



Designation: C 476 – 042

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

This standard is issued under the fixed designation C 476; 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 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. Grout is specified ~~by:~~ by (1) proportions or (2) 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.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

C 5 Specification for Quicklime for Structural Purposes<sup>2</sup>

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<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 and Grout Admixtures for Masonry.

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

- C 143/C 143M Test Method for Slump of Hydraulic-Cement Concrete<sup>3</sup>
- C 150 Specification for Portland Cement<sup>2</sup>
- C 207 Specification for Hydrated Lime for Masonry Purposes<sup>2</sup>
- C 260 Specification for Air-Entraining Admixtures for Concrete<sup>3</sup>
- C 404 Specification for Aggregates for Masonry Grout<sup>4</sup>
- C 595 Specification for Blended Hydraulic Cements<sup>2</sup>
- C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete<sup>2</sup>
- C 989 Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars<sup>3</sup>
- C 1019 Test Method for Sampling and Testing Grout<sup>4</sup>
- C 1157 Performance Specification for Hydraulic Cement<sup>2</sup>

### 3. Materials

- 3.1 Materials used as ingredients in grout shall conform to the requirements specified in 3.1.1-3.1.8.
  - 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 C 150.
    - 3.1.1.2 *Blended Cements*— Type IS, IS(MS), IS-A, IS-A(MS), IP, or IP-A of Specification C 595 or types GU, HE, MS, or HS of Specification C 1157.
      - 3.1.1.3 *Quicklime*—Specification C 5.
      - 3.1.1.4 *Hydrated Lime*— Type S of Specification C 207.
      - 3.1.1.5 *Coal Fly Ash or Raw Calcined Natural Pozzolan* —Specification C 618. Addition rates shall be in an amount governed by the portland-pozzolan cement category of Specification C 595. The grout produced with blends of portland cement and fly ash or raw calcined natural pozzolan shall have the compressive strength specified (4.2.2).
      - 3.1.1.6 *Granulated Blast Furnace Slag*—Specification C 989. Addition rates shall be as governed by the portland blast furnace slag cement category of Specification C 595. Grouts produced with blends of portland cement and granulated blast furnace slag shall have the compressive strength specified (4.2.2).
    - 3.1.2 *Air-Entraining Admixtures*—Air-entraining admixtures shall conform to Specification C 260.
    - 3.1.3 *Aggregates*—Aggregates shall conform to Specification C 404.
    - 3.1.4 *Water*—Water shall be clean and potable.
    - 3.1.5 *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 purchaser.
    - 3.1.6 *Pumping Aids*— Pumping aids are permitted to be used in cases where the brand, quality, and quantity are approved in writing by the purchaser or are definitely stipulated in the specification.
    - 3.1.7 *Antifreeze Compounds*—No antifreeze liquids, salts, or other substances shall be used in grout to lower the freezing point.
    - 3.1.8 *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 1—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 2—Building code provisions and grout space dimensions should be reviewed when selecting grout type or types.

- 4.2 *Proportions of Ingredients* —Grout proportions shall be determined by one of the following methods:

- 4.2.1 Requirements of Table 1.
- 4.2.2 *Specified Compressive Strength* —Proportions established by 28-day compressive strength tests in accordance with Test Method C 1019 that obtain 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 C 143/C 143M and shall have a minimum compressive strength of 2000 psi (14 MPa) at 28 days.

NOTE 3—Building code provisions should be reviewed when selecting the specified compressive strength of grout.

### 5. Measurement and Production

- 5.1 *Measurement of Materials*—Measure materials for grout such that the required proportions of the grout materials are controlled and accurately measured.

<sup>2</sup> Annual Book of ASTM Standards, Vol 04.01.

<sup>3</sup> Annual Book of ASTM Standards, Vol 04.02.

<sup>4</sup> Annual Book of ASTM Standards, Vol 04.05.

**TABLE 1 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	0–1/10	2¼ –3 times the sum of the volumes of the cementitious materials	...
Coarse grout	1	0–1/10	2¼ –3 times the sum of the volumes of the cementitious materials	1–2 times the sum of the volumes of the cementitious materials

NOTE 4—The weight of a cubic foot of each 4—When converting volume proportions to batch weights, use the following material is as follows: bulk densities:

Material	Weight, lb/ft <sup>3</sup> (kg/m <sup>3</sup> )
Portland cement	94 (1504)
Portland cement	94 (1505)
Blended cement	weight printed on bag
	Obtain from bag or supplier
Blended cement	Obtain from bag or supplier
Other cementitious materials	Obtain from bag or supplier
Hydrated lime	40 (640)
Lime putty <sup>A</sup>	80 (1281)
Lime putty <sup>A</sup>	80 (1280)
Sand, damp and loose	80 (1281) of dry sand
Sand, damp and loose	80 (1280) of dry sand
Coarse aggregate	Refer to C 404 to determine weight per cubic foot.

<sup>A</sup> All quicklime should be slaked in accordance with the manufacturer's directions. All quicklime putty, except pulverized quicklime putty, should be sieved through a No. 20 (850-µm) sieve and allowed to cool until it has reached a temperature of 80°F (26.7°C). Quicklime putty should weigh at least 80 lb/ft<sup>3</sup> (281 kg/m<sup>3</sup>). Putty that weighs less than this may be used in the proportions specifications if the required quantity of extra putty is added to meet the minimum weight requirements.

5.2 *Production Methods*—Grout shall be produced using one of the following procedures:

5.2.1 *Materials Mixed at Job Site:*

5.2.1.1 Individual cementitious materials and aggregates stored at the job site shall be mixed in a mechanical mixer for a minimum of 5 min with sufficient water to achieve the desired consistency.

5.2.1.2 Individual dry ingredients transported to the job site in suitable compartments shall be mixed with water at the job site using continuous volumetric proportioning equipment to achieve the desired consistency. Mix with an auger of appropriate length to provide adequate mixing.

5.2.2 *Mixed Materials Transported to the Job Site:*

5.2.2.1 Factory dry-blended cementitious materials and aggregates delivered to the job site shall be mixed in a mechanical mixer for a minimum of 5 min with sufficient water to achieve the desired consistency.

5.2.2.2 Wet-mixed grout shall arrive at the job site in a ready-mixed condition. Slump shall be adjusted as necessary, and grout shall be re-mixed at mixing speed for at least 1 min before discharging to achieve the desired consistency.

NOTE 5—Grout may be hand mixed on small jobs with written approval of the mixing procedure by the specifier.

## 6. Keywords

6.1 aggregates; cement; compressive strength; grout; masonry; portland cement; proportions

## SUMMARY OF CHANGES

Committee C12 has identified the location of selected changes to this standard since C-476-99\_476-01 that may impact the use of this standard.

~~(1) Revised Sections 4 and 5 to include production methods.~~

~~Note 4. (2) Added metric equivalents.~~

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