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Standard Specification for Hydraulic-Hydrated Hydraulic Lime for Structural Purposes¹

This standard is issued under the fixed designation C141/C141M; 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 hydraulic hydrated lime for structural purposes.~~
~~1.2 Hydraulic hydrated lime may be used in the scratch or brown coat of plaster, stucco, mortar, or in portland-cement concrete either as blend, amendment, or admixture.~~
~~1.3 The values stated in inch-pound units are to be regarded as the standard.*~~
1.1 This specification covers hydrated hydraulic lime for structural purposes.
1.2 Hydrated hydraulic lime may be used in the scratch or brown coat of plaster, stucco, mortar, or in portland-cement concrete either as blend, amendment, or admixture.
1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the inch-pound units are shown in brackets. The values stated in each system may 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 precautionary caveat pertains only to the test method portion, Section ~~10-11~~ 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

- C25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
C50 Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products
C51 Terminology Relating to Lime and Limestone (as used by the Industry)
C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
C150 Specification for Portland Cement
C151 Test Method for Autoclave Expansion of Hydraulic Cement
C184 Test Method for Fineness of Hydraulic Cement by the 150- μ m (No. 100) and 75- μ m (No. 200) Sieves
110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone
C187 Test Method for Normal Consistency of Hydraulic Cement
C191 Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
C230/C230M Specification for Flow Table for Use in Tests of Hydraulic Cement
C266 Test Method for Time of Setting of Hydraulic Cement Paste by Gillmore Needles
270 Specification for Mortar for Unit Masonry
C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
C778 Specification for Standard Sand
E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves
Specification for Standard Sand

3. Terminology

3.1 Definitions:

- 3.1.1 *hydraulic hydrated lime*—the hydrated dry cementitious product obtained by calcining a limestone containing silica and

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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.

alumina, or a synthetic mixture of similar composition, to a temperature short of incipient fusion so as to form sufficient free lime (CaO) to permit hydration and at the same time leaving unhydrated sufficient calcium silicates to give the dry powder, meeting the requirements herein prescribed, its hydraulic properties:

3.1 For definitions of terms related to this specification, see Terminology C51.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *hydrated hydraulic lime, n*—the product resulting from the slaking of hydraulic quicklime generally to a powder, without any addition, and with or without grinding. It has the property of setting and hardening under water and by reaction of carbon dioxide from the air. The hydraulic properties of this material comes only from the composition of the raw materials.

3.2.2 *hydraulic quicklime, n*—a cementitious product obtained by calcining argillaceous or siliceous limestone, or a mixture of similar composition to form sufficient free lime to permit hydration by slaking.

3.2.3 *reworkability, n*—the ability of a material which has setting and hardening properties to be remixed after a given period without significantly compromising the final hardened properties of the material.

3.2.4 *period of reworkability*—the length of time a material can be reworked after initial mixing; it shall be expressed in hours.

NOTE1—The purchaser may increase the hydraulicity by the addition of pulverized portland cement clinker, or a pulverized pozzolan, either natural or artificial.

3.1.1.1 *high calcium hydraulic hydrated lime*—a lime that contains not more than 5% magnesium oxide (of the nonvolatile portion):

3.1.1.2 *magnesium hydraulic hydrated lime*—a lime containing more than 5% magnesium oxide (of the nonvolatile portion):

1—Hydrated hydraulic limes have a long working time lasting up to 24 h. The user should seek advice from the producer as to maximum working time.

4. Chemical Composition

4.1 The hydraulic-hydrated hydraulic lime shall conform to the following requirements as to chemical composition, calculated to the nonvolatile basis:

	Min	Max
Calcium and magnesium oxides (CaO and MgO calculated to the nonvolatile basis), %	65	75
Calcium and magnesium oxides (CaO and MgO calculated to the nonvolatile basis), %	50	75
Silica (SiO ₂ calculated to the nonvolatile basis), %	16	26
Silica (SiO ₂ calculated to the nonvolatile basis), %	4	20
Iron and aluminum oxides (Fe ₂ O ₃ and Al ₂ O ₃ calculated to the nonvolatile basis), %	...	12
Iron and aluminum oxides (Fe ₂ O ₃ and Al ₂ O ₃ calculated to the nonvolatile basis), %	...	7
Carbon dioxide (CO ₂ on an as received basis), %	...	816
Carbon dioxide (CO ₂ on an as received basis), %	...	16
Available lime (CaO calculated with Test Methods C25 Section 28), %	16	...

5. Fineness

5.1 The sample shall leave a residue of not more than 0.5 % on a No. 30 (600-µm) sieve and not more than 10 % on a No. 200 (75-µm) sieve when tested as described in 10.211.2.

6. Time of Setting

6.1 The neat lime paste mixed to normal consistency shall not develop an initial set in less than 2 h as determined by the Gillmore Vicat needle method (see 10.411.4). Final set shall be attained within 24 h-48 h at 100 % RH.

7. Reworkability

7.1 Test for reworkability as described in section 11.7.1. The average compressive strength value of the second set of cubes (set B) shall not be less than 30 % of the first set (set A).

8. Soundness

7.1 The neat bars when made, stored, and autoclaved as described in 10.5

8.1 The samples when made, stored, and autoclaved as described in 11.5 shall not have an expansion of more than 1.0 %.

8. Compressive Strength

8.1 The average compressive strength of not less than three 2-in. (50-mm) cubes, made, stored, and tested in accordance with 10.6, shall be not less than 250 psi (1.7 MPa) at the age of 7 days. The average strength attained at 28 days shall be not less than 500 psi (3.4 MPa):

9. Compressive Strength

9.1 The average compressive strength of at least three 50-mm [2-in.] cubes, made, stored, and tested in accordance with 11.6,