Bridge Material Testing Specification for Non-Shrink Grouts

Government of Alberta

Transportation and Economic Corridors – Technical Standards Branch

B387 – March 26, 2025

Scope: This specification contains approval procedures and requirements necessary for qualifying products for use as flowable non-shrink cementitious grouts for bridge structures.

1. General

1.1. Introduction

Non-shrink and non-staining cementitious grouts are used for bridge bearing and bridgerail post grout pads. These pads are subject to significant load, freeze-thaw cycles, and exposure to deicing salts; and are sometimes installed during cold weather conditions. To ensure full bearing contact, the grouts are required to be highly flowable and non-shrinking.

This specification covers the supply of packaged, dry cementitious grouts for the use in bridge grout pads. All materials and aggregates must be included as a component of the packaged product and only the mixing liquid, and if applicable extension aggregates as specified by the manufacturer, are to be added in the field. The current edition of all reference documents and standards shall be applied at the time of testing.

Before testing begins, contact the Bridge Materials Engineer with a list of products to be tested for a prescreening discussion. Provide product data sheets, safety data sheets, and any additional information that may assist in evaluating the product's suitability, such as a list of trial projects and their outcomes. Note that certain types of products may require additional testing.

2. Approval Procedure

2.1. Arrangements for Testing

The Supplier/Manufacturer shall have his product tested for approval according to the procedures as outlined in this specification. Once reviewed and approved, the product will be included on the Department's Products List. Testing shall be completed at the Supplier or Manufacturer's expense.

The tests shall be carried out by an independent laboratory certified to CSA A283 or AASHTO R18 with accompanying accreditation by a reputable Canadian or American accreditation body (CCiL, SCC, CALA, CCRL, etc.). A copy of the valid accreditation certificate for the applicable scope of work shall be included as part of the submission package.

2.2. Submission Requirements

At minimum, submissions shall contain the following:

- Product name
- Date of manufacturing and product batch/lot number
- Shelf life
- Product bulletins (if available)
- Technical product data sheet (including product description, recommended applications, installation and working temperatures, advantages, limitations, etc.)
- Comprehensive mixing and installation instructions (including requirements for surface preparation, mixing, application, finishing, curing, clean-up, limitations, etc.)
- Material safety data sheet
- Water to dry grout ratio
- Quality control test reports
- Photographs of packaging and required expiry date markings

- Laboratory test report including all required individual qualifying test results.
- Updated list of Alberta based suppliers/distributors
- Applicable and current lab qualification certificate(s)

Submissions shall be forwarded by the Supplier/Manufacturer to:

Alberta Transportation
Technical Standards Branch
2nd Floor, Twin Atria Building
4999 - 98 Avenue N.W.
Edmonton, Alberta, T6B 2X3

Attention: Tyler Donovan, M.Eng., P.Eng.
Bridge Materials Engineer
tyler.donovan@gov.ab.ca
780-641-9482

Test results will become the property of the Department. The Department reserves the right to publish the test information for public use. Results of testing may be submitted at any time provided all the requirements are met. The Department will update the Products List after a review has been undertaken to ensure that all requirements are satisfied.

2.3. Evaluation of Test Results

The test results will be evaluated as per tests listed in Table 1, Physical Property Requirement for Non-Shrink Grout, Supplier/Manufacturer's product data sheet and materials safety data sheet. Product batch numbers, designation, date of manufacture and comments as to the products workability shall be shown. The water to dry grout ratio shall be reported.

3. Testing Requirements

3.1. Sample Mixing and Casting

The sample of dry grout submitted to the testing laboratory shall be large enough to allow all the samples for the required tests to be cast from the same batch. The batch shall be prepared, mixed, placed and cured according to Manufacturer's directions and the requirements of this specification. All test specimens shall be prepared using the highest water-to-solids ratio, maximum flow, or most fluid consistency stated on the packaging; and shall remain in the mixing apparatus for the maximum usable working time or pot life specified by the manufacture. The use of accelerators will not be permitted.

All material and equipment shall be conditioned to a temperature of 23°C (± 2°C) for mixing and placement operations.

3.2. Curing

Curing of freshly placed grout shall be maintained at 23°C (± 2°C) and 50% (± 4%) relative humidity until the grout has reached its final set when wet curing shall commence.

Forms/molds shall be left in-place and the exposed grout surfaces wet cured using potable water and 2 layers of white colored filter fabric (such as Nilex 4504 or an equivalent product approved by the Department). Wet curing shall be completed for 72±1/2 hours after placement.

After the 72-hour curing period, maintain the specimen at 23°C (± 2°C) and 50% (± 4%) relative humidity until the remaining tests are conducted.

