.

4. BIDDERS’ AND SUPPLIERS’ REQUIREMENTS

The Department will only purchase or allow on projects those products listed by producer and product code or designation shown on the MPL.

Use of pre-qualified product does not relieve the Contractor of the responsibility to provide product that meets this Specification. The Department may inspect or test material at any time and reject any material that does not meet the specifications.

5. PRE-QUALIFICATION PROCEDURE

5.1. Pre-Qualification Request. Submit a request for evaluation under DMS-4655 to DMS_Prequal@txdot.gov.

Include the following information in the request:
- company name;
- physical and mailing addresses;
- contact person, phone number(s), and email address; and
- repair material classification listed under Article 6 of this Specification;
- independent laboratory test report from a laboratory audited and inspected by the Cement and Concrete Reference Laboratory containing test results and certifying compliance of the repair material with this Specification;
- technical data sheets typically accompanying product with printed instructions for mixing and application and shelf life; and
- list of all possible package types and available sizes.
5.2. **Pre-Qualification Sample.** After reviewing the pre-qualification request, CST/M&P will request a sample of adequate size to complete testing for the classification(s) being sought. Ship samples with packaging representative of that supplied to the field to the Texas Department of Transportation, CST/M&P (CP51), 9500 North Lake Creek Parkway, Austin, TX 78717.

Include the following with the sample:
- producer certification and lot number for submitted sample;
- producer certification that repair material contains no added chlorides;
- technical data sheets typically accompanying product with printed instructions for mixing and application and shelf life;
- statement regarding whether material is used neat or extended—if extended, state the recommended aggregate content, nominal maximum aggregate size and submit all additional material needed, with sourcing information, except water;
- curing protocol (recommended or required) for field application; and
- statement regarding whether bonding agent is required for application. If required, submit bonding agent and a current SDS for the bonding agent. The Department’s standard practice is to require installation of repair material over saturated-surface dry (SSD) substrates rather than utilizing bonding agents.

Submit all materials for pre-qualification at no cost to the Department.

5.3. **Evaluation.** CST/M&P will notify prospective bidders and suppliers after completion of material evaluation.

5.3.1. **Qualification.** If approved for Department use, CST/M&P will add the repair material to the MPL.

To maintain pre-qualified status, submit annual notarized certifications stating that the product has not been altered since it was originally submitted for approval.

Report changes in the composition or in the manufacturing process of any material to CST/M&P. Significant changes reported by the producer, as determined by the Director of CST/M&P, may require a re-evaluation of performance. The Department reserves the right to conduct any tests deemed necessary to identify a pre-qualified material and determine if there is a change in the composition, manufacturing process, or quality that may affect its durability or performance; inclusive of tests not listed in this specification. In case of variance, the Department’s tests will govern.

5.3.2. **Failure.** Products not qualified under this Specification may not furnish materials for use on Department projects.

The Department may withhold pre-qualified status if the material does not perform satisfactorily during mixing and molding. Unsatisfactory performance includes, but is not limited to, excessive bleeding, presence of deleterious material in the dry mix, or segregation.

Producers failing to qualify may submit a request for re-evaluation after 12 months have elapsed from the date of the original request. CST/M&P may modify this time limit at its discretion. In the request for re-evaluation, document the cause for failing to meet the requirements of this Specification and corrective action taken. Include an independent laboratory test report from a laboratory audited and inspected by the Cement and Concrete Reference Laboratory containing test results and certifying compliance of the corrected material with this Specification.

The Department normally bears the costs of sampling and testing; however, the producer will bear the costs associated with materials failing to conform to the requirements of this Specification. The Director of CST/M&P will assess this cost at the time of testing, and amounts due will be billed to the producer.
5.4. **Periodic Evaluation.** The Department reserves the right to conduct random sampling and testing of pre-qualified materials to verify performance and Specification compliance and to perform random audits of documentation. Department representatives may sample material from the manufacturing plant, the project site, and the warehouse.

Failure of materials to comply with the requirements of this Specification as a result of periodic evaluation may be cause for removal of those materials from the MPL. In case of variance, the Department’s tests will govern.

5.5. **Disqualification.** Causes for disqualification and removal from the MPL may include, but are not limited to:

- falsification of documentation,
- producer fails to report any change in material composition or manufacturing process to CST/M&P,
- material fails to meet the requirements of this Specification as a result of periodic evaluation, or
- producer has unpaid charges for failing samples.

