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

This standard is issued under the fixed designation C 1107/C 1107M; 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 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.

1.3The1.3 The values stated in either SI units or inch-pound units shall are to be regarded separately as standard. The values stated in each system aremay not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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:*[2]

C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
C 125 Terminology Relating to Concrete and Concrete Aggregates
C 138/C 138M Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C 157/C 157M Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
C 185 Test Method for Air Content of Hydraulic Cement Mortar
C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
C 702 Practice for Reducing Samples of Aggregate to Testing Size
C 827 Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
C 939 Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
C 1090 Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout
C 1437 Test Method for Flow of Hydraulic Cement Mortar

iTeh Standards (https://standards.iteh.ai) Document Preview
https://standards.iteh.ai/catalog/standards/sist/128e0095-0085-4cc3-8e81-af74f7e18775/astm-c1107-c1107m-08

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology C 125.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *Consistency:*

3.2.2*flowable*consistency, flowable, *adj*n—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.

3.2.3*fluid*

3.2.2 *consistency, fluid*, *adj*n—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.

3.2.4*plastic*

3.2.3 *consistency, plastic*, *adj*n—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.

[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] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard.**

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4. Ordering Information

4.1 When the purchaser specifies that properties of the packaged, dry grout meet the requirements of this specification, also specify 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 (See 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.

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

6.4 All test specimens for performance evaluation shall be prepared using the highest water to solids ratio, maximum flow, or most fluid consistency stated on the package.

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 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.

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 23 ± 2 °C [73.5 ± 3.5 °F].

8.2 Bring all materials and equipment to be used in preparing test specimens to the specified test temperature, ± 3 °C [± 5 °F] prior to use.

TABLE 1 Performance Requirements

Compressive Strength, min	MPa	[psi]
1 day[A]	7.0	[1000]
3 day	17.0	[2500]
7 day	24.0	[3500]
28 day	34.0	[5000]
Early Age Height Change Max % @ Final Set	+ 4.0	
Height Change of Moist Cured Hardened Grout at 1, 3, 14 and 28 Days		
Maximum, %	+ 0.3	
Minimum, %	0.0	

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

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 is not prohibited from including, in the package instructions, procedures for 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 ±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 Either the mixer described in Practice C 305 or the mortar mixer described in 10.1.2 shall be used for performance qualifications. In the event of a dispute, the mixer described in 10.1.2 shall be used for the referee test.

NOTE 2—The referee test is a test made to settle disagreement as to the conformance to the specified requirements.

10.1.1 ~~*Mixer for Preliminary Adjustments*— For smaller quantities of grout, the mortar-mixing apparatus shall be as specified in Practice C305~~Bench Scale Epicyclic Mixer—The mortar-mixing apparatus shall be as specified in Practice C 305. However, the mixer shall 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 90-L [3-ft~~

10.1.2 *Mortar Mixer*—A 110 to 125-L [4 to 4½-ft^3 ~~]capacity mortar mixer (Note 2) is required. The mixer shall be clean, pre-wetted, 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.~~] capacity horizontal shaft stationary drum mortar mixer (See Note 3) is required. The mortar mixer shall have a metal shell with horizontal mixing blades. The mixing blades shall be angled so that adjacent paddle arms reverse the flow of the grout in the mixing drum during rotation of the horizontal shaft. The mixing blades shall have adjustable wiper blades that wipe the inner surfaces of the mixing chamber. The wiper blades shall be rubber or other flexible, wear-resistant material that does not deleteriously react with the grout mixture. The wiper blades shall be adjusted to continuously wipe the curved inner surface of the mixing chamber below the grout level and the ends of the chamber. The horizontal shaft shall rotate the mixing paddles at 28 to 35 r/min. The mixer shall be clean, pre-wetted, 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.

ASTM C1107/C1107M-08

NOTE ~~2—An~~ 3—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*~~Mixing Procedure for Bench Scale Mixing:

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

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

~~10.2.3Measure the water by mass or volume to the nearest 0.1%.~~

~~10.2.4Mix for 3 min, briefly stopping the mixer (not over 15 s) at 1 min to scrape into the batch any grout that may have collected on the side of the bowl. Use other mixing procedures if recommended by the manufacturer (Note 3).~~

10.2.1 Use a 3000-g [7-lb] sample to determine the consistency classification and to determine the water content of grout tested at maximum flow or most fluid consistency.

10.2.2 Weigh all grout on a balance or on a platform scale to the nearest 0.1 %.

10.2.3 Measure the water by mass or volume to the nearest 0.1 %. If the manufacturer recommends maximum water content, calculate the percent water from the packaging information and use that amount of water to prepare the grout mixture. If the manufacturer recommends maximum flow or most fluid consistency, use the suggested water content as a starting point and adjust water as necessary to achieve the maximum flow or most fluid consistency stated on the package. If the required consistency has not been met, make additional adjustments to estimate the water content to use for the next batch. Discard current batch and repeat with newly established water content.

10.2.4 Place water in the bowl. Start the mixer at speed 1. Add the dry grout material to the water over approximately 30 sec. After 1 min, stop the mixer for 15 sec and scrape into the batch any grout that may have collected on the side of the bowl. Switch to speed 2 and mix for a total of 5 min as measured from first contact of dry material with water. Use other mixing procedures if recommended by the manufacturer.

NOTE ~~3—It is advisable to cover the bowl with a lid while mixing. A metal disc in which a slit has been cut to accommodate the mixer shaft has been~~