



Minnesota Department of Transportation  
Approved Packaged, Dry, Non-Shrink, Rapid- Hardening  
Cementitious Material for Dowel Bar Retrofit (DBR) Program  
March 05, 2018

The Minnesota Department of Transportation (MnDOT) will only accept Approved Packaged, Dry, Non-Shrink, and Rapid- Hardening Cementitious Material for Dowel Bar Retrofit (DBR) from the MnDOT Approved/Qualified Products List.

Provide material and test result submittals to the MnDOT Concrete Engineering Unit 30 days (minimum) prior to the start DBR repair work. Once **all** the material and test result are submitted to the Concrete Engineering Unit, the Concrete Engineering Unit will either approve or disapprove the Packaged, Dry, Non-Shrink, and Rapid- Hardening Cementitious Material for Dowel Bar Retrofit repairs within 30 days.

The Manufacturer must comply with the following:

A. Reference Materials

Submit a material sample for approval to the MnDOT Materials Lab. Also include a Materials Safety Data Sheet (MSDS) and a Technical Data Information Sheet.

B. Requirements

Provide a Packaged, Dry, Non-Shrink, and Rapid- Hardening Cementitious Material for Dowel Bar Retrofit Repairs” conforming to ASTM C 928 (R3) and Table1:

**Table 1**  
**Hardened Concrete Properties for Packaged, Dry, Non-Shrink, Rapid-Hardening Cementitious Material (Type R3) Requirements**

Test	Requirement	Test Method
Compressive Strength (Average of 3 cylinders)	<ul style="list-style-type: none"><li>Per ASTM C928 for 3 hours, 1, 7 and 28 days</li><li>Info only compressive strengths at 4, 5, 6, 8, and 36 hours.</li></ul>	ASTM C31
Freeze-Thaw Durability	Greater than 80% at 300 cycles	ASTM C666 Procedure A
Shrinkage	No greater than 0.050 percent at 28 days	ASTM C157 as modified by ASTM C928
Hardened Air Content	Spacing Factor $\leq 0.008$	ASTM C457

C. Fine Aggregate Requirements

If required to meet the hardened concrete properties, provide a fine aggregate that is dried, blended, and packaged with the Non-Shrink Rapid Hardening, Cementitious Material for Dowel Bar Retrofit. Field additions of fine aggregate is not allowed.

D. Coarse Aggregate Requirements

If required to meet the hardened concrete properties, on site addition of coarse aggregate extender is allowed in accordance with the following:

- (1) Limit the coarse aggregate extension to the manufacturer's recommended maximum or to a maximum of 50 percent by mass, whichever is less,
- (2) Limit coarse aggregate extension to same source/same percent mass extension as was utilized in the AMRL certified laboratory trial-batch testing,
- (3) Meets aggregate quality requirements of Standard Specification 3137.2.D.3, and
- (4) In accordance with Standard Specification 3137, provide a coarse aggregate meeting the gradation requirements of either MnDOT CA-80 or ASTM #89.

**Table 2**  
**Coarse Aggregate Designations for DBR Backfill**  
**(Percent by weight passing square opening sieves)**

<b>Sieve Sizes</b>	<b>ASTM #89</b>	<b>MnDOT CA-80</b>
<b>1/2 inch</b>	<b>100</b>	<b>-</b>
<b>3/8 in</b>	<b>90-100</b>	<b>100</b>
<b>No.4</b>	<b>20-55</b>	<b>55 – 95</b>
<b>No.8</b>	<b>5-30</b>	<b>-</b>
<b>No.16</b>	<b>0-10</b>	<b>-</b>
<b>No.50</b>	<b>0-5</b>	<b>0 - 5</b>

E. Testing

Provide Independent Testing from an AMRL independent Laboratory for each material. Perform testing in accordance with ASTM Standards and MnDOT Methods as detailed.

Required testing procedures:

- (1) ASTM C928 test results performed on Non-Shrink Rapid Hardening Cementitious Material

- (2) ASTM C928 test results performed using the same exact proposed coarse aggregate extender in the Non-Shrink Rapid-Hardening Cementitious Material
- (3) ASTM C666 Procedure A, Test results for Freeze-Thaw Durability
- (4) ASTM C39 Compressive Strengths at 3 hours, 1, 7 and 28 days required by ASTM C928. In addition, cast additional test specimens (sets of 3) and test at 4, 5, 6, 8, and 36 hours.
- (5) ASTM C457, Determination of Air-Void System in Hardened Concrete.
- (6) ASTM C143 Test method for Slump of hydraulic-Cement Concrete, modified by ASTM C928, include manufacturer's minimum/maximum slump test requirements for DBR repairs on the test report.

The Concrete Engineer will consider the mix design and passing tests as a MnDOT Approved/Qualified Product for a period of 5 years. The Concrete Engineer will not require new testing within a 5-year period as long as all the constituents and proportions of the concrete mix are the same as the original mix design

#### F. Approval Requirements

Along with the required test data/test reports from the AMRL certified laboratory, provide the following:

- (a) Provide as tested concrete mix design
- (b) A signed letter from the Rapid-Hardening Cementitious Material manufacturer stating the means and methods specified in both MnDOT Special Provision 2302 and outlined on the Dowel Bar Retrofit detail sheets are acceptable procedures.
- (c) Provide any field testing requirements recommended by the manufacturer of the Rapid Hardening Concrete Material, if any.

#### G. Field Certification

In accordance with specification 2302 (Concrete Pavement Rehabilitation,) the Engineer will require the Contractor to take cores to verify both placement and bonding of the approved concrete material. Refer to Spec 2302 for DBR warranty requirements.

#### H. Non-Compliance

If future samples of these materials do not meet MnDOT specifications including satisfactory placement and performance, the product may be removed from the approved product list and subject to other failing material procedures.

Please also note that it is the manufacturer's responsibility to immediately notify MnDOT if the chemical formulation of any product is changed or modified, or if the product is no longer being produced. If our testing determines that the chemical formulation has changed, without prior notification from the manufacturer, the product may be removed from the approved product list.

The list of approved products may be found on the MnDOT Concrete website at <http://www.dot.state.mn.us/products/index.html>

Reference samples, test data, and certification shall be sent to:

MnDOT Office of Materials and Road Research  
Attention: MnDOT Concrete Engineering Unit  
1400 Gervais Avenue  
Maplewood MN 55109  
Tel. (651-366-5523)