CST/M&P will remove disqualified producers from the MPL and will not allow submission of material for re-qualification for 12 months, at the Department’s discretion.

5.6. **Re-Qualification.** Once the disqualification period established by CST/M&P has elapsed, producers disqualified and removed from the MPL may begin the re-qualification process by submitting a request in accordance with Section 5.1, including additional documentation identifying the cause for disqualification and corrective action taken. The re-qualification process will then follow all subsequent Sections of Article 5.

The Department normally bears the costs of sampling and testing; however, the disqualified producer will bear the costs associated with re-qualification. The Director of CST/M&P will assess this cost at the time of re-evaluation, and amounts due will be billed to the producer.

6. **REPAIR MATERIAL CLASSIFICATIONS**

A concrete repair material may be pre-qualified for multiple repair material classifications if desired. The target compressive strengths listed in this Article are intended only to distinguish between the different classifications. See Article 7 for the full material requirements for each classification.

6.1. **Definitions.**

6.1.1. **Neat.** Material with 100% of the final mixed product passing the No.8 sieve (2.36 mm) sieve.

6.1.2. **Extended.** Material with aggregate of the final mixed product retained on the 3/8-in. (9.53 mm) sieve. Aggregates must be pre-mixed with the dry product by the producer, or the producer must list the recommended aggregate content in the product technical data sheet.

6.2. **Classifications.**

6.2.1. **Type A—Rapid Repair Materials.** These materials must attain 3,000 psi compressive strength in 8 hours, 4,000 psi compressive strength in 3 days, and may be either neat or extended.

6.2.2. **Type B—Ultra-Rapid Repair Materials.** These materials must attain 2,000 psi compressive strength in 2 hours, 3,000 psi compressive strength in 4 hours, and may be either neat or extended.

6.2.3. **Type C—Vertical or Overhead Repair Materials.** These materials, while not necessarily rapidly setting, will produce good quality vertical or overhead repairs and must be trowel-applied or pneumatically-placed, neat materials.
6.2.4. **Type D—Standard (Non-Rapid) Repair Materials.** These non-rapid materials will produce good quality repairs with highly desirable 28-day characteristics and may be either neat or extended. Rapid or ultra-rapid materials that use admixtures or material additions to extend the working time are not considered standard (non-rapid) repair materials.

7. **MATERIAL REQUIREMENTS**

Use of recycled aggregate is not allowed. Addition of chlorides is not allowed.

7.1. **Type A—Rapid Repair Materials.**

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Compressive Strength, psi</td>
<td>3,000 at 8 hours</td>
<td>ASTM C39(^2)</td>
</tr>
<tr>
<td></td>
<td>4,000 at 3 days</td>
<td></td>
</tr>
<tr>
<td>Maximum Shrinkage, %</td>
<td>0.07 at 28 days</td>
<td>ASTM C157(^3)</td>
</tr>
<tr>
<td>Minimum Splitting Tensile Strength, psi</td>
<td>400 at 28 days</td>
<td>ASTM C496</td>
</tr>
<tr>
<td>Maximum Coefficient of Thermal Expansion, microstrain /°F.</td>
<td>Informational(^4) Tex-428-A</td>
<td></td>
</tr>
<tr>
<td>Maximum Modulus of Elasticity, ksi</td>
<td>Informational(^4)</td>
<td>ASTM C469</td>
</tr>
<tr>
<td>Minimum Bond Strength, psi</td>
<td>2,000 at 3 days</td>
<td>ASTM C882(^5)</td>
</tr>
</tbody>
</table>

1. Unless otherwise specified, cure all test specimens in covered molds in the laboratory.
2. Specimen dimensions are as follows: 3 × 6” cylinders for neat materials; 4 × 8” cylinders for extended materials.
3. Modified as follows:
   - Specimen dimensions are as follows: 1 × 1 × 11.25” prisms for neat materials; 3 × 3 × 11.25” prisms for extended materials.
   - Demold and determine initial length reading at 6 ± 1/4 hr.
   - Store specimens in a drying room; at no point should specimens be placed in water after they are demolded.
   - Take readings at 1, 3, 7, 14, and 28 days.
4. There are no property requirements for this test. CST/ M&P will test for this property and report it on the MPL for material selection purposes.
5. Standard substrate concrete used in test procedure must have the following properties:
   - Maximum Water-Cementitious Material Ratio: 0.45
   - Maximum Nominal Aggregate Size: 3/4”
   - Compressive Strength at 28 days: 5,000–6,000 psi

