

ALBERTA TRANSPORTATION
TECHNICAL STANDARDS BRANCH

B387 - JULY 2000

SPECIFICATION FOR NON-SHRINK GROUT

SCOPE - The approval requirements necessary prior to certification of the product for use as a Type 1 or Type 2 non-shrink grout are specified.

1.0 GENERAL

1.1 INTRODUCTION

This specification covers the requirements for non-shrink cement grouts which are cementitious, gas producing, non-metallic and expansive. Only the mixing liquid, as specified by the manufacturer, is to be added in the field.

The specification covers the approval requirements for certification of all non-shrink grouts to be used in the flowable condition. Non-shrink, non-staining grout is used for bridge bearing and bridgerail post grout pads. These pads are subject to freeze-thaw cycles and exposure to deicing salts.

The current edition of the time of testing shall apply for codes and standards referred to within this specification.

2.0 APPROVAL REQUIREMENTS

2.1 ARRANGEMENT FOR TESTING

The Supplier/Manufacturer shall engage an independent engineering testing laboratory for the purpose of completing the qualifying tests as outlined in the specification. The results of the qualifying tests, product data sheet and safety data sheet for each product, shall be submitted to the Department for review.

The tests are to be carried out by an independent, CSA certified laboratory at the Supplier/Manufacturer's expense.

The test results shall be submitted by the Supplier/Manufacturer to:

Alberta Transportation
Technical Standards Branch
2nd Floor, Twin Atria Building
4999 - 98 Avenue
Edmonton, Alberta T6B 2X3
Attention: Dave Besuyen, Bridge Materials Engineer
Telephone: (780) 415-1037 ; Fax: (780) 422-5426

The test report when submitted will become the property of the Department.

The Department reserves the right to publish the test information for their own or public use. The testing may take place and the results submitted at any time provided all the requirements are met. The Department will update the approval list after a review has been undertaken to ensure the specification requirements are satisfied.

2.2 LABORATORY TEST REPORT

The report prepared by the testing laboratory shall include all the results from the tests listed in Table 1 Physical Property Requirement for Non-Shrink Grout, Supplier/Manufacturer's product data sheet and 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, except when approving Type 2 non-shrink grout the temperature shall be 10⁰C ($\pm 2^0$) for the initial and final set tests only.

3.2 REQUIREMENTS FOR NON-SHRINK GROUT

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

3.2.1 Flow

The flow shall be measured in accordance with CAN/CSA A23.2-1B, Viscosity, Bleeding, Expansion and Compressive Strength of Flowable Grout.

3.2.2 Early Volume Change

Early volume 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.

3.2.3 Hardened Volume Change

Hardened volume change shall be measured in accordance with CRD-C621, Standard of Corps of Engineers U.S. Army Specification for Non-Shrink Grout.

3.2.4 Time of Set

Time of set for both initial and final set shall be measured in accordance with ASTM C807, Test Method for Time of Setting of Hydraulic Cement Mortar by Vicat Needle, except when approving Type 2 non-shrink grout the temperature shall be 10⁰C ($\pm 2^0$).

3.2.5 Bleeding

Bleeding shall be measured in accordance with CAN/CSA A23.2-1B, Viscosity, Bleeding, Expansion and Compressive Strength of Flowable Grout.

3.2.6 pH

The pH shall be measured in accordance with ASTM C110, Standard Test Method for Physical Testing of Quicklime, Hydrated Lime, and Limestone.

The test shall be performed on a powdered sample of the hardened non-shrink grout.

3.2.7 Compressive Strength and Unit Weight

Compressive strength shall be measured in accordance with CAN/CSA A23.2-1B, Viscosity, Bleeding, Expansion and Compressive Strength of Flowable Grout. Compressive strength test and unit weights shall be performed for 7 day and 28 day old grout.

3.2.8 Salt Scaling

Salt scaling shall be measured in accordance with ASTM C672, Standard Test Method for Scaling Resistance of Concrete Surface Exposed to Deicing Chemicals. This test method determines the resistance to scaling of a horizontal surface exposed to freeze-thaw cycles in the presence of deicing chemicals.

