

ALBERTA TRANSPORTATION
TECHNICAL SERVICES BRANCH

B387 – August 2017

SPECIFICATION FOR NON-SHRINK GROUTS

SCOPE – This specification contains approval procedures and requirements necessary for qualifying products for use as flowable non-shrink cementitious grouts.

1.0 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. Only the mixing liquid, as specified by the manufacturer, is to be added in the field.

The current edition of all reference documents and standards shall be applied at the time of testing.

2.0 APPROVAL REQUIREMENTS

2.1 ARRANGEMENT 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 Product List.

The tests are to be carried out by an independent laboratory certified to CSA A283 or AASHTO R18 with accompanying accreditation from the Concrete

2.2 SUBMISSION REQUIREMENTS

Submissions shall contain the following:

- Product name;
- Date of manufacturing and product batch/lot number;
- Shelf Life;
- Product Bulletins (if available);
- Product data sheet;
- Material safety data sheet;

- Instructions for mixing including recommended amount of water or other liquid component or both to be mixed with the package contents. The sequence of mixing, recommended mixing times and resting time in minutes;
- Instructions for curing;
- Water to dry grout ratio;
- Photographs of packaging and required markings and;
- Laboratory test report including all required individual qualifying test results.

Submissions shall be forwarded by the Supplier/Manufacturer to:

Alberta Transportation
Technical Services Branch
2nd Floor, Twin Atria Building
4999, 98 Avenue N.W.
Edmonton, Alberta T6B 2X3
Attention: Junaid Iqbal, P.Eng.
Telephone: (780) 422-9970
Fax: (780) 422-5426

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.

3.0 QUALIFYING TESTS

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 mixed and cured according to manufacturer's directions and the requirements of this specification. All material and equipment shall be brought to a temperature of 23⁰C ($\pm 2^0$) and maintained at this temperature for the duration of the test.

3.2 CURING

Exposed grout shall be wet cured using water and 2 layers of light colored filter fabric such as Nilex 4504 or an equivalent product approved by the department.

3.3 REQUIREMENTS FOR NON-SHRINK GROUT

The non-shrink grout sample when mixed with the prescribed amount of mixing liquid shall meet the physical property requirements of Table 1.

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 ASTM C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

Compressive strength for the test specimens shall be reported at ages of 1, 3, 7, and 28 days.

3.3.7 Drying Shrinkage

Drying Shrinkage shall be measured in accordance with ASTM C596, Standard Test Method for Drying Shrinkage on Mortar Containing Hydraulic Cement.

Drying Shrinkage, in percent, shall be reported at an age of 28 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

4.0 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:

- Product name;
- Manufacturer's name;
- Batch number;
- Weight of bag;

- Date product was manufactured;
- Shelf Life;
- Yield in cubic metre when mixed with recommended amount of liquid;
- Mix instructions including recommended amount of water or other liquid component or both to be mixed with the package contents.
- The recommended length of mixing time or sequence of mixing time (Or sequence of mixing and resting time in minutes)
- Curing recommendations and
- Photographs of the packaging markings shall also be submitted.

5.0 ADDITIONAL REQUIREMENTS

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 type, name, and manufacturer and Alberta supplier.

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.

TABLE 1**Physical Property Requirements for Non-Shrink Grouts**

Property	Test Method	Requirements for Type 1 Grouts
Flow (Fluid Grout)	ASTM C939	> 10 sec. < 30sec.
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 to ≤ 6.0 hours
Final Time Set	ASTM C403	≤ 10 hours
Bleeding	ASTM C940	≤ 2.0%
Compressive Strength <ul style="list-style-type: none">▪ 1 day▪ 3 days▪ 7 days▪ 28 days	ASTM C109	≥ 7.0 MPa (1 day) ≥ 17.0 MPa (3 days) ≥ 24.0 MPa (7 days) ≥ 34.0 MPa (28 days)
Drying Shrinkage	ASTM C596	< 0.10 %
Freezing & Thawing Resistance	ASTM 666	Durability Factor (D.F) > 80
Yield and Unit Weight	ASTM C138	≤ 2.0%