Modified as follows:
   - Preparation of slant face surface of substrate concrete includes the following: sand blast the surface to expose aggregate surface to a uniform depth and maintain at saturated surface dry (SSD) condition prior to casting repair material.
   - Use one of the following methods when casting repair material onto the substrate surface:
     - If required by the manufacturer, apply the bonding system as directed.
     - If a bonding system is not required, maintain the substrate at SSD and apply a scrub coat of repair material to the substrate surface.
     - If directed by the manufacturer, cast the repair material directly onto the prepared surface.
7.2. **Type B—Ultra-Rapid Repair Materials.**

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Compressive Strength, psi</td>
<td>2,000 at 2 hours</td>
<td>ASTM C39(^a)</td>
</tr>
<tr>
<td></td>
<td>3,000 at 4 hours</td>
<td></td>
</tr>
<tr>
<td>Maximum Shrinkage, %</td>
<td>0.07 at 28 days</td>
<td>ASTM C157(^a)</td>
</tr>
<tr>
<td>Minimum Splitting Tensile Strength, psi</td>
<td>400 at 24 hours</td>
<td>ASTM C496</td>
</tr>
<tr>
<td>Maximum Coefficient of Thermal Expansion, psi</td>
<td>Informational</td>
<td>Tex-428-A</td>
</tr>
<tr>
<td>Maximum Modulus of Elasticity, ksi</td>
<td>Informational</td>
<td>ASTM C496</td>
</tr>
<tr>
<td>Minimum Bond Strength, psi</td>
<td>2,000 at 24 hours</td>
<td>ASTM C882(^c)</td>
</tr>
</tbody>
</table>

1. Unless otherwise specified, cure all test specimens in covered molds in the laboratory.
2. Specimen dimensions are as follows: 3 × 6” cylinders for neat materials; 4 × 8” cylinders for extended materials.
3. Modified as follows:
   - Specimen dimensions are as follows: 1 × 1 × 11.25” prisms for neat materials; 3 × 3 × 11.25” prisms for extended materials.
   - Demold and determine initial length reading at 2 ± 1/4 hours.
   - Store specimens in a drying room; at no point should specimens be placed in water after they are demolded.
   - Take readings at 1, 3, 7, 14, and 28 days.
4. There are no property requirements for this test. CST/ M&P will test for this property and report it on the MPL for material selection purposes.
5. Standard substrate concrete used in test procedure has the following properties:
   - Maximum Water/Cementitious Ratio: 0.45
   - Maximum Nominal Aggregate Size: 3/4”
   - Compressive Strength at 28 days: 5,000–6,000 psi

Modified as follows:
- Preparation of slant face surface of substrate concrete includes the following: sand blast the surface to expose aggregate surface to a uniform depth and maintain at saturated surface dry (SSD) condition prior to casting repair material.
- Use one of the following methods when casting repair material onto the substrate surface:
  - If required by the manufacturer, apply the bonding system as directed.
  - If a bonding system is not required, maintain the substrate at SSD and apply a scrub coat of repair material to the substrate surface.
  - If directed by the manufacturer, cast the repair material directly onto the prepared surface.
7.3. Type C—Vertical or Overhead Repair Material.

### Table 3
Vertical or Overhead Repair Material Requirements

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Compressive Strength, psi.</td>
<td>3,600 at 28 days</td>
<td>ASTM C 391</td>
</tr>
<tr>
<td>Maximum Shrinkage, %</td>
<td>0.07 at 28 days</td>
<td>ASTM C 1571</td>
</tr>
<tr>
<td>Maximum Coefficient of Thermal Expansion, micro strain /°F</td>
<td>Informational</td>
<td>Tex-428-A</td>
</tr>
<tr>
<td>Maximum Modulus of Elasticity, ksi</td>
<td>Informational</td>
<td>ASTM C 469</td>
</tr>
<tr>
<td>Minimum Bond Strength, psi</td>
<td>2,000 at 3 days</td>
<td>ASTM C 882a</td>
</tr>
</tbody>
</table>

