



Designation: C270 – 19a<sup>ε1</sup>

## Standard Specification for Mortar for Unit Masonry<sup>1</sup>

This standard is issued under the fixed designation C270; 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 U.S. Department of Defense.*

<sup>ε1</sup> NOTE—Editorially corrected 4.1.1.2 in July 2019.

### 1. Scope\*

1.1 This specification covers mortars for use in the construction of non-reinforced and reinforced unit masonry structures. Four types of mortar are covered in each of two alternative specifications: (1) proportion specifications and (2) property specifications.

NOTE 1—When the property specification is used to qualify masonry mortars, the testing agency performing the test methods should be evaluated in accordance with Practice C1093.

1.2 The proportion or property specifications shall govern as specified.

1.3 When neither proportion or property specifications are specified, the proportion specifications shall govern, unless data are presented to and accepted by the specifier to show that mortar meets the requirements of the property specifications.

1.4 This standard is **not** a specification to determine mortar strengths through field testing (see Section 3).

1.5 The text of this specification references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.6 The terms used in this specification are identified in Terminologies C1180 and C1232.

1.7 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.8 The following safety hazards caveat pertains only to the test methods section 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, health, and environ-*

*mental practices and determine the applicability of regulatory limitations prior to use.*

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- C5 Specification for Quicklime for Structural Purposes
- C91/C91M Specification for Masonry Cement
- C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- C110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone
- C128 Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate
- C144 Specification for Aggregate for Masonry Mortar
- C150/C150M Specification for Portland Cement
- C188 Test Method for Density of Hydraulic Cement
- C207 Specification for Hydrated Lime for Masonry Purposes
- C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
- C511 Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
- C595/C595M Specification for Blended Hydraulic Cements
- C780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
- C952 Test Method for Bond Strength of Mortar to Masonry

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C12 on Mortars and Grouts for Unit Masonry and is the direct responsibility of Subcommittee C12.03 on Specifications for Mortars.

Current edition approved May 1, 2019. Published June 2019. Originally approved in 1951. Last previous edition approved in 2019 as C270 – 19. DOI: 10.1520/C0270-19AE01.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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

Units (Withdrawn 2017)<sup>3</sup>

- C979/C979M Specification for Pigments for Integrally Colored Concrete  
C1072 Test Methods for Measurement of Masonry Flexural Bond Strength  
C1093 Practice for Accreditation of Testing Agencies for Masonry  
C1157/C1157M Performance Specification for Hydraulic Cement  
C1180 Terminology of Mortar and Grout for Unit Masonry  
C1232 Terminology for Masonry  
C1324 Test Method for Examination and Analysis of Hardened Masonry Mortar  
C1329/C1329M Specification for Mortar Cement  
C1384 Specification for Admixtures for Masonry Mortars  
C1489 Specification for Lime Putty for Structural Purposes  
C1506 Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters  
C1586 Guide for Quality Assurance of Mortars  
C1717 Test Methods for Conducting Strength Tests of Masonry Wall Panels  
E514/E514M Test Method for Water Penetration and Leakage Through Masonry  
E518/E518M Test Methods for Flexural Bond Strength of Masonry
- 2.2 *Masonry Industry Council*.<sup>4</sup>  
*Hot and Cold Weather Masonry Construction Manual*, January 1999

### 3. Specification Limitations

3.1 Laboratory testing of mortar to ensure compliance with the property specification requirements of this specification shall be performed in accordance with 5.3. The property

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Available from the Mason Contractors Association of America, 1910 South Highland Avenue, Suite 101, Lombard, IL 60148.

specification of this standard applies to mortar mixed to a specific flow in the laboratory.

3.2 Property specifications requirements in Table 1 shall not be used to evaluate construction site-produced mortars.

NOTE 2—Refer to X1.5.3.1 for further explanation.

3.3 Since the compressive strength values resulting from field tested mortars do not represent the compressive strength of mortar as tested in the laboratory nor that of the mortar in the wall, physical properties of field sampled mortar shall not be used to determine compliance to this specification and are not intended as criteria to determine the acceptance or rejection of the mortar (see Section 8 and Guide C1586).

