



Designation: C476 – 19

## Standard Specification for Grout for Masonry<sup>1</sup>

This standard is issued under the fixed designation C476; 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 ( $\epsilon$ ) 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.*

### 1. Scope\*

1.1 This specification covers two types of grout, fine and coarse grout, for use in the construction of masonry structures. Each type (fine and coarse) is further classified as conventional grout (requiring mechanical consolidation by puddling or vibration when placed) and self-consolidating grout (not requiring mechanical consolidation when placed). Conventional grout is specified by (1) proportions or (2) strength requirements. Self-consolidating grout is specified by strength requirements.

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

1.3 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.

1.4 *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
- C29/C29M Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
- C143/C143M Test Method for Slump of Hydraulic-Cement Concrete

<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 C12.05 on Grout & Grout Admixtures for Masonry.

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<sup>2</sup> 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.

- C150/C150M Specification for Portland Cement
- C207 Specification for Hydrated Lime for Masonry Purposes
- C260/C260M Specification for Air-Entraining Admixtures for Concrete
- C404 Specification for Aggregates for Masonry Grout
- C494/C494M Specification for Chemical Admixtures for Concrete
- C595/C595M Specification for Blended Hydraulic Cements
- C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- C989/C989M Specification for Slag Cement for Use in Concrete and Mortars
- C1019 Test Method for Sampling and Testing Grout
- C1157/C1157M Performance Specification for Hydraulic Cement
- C1602/C1602M Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- C1611/C1611M Test Method for Slump Flow of Self-Consolidating Concrete

### 3. Materials

3.1 Materials used as ingredients in grout shall conform to the requirements specified in 3.1.1 – 3.1.5.

3.1.1 *Cementitious Materials*—Cementitious materials shall conform to one of the following specifications:

3.1.1.1 *Portland Cement*—Type I, IA, II, IIA, III, and IIIA of Specification C150/C150M.

3.1.1.2 *Blended Cements*—Type IL, IS(<70), IP, IT(S<70), or blended cements with special properties designated by (A), (MS), or (HS), or a combination of (A) and (MS) or (HS), as appropriate, of Specification C595/C595M.

3.1.1.3 *Hydraulic Cements*—Types GU, HE, MS, or HS of Specification C1157/C1157M.

3.1.1.4 *Quicklime*—Specification C5.

3.1.1.5 *Hydrated Lime*—Type S of Specification C207.

3.1.1.6 *Coal Fly Ash or Raw Calcined Natural Pozzolan*—Specification C618. Addition rates shall be in an amount governed by the portland-pozzolan cement category of Specification C595/C595M. The grout produced with blends of portland cement and fly ash or raw calcined natural pozzolan shall have the compressive strength specified (4.2.1.2 or 4.2.2.1).

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

**TABLE 1 Conventional Grout Proportions by Volume**

Type	Parts by Volume of Portland Cement or Blended Cement	Parts by Volume of Hydrated Lime or Lime Putty	Aggregate, Measured in a Damp, Loose Condition	
			Fine	Coarse
Fine grout	1	0– $\frac{1}{10}$	$\frac{2}{4}$ –3 times the sum of the volumes of the cementitious materials	...
Coarse grout	1	0– $\frac{1}{10}$	$\frac{2}{4}$ –3 times the sum of the volumes of the cementitious materials	1–2 times the sum of the volumes of the cementitious materials

3.1.1.7 *Granulated Blast Furnace Slag*—Specification **C989/C989M**. Addition rates shall be as governed by the portland blast furnace slag cement category of Specification **C595/C595M**. Grouts produced with blends of portland cement and granulated blast furnace slag shall have the compressive strength specified (4.2.1.2 or 4.2.2.1).

3.1.2 *Aggregates*—Aggregates shall conform to Specification **C404**.

3.1.3 *Water*—Water shall conform to Specification **C1602/C1602M**.

NOTE 1—Specification **C1602/C1602M** allows potable water to be used without testing. Other sources of water may be used if the water meets the requirements of Specification **C1602/C1602M**.