1. Unless otherwise specified, cure all test specimens in covered molds in the laboratory.
2. Test specimens may be vibrated, rodded, and/or tapped on a solid surface to achieve satisfactory consolidation of the material within the molds.
3. Specimen dimensions are 3 × 6" cylinders.
4. Modified as follows:
   - Specimen dimensions are 1 × 1 × 11.25" prisms.
   - Demold and determine initial length reading at 24 ± 1/4 hours.
   - Store specimens in a drying room; at no point should specimens be placed in water after they are demolded.
   - Take readings at 3, 7, 14, and 28 days.
5. There are no property requirements for this test. CST/ M&P will test for this property and report it on the MPL for material selection purposes.
6. Standard substrate concrete used in test procedure shall have the following properties:
   - Maximum Water-Cementitious Material Ratio: 0.45
   - Maximum Nominal Aggregate Size: 3/4"
   - Compressive Strength at 28 days: 5,000–6,000 psi

Modified as follows:
- Preparation of slant face surface of substrate concrete includes the following: sand blast the surface to expose aggregate surface to a uniform depth and maintain at saturated surface dry (SSD) condition prior to casting repair material.
- Use one of the following methods when casting repair material onto the substrate surface:
  - If required by the manufacturer, apply the bonding system as directed.
  - If a bonding system is not required, maintain the substrate at SSD and apply a scrub coat of repair material to the substrate surface.
  - If directed by the manufacturer, cast the repair material directly onto the prepared surface.
7.4. Type D—Standard (Non-Rapid) Repair Materials.

<table>
<thead>
<tr>
<th>Table 4 Standard Repair Material (Non-Rapid) Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Property</strong></td>
</tr>
<tr>
<td>Minimum Setting Time, minutes</td>
</tr>
<tr>
<td>Minimum Compressive Strength, psi</td>
</tr>
<tr>
<td>Maximum Shrinkage, %</td>
</tr>
<tr>
<td>Minimum Splitting Tensile Strength, psi</td>
</tr>
<tr>
<td>Maximum Coefficient of Thermal Expansion, micro strain/°F</td>
</tr>
<tr>
<td>Maximum Modulus of Elasticity, ksi</td>
</tr>
<tr>
<td>Minimum Slant Shear, psi</td>
</tr>
<tr>
<td>Maximum Permeability, Coulombs</td>
</tr>
</tbody>
</table>

1. Unless otherwise specified, cure all test specimens in covered molds in the laboratory.
2. Specimen dimensions are as follows: 3 × 6" cylinders for neat materials; 4 × 8" cylinders for extended materials.
3. Modified as follows:
   - Specimen dimensions are 1 × 1 × 11.25" prisms for neat materials; 3 × 3 × 11.25" prisms for extended materials.
   - Demold and determine initial length reading at 24 ± 1/4 hours.
   - Store specimens in a drying room; at no point should specimens be placed in water after they are demolded.
   - Take readings at 3, 7, 14, and 28 days.
4. There are no property requirements for this test. CST/M&P will test for this property and report it on the MPL for material selection purposes.
5. Standard substrate concrete used in test procedure has the following properties:
   - Maximum Water/Cementitious Ratio: 0.45
   - Maximum Nominal Aggregate Size: 3/4" 
   - Compressive Strength at 28 days: 5,000–6,000 psi
Modified as follows:
   - Preparation of slant face surface of substrate concrete includes the following: sand blast the surface to expose aggregate surface to a uniform depth and maintain at saturated surface dry (SSD) condition prior to casting repair material.
   - Use one of the following methods when casting repair material onto the substrate surface:
     - If required by the manufacturer, apply the bonding system as directed.
     - If a bonding system is not required, maintain the substrate at SSD and apply a scrub coat of repair material to the substrate surface.
     - If directed by the manufacturer, cast the repair material directly onto the prepared surface.

8. PACKAGING AND LABELING

Prepackage material in plastic lined or coated bags or other suitable moisture-resistant container. Repair material packaging must indicate the producer name, product name, date of manufacture, lot number, and mixing/placing instructions. The repair material supplier must provide the Contractor and Engineer with a copy of the manufacturer’s certificate for each lot number and shipment sent to the jobsite.

9. ARCHIVED VERSIONS

Archived versions are available.