### 4. Materials

4.1 Materials used as ingredients in the mortar shall conform to the requirements specified in 4.1.1 to 4.1.4.

4.1.1 *Cementitious Materials*—Cementitious materials shall conform to the following ASTM specifications:

4.1.1.1 *Portland Cement*—Types I, IA, II, IIA, III, IIIA, or V of Specification C150/C150M.

4.1.1.2 *Blended Hydraulic Cements*—Types IL, IL-A, IS, IS-A, IP, IP-A, IT, and IT-A of Specification C595/C595M. Blended hydraulic cements with 70 % or more slag cement content are only permitted for use in property specifications.

4.1.1.3 *Hydraulic Cements*—Types GU, HE, MS, and HS of Specification C1157/C1157M. Types MH and LH are only permitted for use in property specifications.

4.1.1.4 *Masonry Cement*—See Specification C91/C91M.

4.1.1.5 *Mortar Cement*—See Specification C1329/C1329M.

4.1.1.6 *Quicklime*—See Specification C5.

4.1.1.7 *Hydrated Lime*—Specification C207, Types S or SA. Types N or NA limes are permitted if shown by test or performance record to be not detrimental to the soundness of the mortar.

4.1.1.8 *Lime Putty*—See Specification C1489.

4.1.2 *Aggregates*—See Specification C144.

TABLE 1 Property Specification Requirements<sup>A</sup>

Mortar	Type	Average Compressive Strength at 28 days, min, psi (MPa)	Water Retention, min, %	Air Content, max, % <sup>B</sup>	Aggregate Ratio (Measured in Damp, Loose Conditions)
Cement-Lime	M	2500 (17.2)	75	12	Not less than 2 ¼ and not more than 3 ½ times the sum of the separate volumes of cementitious materials
	S	1800 (12.4)	75	12	
	N	750 (5.2)	75	14 <sup>C</sup>	
	O	350 (2.4)	75	14 <sup>C</sup>	
Mortar Cement	M	2500 (17.2)	75	18	
	S	1800 (12.4)	75	18	
	N	750 (5.2)	75	20 <sup>D</sup>	
	O	350 (2.4)	75	20 <sup>D</sup>	
Masonry Cement	M	2500 (17.2)	75	18	
	S	1800 (12.4)	75	18	
	N	750 (5.2)	75	20 <sup>D</sup>	
	O	350 (2.4)	75	20 <sup>D</sup>	

<sup>A</sup>Laboratory prepared mortar only (see Note 5).

<sup>B</sup>See Note 6.

<sup>C</sup>When structural reinforcement is incorporated in cement-lime, the maximum air content shall be 12 %.

<sup>D</sup>When structural reinforcement is incorporated in masonry cement mortar or mortar cement mortar, the maximum air content shall be 18 %.

4.1.3 *Water*—Water shall be clean and free of amounts of oils, acids, alkalies, salts, organic materials, or other substances that are deleterious to mortar or any metal in the wall.

4.1.4 *Admixtures*—Admixtures shall not be added to mortar unless specified. Admixtures shall not add more than 65 ppm (0.0065 %) water soluble chloride or 90 ppm (0.0090 %) acid soluble chloride to the mortar's overall chloride content, unless explicitly provided for in the contract documents.

4.1.4.1 *Classified Admixtures*—Admixtures which are classified as bond enhancers, workability enhancers, set accelerators, set retarders, and water repellents shall be in accordance with Specification **C1384**.

4.1.4.2 *Color Pigments*—Coloring pigments shall be in accordance with Specification **C979/C979M**.

4.1.4.3 *Unclassified Admixtures*—Mortars containing admixtures outside the scopes of Specifications **C1384** and **C979/C979M** shall be in accordance with the property requirements of this specification and the admixture shall be shown to be non-deleterious to the mortar, embedded metals, and the masonry units.

