Designation: C1797 – 16ε1

Standard Specification for Ground Calcium Carbonate and Aggregate Mineral Fillers for use in Hydraulic Cement Concrete[1]

This standard is issued under the fixed designation C1797; 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.

ε[1] NOTE—The designation was corrected editorially in September 2016.

1. Scope

1.1 This specification applies to ground calcium carbonate (GCC is a type of ground limestone) and other finely divided aggregate mineral filler (AMF) materials for use in concrete mixtures. The specification defines the types of GCC and AMF materials for use in concrete.

1.2 If concrete in service is subject to sulfate exposure, fillers derived from ground limestone should not be used unless mitigation methods are used.

NOTE 1—American Concrete Institute (ACI) technical documents 201.2R, 318, 332, and 350 contain useful information and code requirements dealing with sulfate exposure in service. Soluble sulfate in water can be determined in accordance with Test Method D516 or Test Method D4130. Percent sulfate by mass in soil can be determined by Test Method C1580.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 2—Sieve size is identified by its standard designation in Specification E11. The alternative designation given in parentheses is for information only and does not represent a different standard sieve size.

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

1.5 *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/C50M 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)

C110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone

C117 Test Method for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing

C125 Terminology Relating to Concrete and Concrete Aggregates

C136/C136M Test Method for Sieve Analysis of Fine and Coarse Aggregates

C311/C311M Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete

C566 Test Method for Total Evaporable Moisture Content of Aggregate by Drying

C595/C595M-15 Specification for Blended Hydraulic Cements

C1580 Test Method for Water-Soluble Sulfate in Soil

C1777 Test Method for Rapid Determination of the Methylene Blue Value for Fine Aggregate or Mineral Filler Using a Colorimeter

D75/D75M Practice for Sampling Aggregates

D516 Test Method for Sulfate Ion in Water

D1193 Specification for Reagent Water

D4130 Test Method for Sulfate Ion in Brackish Water, Seawater, and Brines

[1] This specification is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.20 on Normal Weight Aggregates.

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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.

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves
E832 Specification for Laboratory Filter Papers

2.2 *ACI Documents:*[3]
ACI 201.2R Guide to Durable Concrete
ACI 318 Building Code Requirements for Structural Concrete and Commentary
ACI 332 Residential Code Requirements for Structural Concrete and Commentary
ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary
ACI CT-13 Concrete Terminology

2.3 *Standards of Other Organizations:*
AASHTO T 330 Method of Test for the Quantitative Detection of Harmful Clays of the Smectite Group in Aggregates Using Methylene Blue[4]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this specification, refer to Terminology C51 and Terminology C125.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aggregate mineral filler (AMF), n*—a finely divided inorganic material derived from quarried stone, for use as an ingredient in hydraulic cementitious mixtures and meeting specified chemical and physical requirements.

3.2.1.1 *Discussion*—AMF derived from carbonate or non-carbonate quarried stone are finely divided particulate matter that have been shown to be effective in improving the particle packing and rheological characteristics of fresh concrete. In some cases, enhancement is seen in mechanical and fluid transport properties of hardened concrete. AMF for use in concrete may undergo a series of processing steps such as screening, grinding, classifying and drying as needed to meet requirements of this specification.

3.2.2 *ground calcium carbonate (GCC), n*—a finely divided inorganic material consisting predominantly of calcium carbonate or of the carbonates of calcium and magnesium and meeting specified chemical and physical requirements.

3.2.2.1 *Discussion*—The series of processing steps like grinding and classifying that these products undergo, ensure consistent particle size distribution. Research has demonstrated that the use of GCC results in improved packing density and the GCC particles provide nucleation sites that increase the rate of hydration of hydraulic cementitious materials. The effect of hydration is also influenced by the particle size distribution (PSD) and fineness of the GCC. See cited References (**1-6**).[5]

4. Classification

4.1 Types A and B, which are derived from calcium carbonates, are ground products from quarried stone. The chemical and physical properties shall comply with the requirements in Table 1.

4.2 Type C is typically a byproduct from the crushing of quarried stone, with mineral composition that depend on the stone from which it is derived. The chemical and physical properties shall comply with the requirements of Table 1.

4.3 The Type classification shall be stated by the supplier of the product.

NOTE 3—ACI CT-13 defines mineral filler as a finely divided mineral product at least 65% of which passes the 75-µm (No. 200) sieve. This specification establishes requirements for GCC and AMF materials that meet this definition.

5. General Requirements

5.1 The chemical and physical requirements for Type A, Type B, and Type C shall conform to the requirements in Table 1.

5.2 The purchaser has the authority to request measurement by a specified method of the chloride ion content of the material.

6. Sampling

6.1 Obtain a sample from each lot for testing in accordance with Practice C50/C50M or Practice D75/D75M.

7. Test Methods

7.1 Calcium carbonate and magnesium carbonate content – Test Methods C25 or Annex A1.

7.2 Methylene Blue Value – AASHTO T330 or Test Method C1777.

TABLE 1 Chemical and Physical Requirements

Parameter	Type A	Type B	Type C
$CaCO_3$, % by mass	≥ 92	≥ 70	NA
Sum of $CaCO_3$ + $MgCO_3$, % by mass	≥ 95	≥ 90	NA
Methylene blue value (mg/g)	≤ 3	≤ 5	≤ 5
Total Organic Carbon Content % by mass	≤ 0.5	≤ 0.5	≤ 0.5
Particle size distribution, minimum % by mass passing			
300-µm (No. 50) sieve	100	100	100
150-µm (No.100) sieve	100	85	
75-µm (No. 200) sieve	95	70	65
45-µm (No. 325) sieve	90	65	
Fineness (m^2/kg)^D	Report^A	Report^A	Report^A
Moisture Content (%)^B by mass	≤ 1	≤ 1	≤ 1
Strength Activity Index, % of control at 28d^C	≥ 75	≥ 75	≥ 75
Water Requirement, maximum % by mass of control	120	120	120

^{A} The purchaser has the authority to approve a change in the fineness or to add a range if needed.
^{B} The moisture content is listed for materials that can be pneumatically transferred. If material is not pneumatically transferred, then the purchaser can waive the moisture content requirement.
^{C} The purpose of testing the Strength Activity Index is to evaluate whether the material has any detrimental effect when used in concrete.
^{D} There is no specification limit but the value is reported to provide information to the purchaser. The proportioning of a concrete mixture may be dependent on the fineness of the material to be used. If there is a change in fineness, the purchaser should be notified so that appropriate adjustments can be made to the concrete mixtures.

[3] Available from American Concrete Institute (ACI), 38800 Country Club Dr., Farmington Hills, MI 48331-3439, http://www.concrete.org.
[4] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.
[5] The boldface numbers in parentheses refer to the list of references at the end of this standard.