Designation: C404 – 11

Standard Specification for Aggregates for Masonry Grout[1]

This standard is issued under the fixed designation C404; 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 aggregate for use in grout for masonry.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 8 of the standard. *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]

C33 Specification for Concrete Aggregates
C40 Test Method for Organic Impurities in Fine Aggregates for Concrete
C87 Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C117 Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
C123 Test Method for Lightweight Particles in Aggregate
C127 Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
C128 Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
C142 Test Method for Clay Lumps and Friable Particles in Aggregates
C144 Specification for Aggregate for Masonry Mortar
C476 Specification for Grout for Masonry
D75 Practice for Sampling Aggregates

3. General Characteristics

3.1 Aggregates shall consist of natural sand or manufactured sand, used alone or in combination with coarse aggregate as described in this specification. Manufactured sand is the product obtained by crushing stone, gravel, or air-cooled iron blast-furnace slag. Coarse aggregate shall consist of crushed stone, gravel, or air-cooled iron blast-furnace slag processed to assure suitable gradation.

NOTE 1—Care should be taken to ensure a suitable particle shape, since excessive quantities of flat and elongated particles have historically caused problems with workability.

4. Grading

4.1 Grading shall conform to the requirements in Table 1 or shall comply with the requirements of 4.2.

NOTE 2—Size No. 1 is that specified for concrete sand in Specification C33; Size No. 2 is that specified for masonry mortar in Specification C144; and Sizes 8 and 89 are standard sizes as given in Specification C33.

4.2 Aggregates of gradations other than those covered by Table 1 are permitted if all of the requirements of 4.2.1, 4.2.2, and 4.2.3 are met.

4.2.1 One hundred percent of the fine aggregate shall pass the 9.5–mm(⅜-in.) sieve and no more than 5 % natural sand or 10 % for manufactured sand shall pass the 75- mm (No. 200) sieve.

4.2.2 One hundred percent of the coarse aggregate shall pass the 12.5-mm (½-in.) sieve and no more than 5 % shall pass the 600-µm (No. 30) sieve.

4.2.3 The compressive strength of grout shall be specified and meet the requirements of Specification C476.

5. Deleterious Substances

5.1 The amounts of deleterious substances in either fine or coarse aggregate shall not exceed the following:

[1] This specification is under the jurisdiction of ASTM Committee C12 on Mortars and Grouts for Unit Masonry and is the direct responsibility of Subcommittee C12.04 on Specifications for Aggregates for Mortars.

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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.

TABLE 1 Grading Requirements

Sieve Designation	Amounts Finer than Each Laboratory Sieve Designation, weight %				
	Fine Aggregate			Coarse Aggregate	
	Size No. 1	Size No. 2		Size No. 8	Size No. 89
		Natural	Manufactured		
12.5-mm (½-in.)	...	...	...	100	100
9.5-mm (⅜-in.)	100	...	...	85 to 100	90 to 100
4.75-mm (No. 4)	95 to 100	100	100	10 to 30	20 to 55
2.36-mm (No. 8)	80 to 100	95 to 100	95 to 100	0 to 10	5 to 30
1.18-mm (No. 16)	50 to 85	70 to 100	70 to 100	0 to 5	0 to 10
600-µm (No. 30)	25 to 60	40 to 75	40 to 75	...	0 to 5
300-µm (No. 50)	5 to 30	10 to 35	20 to 40	...	...
150-µm (No. 100)	0 to 10	2 to 15	10 to 25	...	...
75-µm (No. 200)	...	0 to 5	0 to 10	...	...

Deleterious Substances	Permissible Content, max, weight %
Friable particles	1.0
Lightweight particles, floating on liquid having a specific gravity of 2.0	0.5[A]

[A] This requirement does not apply to blast-furnace slag aggregate.

6. Organic Impurities

6.1 The fine aggregate shall be free from injurious amounts of organic impurities. Except as herein provided, aggregates subjected to the test for organic impurities and producing a color darker than the standard shall be rejected.

6.2 Fine aggregate failing in the test may be used, provided that the discoloration is due principally to the presence of small quantities of coal, lignite, or similar discrete particles.

6.3 A fine aggregate failing in the test may be used, provided that, when tested for the effect of organic impurities on strength of mortar, the relative strength at 7 days calculated in accordance with Section 11 of Test Method C87 is not less than 95 %.

7. Soundness

7.1 Except as herein provided, either fine or coarse aggregates subjected to 5 cycles of the soundness test shall show a loss, weighted in accordance with the grading of a sample complying with the limitations prescribed in Section 4, not greater than 10 % when sodium sulfate is used or 15 % when magnesium sulfate is used.

7.2 Aggregate failing to meet the requirements of 7.1 may be accepted, provided that grout of comparable properties made from similar aggregate from the same source has been exposed to weathering, similar to that to be encountered, for a period of more than 5 years without appreciable disintegration.

8. Test Methods for Sampling and Testing

8.1 Sample and test the aggregate in accordance with the following standards, except as otherwise provided in this specification:

8.1.1 *Sampling*—Practice D75.

8.1.2 *Grading*—Test Method C136.

8.1.3 *Amount of Material Finer Than 75-µm (No. 200) Sieve*—Test Method C117.

8.1.4 *Organic Impurities*—Test Method C40.

8.1.5 *Effect of Organic Impurities on Strength*—Test Method C87.

8.1.6 *Friable Particles*—Test Method C142.

8.1.7 *Lightweight Constituents*—Test Method C123.

8.1.8 *Soundness*—Test Method C88.

8.1.9 *Density*—Determine the density of the fine aggregate in accordance with Test Method C128 and the density of the coarse aggregate in accordance with Test Method C127.

9. Keywords

9.1 aggregate; coarse aggregate; fine aggregate; grout; masonry; sand; soundness