4.1.4.4 *Calcium Chloride*—When explicitly provided for in the contract documents, calcium chloride is permitted to be used as an accelerator in amounts not to exceed 2 % by weight of the portland cement content or 1 % of the masonry cement content, or both, of the mortar.

NOTE 3—If calcium chloride is allowed, it should be used with caution as it may have a detrimental effect on metals and on some wall finishes.

## 5. Requirements

5.1 Unless otherwise stated, a cement/lime mortar, a mortar cement mortar, or a masonry cement mortar is permitted. A mortar type of known higher strength shall not be indiscriminately substituted where a mortar type of anticipated lower strength is specified.

5.2 *Proportion Specifications*—Mortar conforming to the proportion specifications shall consist of a mixture of cementitious material, aggregate, and water, all conforming to the requirements of Section 4 and the proportion specifications' requirements of **Table 2**. See **Appendix X1** or **Appendix X3** for a guide for selecting masonry mortars.

5.3 *Property Specifications*—Mortar conformance to the property specifications shall be established by tests of laboratory prepared mortar in accordance with Section 6 and 7.2. The laboratory prepared mortar shall consist of a mixture of cementitious material, aggregate, and water, all conforming to the requirements of Section 4 and the properties of the laboratory prepared mortar shall conform to the requirements of **Table 1**. See **Appendix X1** for a guide for selecting masonry mortars.

5.3.1 No change shall be made in the laboratory established proportions for mortar accepted under the property specifications, except for the quantity of mixing water. Materials with different physical characteristics shall not be utilized in the mortar used in the work unless compliance with the requirements of the property specifications is reestablished.

NOTE 4—The physical properties of plastic and hardened mortar complying with the proportion specification (5.1) may differ from the physical properties of mortar of the same type complying with the property specification (5.3). For example, laboratory prepared mortars batched to the proportions listed in **Table 2** will, in many cases, considerably exceed the compressive strength requirements of **Table 1**.

NOTE 5—The required properties of the mortar in **Table 1** are for laboratory prepared mortar mixed with a quantity of water to produce a flow of  $110 \pm 5$  %. This quantity of water is not sufficient to produce a mortar with a workable consistency suitable for laying masonry units in the field. Mortar for use in the field must be mixed with the maximum amount of water, consistent with workability, in order to provide sufficient water to satisfy the initial rate of absorption (suction) of the masonry units. The properties of laboratory prepared mortar at a flow of  $110 \pm 5$  %, as

**TABLE 2 Proportion Specification Requirements**

NOTE 1—Two air-entraining materials shall not be combined in mortar.

Mortar	Type	Proportions by Volume (Cementitious Materials)								Aggregate Ratio (Measured in Damp, Loose Con- ditions)
		Cement <sup>4</sup>	Mortar Cement			Masonry Cement			Hydrated Lime or Lime Putty	
			M	S	N	M	S	N		
Cement-Lime	M	1	...	...	...	...	...	...	1/4	Not less than 2¼ and not more than 3 times the sum of the separate vol- umes of cementi- tious materials
	S	1	...	...	...	...	...	...	over 1/4 to 1/2	
	N	1	...	...	...	...	...	...	over 1/2 to 1¼	
	O	1	...	...	...	...	...	...	over 1¼ to 2½	
Mortar Cement	M	1	...	...	1	...	...	...	...	
	M	...	1	...	...	...	...	...	...	
	S	½	...	...	1	...	...	...	...	
	S	...	...	1	...	...	...	...	...	
	N	...	...	...	1	...	...	...	...	
	O	...	...	...	1	...	...	...	...	
Masonry Cement	M	1	...	...	...	...	...	1	...	
	M	...	...	...	...	1	...	...	...	
	S	½	...	...	...	...	...	1	...	
	S	...	...	...	...	...	1	...	...	
	N	...	...	...	...	...	...	1	...	
	O	...	...	...	...	...	...	1	...	

<sup>4</sup>Includes Specification **C150/C150M**, **C595/C595M**, and **C1157/C1157M** cements as described in 4.1.1.