



Designation: C 1107 – 02

Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)¹

This standard is issued under the fixed designation C 1107; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers three grades of packaged dry, hydraulic cement grout (nonshrink) intended for use under applied load (such as to support a structure, a machine, and the like) where a change in height below initial placement height is to be avoided.

1.2 Grouts covered are composed of hydraulic cement, fine aggregate, and other ingredients. They require only the addition of mixing water for use.

1.3 The values stated in SI units are to be regarded as the standard. The inch-pound units in parenthesis are for information only. Values in SI units shall be obtained by measurement in SI units or by appropriate conversion of measurements made in other units, using the Rules of Conversion and Rounding given in IEEE/ASTM SI-10.

1.4 The following safety hazards caveat pertains only to the test method portion of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)²

C 125 Terminology Relating to Concrete and Concrete Aggregates³

C 138/C 138M Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete³

C 157/C 157M Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete³

C 185 Test Method for Air Content of Hydraulic Cement Mortar²

C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency²

C 702 Practice for Reducing Field Samples of Aggregate to Testing Size³

C 827 Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures³

C 939 Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)³

C 1090 Test Method for Measuring Change in Height of Cylindrical Specimens for Hydraulic-Cement Grout³

C 1437 Test Method for Flow of Hydraulic Cement Mortar²

IEEE/ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 Consistency:

3.1.2 *flowable, adj*—a grout consistency having a flow of 125 to 145 by the flow test in accordance with the applicable provisions of Test Method C 1437; the flow after 5 drops of the flow table in 3 s.

3.1.3 *fluid, adj*—a grout consistency having a time of efflux of 10 to 30 s when tested by the flow cone procedure of Test Method C 939.

3.1.4 *plastic, adj*—a grout consistency having a flow of 100 to 125 by the flow test in accordance with the applicable provisions of Test Method C 1437; the flow after 5 drops of the flow table in 3 s.

3.2 Description of Terms Found in Terminology C 125:

3.2.1 *grout (nonshrink), hydraulic-cement, n*—a hydraulic-cement grout that produces a volume that, when hardened under stipulated test conditions, is greater than or equal to the original installed volume; often used as a transfer medium between load-bearing members.

¹ This specification is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.43 on Packaged Dry Combined Materials.

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² Annual Book of ASTM Standards, Vol 04.01.

³ Annual Book of ASTM Standards, Vol 04.02.

⁴ Annual Book of ASTM Standards, Vol 14.04.

4. Classification

4.1 This specification covers three grades of grout, classified in accordance with the volume-control mechanism exhibited by the grout after being mixed with water.

4.1.1 *Grade A Pre-Hardening Volume-Adjusting*—Volume control of grout is caused by expansion before hardening occurs.

4.1.2 *Grade B Post-Hardening Volume-Adjusting*—Volume control of grout is caused by expansion after grout hardens.

4.1.3 *Grade C Combination Volume-Adjusting*—Volume control of grout is caused by a combination of both mechanisms.

5. Ordering Information

5.1 When the purchaser specifies that properties of the packaged, dry grout meet the requirements of this specification (see 15.1), the grade of grout desired shall also be specified and which, if any, of the optional requirements apply.

5.2 When the grout is to be used in contact with stressed tendons or other corrosion-sensitive, load-bearing structural members, the purchaser shall supply this information to the manufacturer and obtain assurances that the material meets relevant chloride, nitrite, nitrate, sulfide, and sulfate requirements, and any other material limitations imposed by the applicable codes and standards (Note 1).

5.3 When the grout is to be used in abnormal or aggressive environments, the purchaser shall supply this information to the manufacturer and obtain assurance that the grout has a successful history of performance in the same or similar exposures.

NOTE 1—Since all conditions of use cannot be anticipated, this specification requires nonshrink grout to exhibit no shrinkage when tested in a laboratory-controlled, moist-cured environment, and requires only the reporting of the observed height change, usually shrinkage, when test specimens are subjected to some degree of drying. It is suggested that users consult with manufacturers on specific applications to determine the applicability of specific test results.

6. Materials

6.1 The materials used as ingredients in packaged, dry, grout include hydraulic cement, fine aggregate, and other ingredients.

7. Performance Requirements

7.1 Specimens shall be made from freshly mixed grout and from grout that has been retained in the mixer for the maximum usable working time allowed by the manufacturer. Specimens from both conditions shall meet the requirements prescribed in Table 1.

7.2 Specimens shall be prepared using materials and equipment at temperatures representing the maximum and minimum usable temperatures specified by the manufacturer for his product. Specimens from both conditions shall meet the requirements prescribed in Table 1, except that the compressive-strength requirements do not have to be met at minimum usable temperature.

7.3 Specimens for testing shall be prepared by combining the use of grout retained in the mixer as in 7.1 with the minimum and maximum as mixed and curing temperatures

TABLE 1 Performance Requirements

Compressive Strength, min	MPa		(psi)
	1 day ^A	7.0	
3 day	17.0		(2500)
7 day	24.0		(3500)
28 day	34.0		(5000)
Grade Classification	-A ^B - Pre-hardening Volume Controlled Type	-B ^C - Post-hardening Volume Controlled Type	-C- Combination Volume Controlled Type
Early Age Height Change			
Max % @ Final Set	+ 4.0	NA	+ 4.0
Min % @ Final Set	0.0	NA	0.0
Height Change of Moist Cured Hardened Grout at 1, 3, 14 and 28 Days			
Maximum, %	NA	+ 0.3	+ 0.3
Minimum, %	0.0	0.0	0.0

^A When required, the purchaser must so specify in the purchase contract.

^B If posthardening expansion occurs during evaluation of a Grade A material, then the material shall be evaluated according to Grade C criteria.

^C If prehardening expansion occurs during evaluation of a Grade B material, then the material shall be evaluated according to Grade C criteria.

used in 7.2. Specimens from these combinations of conditions shall meet the requirements of Table 1, except that the compressive-strength requirements do not have to be met at minimum usable temperature.

7.4 All test specimens for performance evaluation shall be prepared using the highest water to solids ratio suggested by the manufacturer for his product.

8. Sampling

8.1 Use whole packages of grout selected at random from the lot of grout to be examined.

8.2 Where lesser quantities of grout will serve the purpose, select 3000 g (7 lb) of dry grout from a whole package in accordance with the mechanical-splitter method in Practice C 702. For high-density grouts, adjust the mass to provide an equivalent volume.

9. Batching

9.1 Grout mixtures shall be produced in the following conditions:

9.1.1 Batch grout mixtures at temperature conditions corresponding to the maximum recommended temperature limit and at a temperature corresponding to the minimum temperature stated by the manufacturer.

9.1.2 For standard temperature testing, maintain the grout mixture and the testing equipment at a temperature of $23 \pm 3^\circ\text{C}$ ($73 \pm 5^\circ\text{F}$).

9.2 Bring all materials and equipment to be used in preparing test specimens to the specified test temperature, $\pm 3^\circ\text{C}$ ($\pm 5^\circ\text{F}$) prior to use.

9.2.1 When the controlled-environment test room is too small to accommodate large equipment, immediately prior to use, bring the mixer to the desired testing temperature by filling it with water at the appropriate temperature and agitating it by