3.3. Requirements for Non-Shrink Grout

The non-shrink grout sample when mixed with the prescribed amount of mixing liquid shall meet the following physical property requirements:

TABLE 1: PHYSICAL PROPERTY REQUIREMENTS FOR NON-SHRINK GROUTS

Property	Test Method	Requirements
Flow (Fluid Grout)	ASTM C939	10 seconds to 30 seconds
Early Height Change	ASTM C827	≥ 0% to ≤ 4.0%
Hardened Expansion at 28 days	ASTM C1090	≥ 0% to ≤ 0.3%

Initial Time Set	ASTM C403	≥ 1.0 hour to ≤ 6.0 hours
Final Time Set	ASTM C403	≤ 10.0 hours
Bleeding	ASTM C940	≤ 2.0%
Compressive Strength	ASTM C109	≥ 7.0 MPa (at 1 day) ≥ 17.0 MPa (at 3 day) ≥ 24.0 MPa (at 7 day) ≥ 34.0 MPa (at 28 day)
Linear Shrinkage	ASTM C157M*	< 0.05% (at 28 days)
Freezing and Thawing Resistance	ASTM C666	Durability Factor (D.F.) > 80
Yield and Unit Weight	ASTM C138	≤ 2.0%

*As modified by this specification

3.3.1. Flow

The flow shall be measured in accordance with ASTM C939, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method). The test should be conducted when the grout is in fluid state.

3.3.2. Early Height Change

Early height change shall be measured in accordance with ASTM C827, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures. The early height change shall be reported in percent positive (+) for increase or percent negative (-) for decrease.

3.3.3. Hardened Expansion

Hardened volume change shall be measured in accordance with ASTM C1090, Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout. The hardened volume expansion in percent shall be reported at ages of 1, 3, 14, and 28 days.

3.3.4. Time of Set

Time of set for both initial and final set shall be measured in accordance with ASTM C403, Standard Test Method for time of Setting of Concrete Mixtures by Penetration Resistance.

3.3.5. Bleeding

Bleeding shall be measured in accordance with ASTM C940, Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced Aggregate Concrete in the Laboratory.

3.3.6. Compressive Strength

Compressive strength shall be measured in accordance with CSA A23.2-1B, Testing for Properties of Flowable Grout. Compressive strength for the test specimens shall be reported at ages of 1, 3, 7, and 28 days.

3.3.7. Linear Shrinkage

Linear Shrinkage shall be measured in accordance with ASTM C157M, Standard Test Method for Length Change of Hardened Cement Mortar and Concrete, as modified in this section. The samples shall be 76x76x275 mm regardless if the material is neat or extended with aggregate. Samples shall be removed from moulds at 24±1/2 hours and make initial comparator readings. Samples are then to be wet cured for the remainder of the 72h±1/2 hours before being stored under 23±2°C and 50±4% RH for the remaining testing. Measurements shall be reported at ages of 1, 3, 7, 28, 56, and 90 days.

3.3.8. Freezing and Thawing Resistance

Freezing and thawing resistance shall be measured in accordance with ASTM C666, Procedure A, Rapid Freezing and Thawing in Water. At 300 cycles of testing, the durability factor calculated to the nearest whole number and the relative dynamic modulus should be reported.

3.3.9. Yield and Unit Weight

Yield shall be measured in accordance with ASTM C138, Standard Test Method for Density, Yield, and Air Content.

3.3.10. Calcium Aluminate Content

Calcium aluminate shall not be permitted and shall be reported by the independent testing laboratory.

4. Packaging

4.1. Quality and Size

Bags shall be multi-layered with the outer layer of strong paper and the inner layers of waterproof material.

Maximum weight allowed in a bag is 25 kg. The net weight in each bag shall not vary by more than 2% from that printed on the bag. The volumetric yield shall not vary by more than 2% from that printed on the bag.

4.2. Marking

The following information shall be marked on the outside of each bag:

(a) Product name
(b) Manufacturer's name
(c) Batch number
(d) Weight of bag
(e) Date product was manufactured
(f) Shelf Life
(g) Yield in cubic meter when mixed with recommended amount of liquid
(h) Mix instructions including recommended amount of water or other liquid component or both to be mixed with the package contents.
(i) The recommended length of mixing time or sequence of mixing (or sequence of mixing and resting time in minutes)
(j) Curing recommendations
(k) Photographs of the packaging markings shall also be submitted

5. Approval and Quality Control

5.1. Approved Product

Products meeting this specification will be considered for approval. The approved products will appear on the Department's Product List accompanied by its name, manufacturer, and Alberta based suppliers/distributors (comprehensive list of Alberta based suppliers to be provided and updated as required by the Manufacturer).

Baring unsatisfactory performance, the approval is valid for 5 years from the date of approval. It will be the responsibility of the Supplier/Manufacturer to retest his product, at his own expense, prior to the end of the 5-year period. The Department will not notify the Supplier/Manufacturer of the expiry date.

Any subsequent change in product formulation or future amendments/changes to the Specification for Concrete Patching Material – B387 will require a retest for re-approval at the Supplier/Manufacturer's expense.

5.2. Quality Control

The Manufacturer shall be responsible for quality control of the product. He shall sample and test the material as necessary during production to ensure that all material conforms to these specifications, and is consistent with the sample of material that was tested and approved. When requested by the Department, the Manufacturer will submit the quality control data within 30 days. Any change in the product will require a requalification at the Supplier's/Manufacturer's expense.

5.3. Right to Reject

The Department reserves the right to reject material and withdraw the product from the Department's Product List should it not continue to meet these specification requirements.

The material shall meet or exceed the requirements of all qualifying tests, and shall perform adequately in the field. Unsatisfactory performance, whether short term or long term, may result in removal from the Department's Product List. Grounds for removal will be determined at the sole discretion of the Department.