The following additions will apply to this test:

- (a) Proportioning - the patching product shall be prepackaged by the supplier.

- (b) Specimen - The dike is to be placed on the under or formed side of the specimen. To ensure all form oil is removed the formed surface shall be prepared by light sandblast with an approximate 15 grams of material removed.
- (c) Mixing and Testing - machine mix and test with the applicable provisions of CSA CAN3-A5.
- (d) Curing - to be for a period of 14 days, the first 7 days to be the regular moist and the last 7 days dry cure.
- (e) Salt Solution - the deicing salt shall consist of sodium chloride and water having a concentration such that each 100 ml of solution contains 3 grams of sodium chloride.
- (f) Mass Loss - in addition to the visual examination and rating, after each 10 cycles, remove the salt solution together with all the flaked off concrete from the surface and place into a watertight container. The operation is best accomplished by tilting the slab into a funnel approximately 500 mm in diameter and washing the surface of the specimen with the salt solution. The washing should continue until all loose particles are removed from the concrete. The solution shall then be strained through a filter and the residue dried out in an oven at 105⁰C to a constant mass condition. The residue shall be cumulatively weighed after each 10 cycles. This residue shall be defined as the loss of mass and expressed in kilograms per square metre of exposed slab area. The loss of mass shall be calculated to the nearest 0.001 kg/m².
- (g) Report - measure and report cumulative weight after every 10 cycles, as kg/m².

Specimens for all product types shall have the mass loss determined every 10 cycles until 50 cycles have been completed.

3.2.9 Yield and Unit Weight

Yield shall be measured in accordance with ASTM C387 using the recommended mixing liquid and amount.

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. The waterproof material shall have a water vapour transmission not greater than 100 g/m² in 24 hours as determined in accordance with Procedure B of ASTM Test Method E96

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
- (c) Batch number
- (d) Weight of bag
- (e) Date material was manufactured.
At time of shipping the product must not have been manufactured for more than 30 days.
- (f) Shelf Life
- (g) Yield in cubic feet 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. The sequence of mixing, recommended mixing times and resting time in minutes.
- (i) Curing recommendations.

5.0 ADDITIONAL REQUIREMENTS

5.1 QUALITY CONTROL

The Supplier/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 re-test at the Supplier's/Manufacturer's expense.

5.2 RIGHT TO REJECT

The Department reserves the right to run laboratory tests, reject material, and withdraw approval of the product that does not meet the requirements of the specifications.

The material shall meet or exceed all qualifying tests, and shall perform adequately in the field. Unsatisfactory performance, whether short term or long term, shall be grounds for withdrawal of the approval.

TABLE 1
Physical Property Requirements for Non-Shrink Grout

Property	Test Method	Requirements for Type 1
Flow	CAN/CSA A23.2-1B	> 20 sec. < 30 sec.
Early Volume Change	ASTM C827	≥ 0.5 to ≤ 6.0%
Hardened Volume Change	CRD C621	≥ 0.03 to ≤ 0.4%
Initial Time Set	ASTM C807	≥1.0 to ≤ 6.0 hours
Final Time Set	ASTM C807	≤ 10 hours
Bleeding	CAN/CSA A23.2-1B	≤ 2.0%
pH	ASTM C110	≥ 11.0 to ≤ 13.5
7 Day Compressive and Unit Weight	CAN/CSA A23.2-1B	≥ 25 MPa
28 Day Compressive and Unit Weight	CAN/CSA A23.2-1B	≥ 35 MPa
Salt Scaling at 50 cycles	ASTM C672	≤ 0.500 kg/m ²
Yield and Unit Weight	ASTM C387	≤ 2.0%

NOTE: Type 2 Non-Shrink Grout shall meet all the requirements of Type 1 above except the following:

Initial Time Set	ASTM C807* ≥ 1.0 to ≤ 6.5 hours
Final Time Set	ASTM C807* ≤ 13.0 hours

* - except test temperature shall be 10⁰C (±2⁰C)