3.1.4 *Admixtures*—Integral waterproofing compounds, accelerators, or other admixtures not mentioned definitely in the specification shall not be used in grout for use in reinforced masonry without approval from the specifier.

NOTE 2—The specifier is usually the Licensed Design Professional.

3.1.4.1 *Air-Entraining Admixtures*—Air-entraining admixtures shall conform to Specification **C260/C260M**.

NOTE 3—If the grout is to be used to bond masonry units to reinforcing bars, the use of air-entraining materials or air-entraining admixtures is not recommended.

3.1.4.2 *Admixtures for Ready-Mixed Grout Transported to the Job Site*—Retarding admixtures conforming to Specification **C494/C494M**, Type B or D are permitted in ready-mixed grout transported to the job site if the grout meets the compressive strength and slump requirements of 4.2.1.2.

3.1.4.3 *Admixtures for Self-consolidating Grout*—High-range water-reducing admixtures conforming to Specification **C494/C494M**, Type F or G, and viscosity-modifying admixtures conforming to Specification **C494/C494M**, Type S, are permitted in self-consolidating grout.

NOTE 4—High-range water-reducing admixtures are best suited to achieve the water reduction and slump flow values required for self-consolidating grout. Admixture suppliers should be consulted to ensure that the particular high-range water-reducing admixture is suitable for self-consolidating grout.

NOTE 5—Viscosity-modifying admixtures may be used to enhance the stability of self-consolidating grout. The **C494/C494M** requirements for Type S (specific performance) admixtures provide a means of determining that the viscosity-modifying admixture will not have adverse effects on fresh, hardened and durability properties of the grout. Admixture suppliers should be consulted to ensure that the particular viscosity-modifying admixture is suitable for self-consolidating grout.

3.1.4.4 *Antifreeze Compounds*—No antifreeze liquids, salts, or other substances shall be used in grout to lower the freezing point.

3.1.5 *Storage of Materials*—Cementitious materials and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign material or moisture. Any material that has become unsuitable for good construction shall not be used.

NOTE 6—If the grout is to be used to bond masonry units to reinforcing bars, the use of air-entraining materials or air-entraining admixtures is not recommended.

## 4. Grout Type and Proportions

4.1 *Type*—Grout type shall be specified as fine or coarse.

4.1.1 Fine grout shall be manufactured with fine aggregates.

4.1.2 Coarse grout shall be manufactured with a combination of coarse and fine aggregates.

NOTE 7—Building code provisions and grout space dimensions should be reviewed when selecting grout type or types.

4.2 *Proportions of Ingredients*—Proportions shall be determined as follows:

4.2.1 *Conventional Grout*—Proportions shall be determined by one of the following methods:

4.2.1.1 Requirements of **Table 1**.

4.2.1.2 *Specified Compressive Strength*—Proportions established by 28-day compressive strength tests in accordance with Test Method **C1019** that equal or exceed the specified compressive strength. The grout shall be mixed to a slump of 8 to 11 in. (200 to 280 mm) as determined by Test Method **C143/C143M** and shall have a minimum compressive strength of 2000 psi (14 MPa) at 28 days.

4.2.2 *Self-consolidating Grout*—Proportions shall be determined by the following method:

4.2.2.1 *Specified Compressive Strength*—Proportions established by 28-day compressive strength tests in accordance with Test Method **C1019** that equal or exceed the specified compressive strength. The grout shall be mixed to a slump flow of 24 to 30 in. (610 to 760 mm) as determined by Test Method **C1611/C1611M** and shall have a Visual Stability Index (VSI) of not greater than 1 as determined by Appendix X1 of Test Method **C1611/C1611M**. The grout shall have a minimum compressive strength of 2000 psi (14 MPa) at 28 days.

NOTE 8—The value for  $T_{50}$  as described in Appendix X1.1 and Note X1.1 of Test Method **C1611/C1611M** is a property of self-consolidating concrete and can be used as an indicator of batch-to-batch quality,