



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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

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 inch-pound units are to be regarded as the standard. The SI units in parentheses are for information only.

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 138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete³
- C 157 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

¹ This specification is under the jurisdiction of ASTM Committee C-9 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.

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

3. Classification

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

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

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

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

4. Ordering Information

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

4.2 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).

4.3 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.

5. Materials

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

6. Performance Requirements

6.1 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.

6.2 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.

6.3 Specimens for testing shall be prepared by combining the use of grout retained in the mixer as in 6.1 with the minimum and maximum as mixed and curing temperatures used in 6.2. 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.

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

7. Sampling

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

7.2 Where lesser quantities of grout will serve the purpose, select 7 lb (3000 g) 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.

8. Batching

8.1 Grout mixtures shall be produced in the following conditions:

8.1.1 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.

8.1.2 For standard temperature testing, maintain the grout mixture and the testing equipment at a temperature of $73.4 \pm 5^\circ\text{F}$ ($23 \pm 2.8^\circ\text{C}$).

8.2 Bring all materials and equipment to be used in preparing test specimens to the specified test temperature, $\pm 5^\circ\text{F}$ ($\pm 2.8^\circ\text{C}$) prior to use.

8.2.1 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 turning the mixer on. When this water has stabilized at the desired temperature, discard it and start preparing the batch immediately.

8.3 The manufacturer may permit, in the package instructions, adjusting the mixing water temperature to achieve limitations imposed on the grout use temperatures. Use of this technique shall not abrogate the extended mixing time requirement of this specification.

9. Proportioning

9.1 The minimum and maximum amount of water recommended by the manufacturer on the package shall be used to determine conformance with the requirements of this specification. If the manufacturer provides maximum flow (thinnest consistency) information on the package, conduct consistency tests to an accuracy of $\pm 5\%$ to determine the amount of water to be added for testing. In either case, express the weight of water so determined as a ratio of water to dry grout material by weight. If both are given, make tests at whichever involves the larger amount of water by ratio of dry grout mixture.

10. Mixing

10.1 *Apparatus:*

10.1.1 *Mixer for Preliminary Adjustments*—For smaller quantities of grout, the mortar-mixing apparatus shall be as specified in Practice C 305. However, the mixer may be provided with a bowl positioner to enable clearance of the largest sized aggregate in the mixture being tested.

10.1.2 *Mixer for Grout Performance Qualifications*—A 3-ft³ capacity mortar mixer (Note 2) is required. The mixer shall be clean, pre-wet, and drained and essentially free of hardened mortar and other foreign material that can be removed with a trowel or by reasonably striking with a hammer.

NOTE 2—An electric motor-driven mixer is preferable in the laboratory to avoid noise and exhaust fumes. The horizontal revolving blades are preferred to have rubber tips that contact and wipe the sides of the stationary tub for the most efficient mixing. For greater safety, the mixer should be equipped with a lever-operated clutch. While these comments are selected safety precautions, it is the user's responsibility to see that any equipment in use is not hazardous in a physical or mechanical way to operators and attendant personnel, and that safe work practices are required at all times.

10.2 *Mixing Procedure for Preliminary Adjustment:*

10.2.1 Use a 7-lb (3000-g) sample to determine the consistency classification and to determine the water content of grout tested at a maximum flowability.

10.2.2 For less than whole package amounts, weigh all grout on a balance or on a platform scale to the nearest 0.1 %.

TABLE 1 Performance Requirements

Compressive Strength, min	psi	(MPa)		
1 day ^A	1000	(6.9)		
3 day	2500	(17.2)		
7 day	3500	(24.1)		
28 day	5000	(34.5)		
Grade Classification	-A- Prehardening Volume Controlled Type	-B- 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.