



Designation: C1586 – 20

## Standard Guide for Quality Assurance of Mortars<sup>1</sup>

This standard is issued under the fixed designation C1586; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope\*

1.1 This document provides guidance regarding the proper use of Specification C270 and Test Method C780 for evaluating masonry mortar produced in the laboratory and at the construction site.

1.2 *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>

C144 Specification for Aggregate for Masonry Mortar

C270 Specification for Mortar for Unit Masonry

C780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

### 3. Significance and Use

3.1 This document is intended to provide guidance and clarification to designers, specifiers, inspectors, testing agencies, producers, and users in specifying and evaluating masonry mortar.

3.2 Users of documents Specification C270 and Test Method C780 often confuse and sometimes inadvertently misuse parts of the two documents when specifying or evaluating masonry mortar. This guide seeks to address specific

items within Specification C270 and Test Method C780 to help promote their proper use and interpretation.

### 4. Specifying Masonry Mortar

4.1 Use Specification C270 to specify masonry mortar by either the Proportion or Property Specifications of that standard, but not both. If neither Proportion or Property Specification C270 are specified, the Proportion specification shall govern, unless data are presented to and accepted by the specifier to show that the mortar meets the property specification requirements.

4.2 *Proportion Specifications*—These Specifications direct the mason to produce the masonry mortar using designated volumetric proportions of cementitious materials and aggregate as set forth in the Specification C270 Proportion Specifications table for the Type of mortar specified. This procedure of specifying mortar requires no sampling or testing of mortar, and hence, no measurement of mortar properties in the laboratory or the field is required. All that is necessary is field confirmation of the proper proportions of the mixes used in construction.

4.3 *Property Specifications*—These Specifications require testing of laboratory-prepared mortar for compliance with the requirements of the Specification C270 Property Specifications table for the Type of mortar specified.

4.3.1 The Property Specifications require evaluation of a mortar with a consistency (flow) of  $110 \pm 5\%$ . This is an arbitrarily established mortar consistency that is used to approximate the water content of mortar after it is placed in a masonry assemblage with absorbent masonry units. The amount of water required in mortar produced at the construction site is normally greater than the amount used for Specification C270 Property Specifications testing.

4.3.2 Do not use the Specification C270 Property Specifications requirements to evaluate construction site-produced mortars. Due to the higher amount of water necessary for actual masonry construction, mortar produced and sampled in the field will typically have lower compressive strength than that produced in the laboratory per Specification C270.

<sup>1</sup> This guide 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.

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<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

4.3.3 When mortar is specified by the Property Specifications, the quantities of cementitious materials and aggregates as determined through laboratory testing are converted to volumetric proportions to produce masonry mortar at the construction site.

## 5. Quality Assurance of Masonry Mortar

5.1 *Mortar Materials*—Verify that individual mortar materials being used meet the ASTM Standards listed under the Materials Section of Specification **C270**. Compliance is typically verified by submission of a letter of certification or test report for each mortar material.

NOTE 1—If any of the materials used do not comply with the material requirements of Specification **C270**, the Proportion Specifications can not be used. Specification **C270** specifically permits the use of masonry sands that do not comply with the gradation requirements of Specification **C144** provided that the Property Specifications of Specification **C270** are used rather than the Proportion Specifications.

5.2 *Property Specifications*—Verify that the tested properties of the laboratory-prepared mortar meet the appropriate Property Specifications' requirements of Specification **C270** for the specified mortar Type. Also verify that the laboratory test report includes the volumetric proportions and materials used to meet the Property Specifications.

5.3 *Proportioning of Materials*—Use inspection, testing, or both to assure proper proportioning of mortar materials at the construction site.

5.4 *Inspection*—Verify by observation that the method of measuring material quantities for the mortar used in construction accurately maintains the required proportions. Verify that the individual mortar materials being used are those approved for the project.

### 5.5 Testing:

5.5.1 Use Test Method **C780**, not Specification **C270**, to evaluate mortars prepared at the construction site.

5.5.2 Use Test Method **C780** to evaluate masonry mortar prepared at the construction site for the following properties: consistency (Test Method **C780**, Annex A1), board life (Test Method **C780**, Annex A2 or A3), mortar aggregate ratio (Test Method **C780**, Annex A4), and air content (Test Method **C780**, Annex A5). By measuring the mortar aggregate ratio, the proportion of cementitious materials to aggregate by mass can be determined and then converted to proportions by volume. The measured volumetric proportions of the construction site-produced mortar can be compared to the Specification **C270** Proportion Specifications or the volumetric proportions derived for the Property Specifications, whichever applies.

5.5.3 Measurement of construction site masonry mortar compressive strength using Test Method **C780**, Annex A6, is not the appropriate test method to determine the compliance of the mortar with the compressive strength requirements of

Specification **C270**; however it may have some value in the determination of mortar uniformity. Construction site masonry mortar strengths are not generally equal to the values cited in the Property Specifications Requirements Table of Specification **C270** due to the difference between water contents of field- and laboratory-produced mortars. Furthermore, mortar compressive strengths can vary from day to day depending on the amount of mix water required, the curing conditions at the construction site, the weather conditions, masonry unit and sand moisture contents, and other variables.

5.5.3.1 Measuring mortar compressive strength of field-sampled mortar has no relevance unless preconstruction testing is performed in the laboratory using similar mixing equipment, mortar materials, and the same specimen geometry. Even when this is done, the field compressive strength data can only be compared to the preconstruction mortar strength data in general, due to other factors, such as weather, temperature of mortar, and the absorption properties of the specific masonry units being used.

## 6. Preconstruction and Construction Evaluation of Mortar Properties

6.1 Use Test Method **C780** to evaluate mortar properties of a mortar mixed to a field consistency.

6.2 Annexes A1, A2, and A3 of Test Method **C780** are used to measure consistency and consistency retention of plastic mortar. Annex A5 is used to measure plastic mortar air content. Annex A6 is used to measure hardened mortar compressive strength.

NOTE 2—The consistency of mortar at a construction site should be adjusted to provide optimum workability that is compatible with the masonry units used in the construction, rather than using a predetermined value for consistency. Due to different weather conditions (temperature, humidity, and wind velocity) and masonry unit and sand moisture contents, mortar properties measured from construction site-produced specimens can be quite different from and more variable than those measured during preconstruction evaluation testing.

6.3 Properties of mortars measured by Test Method **C780** are not required nor expected to meet the Property Requirements of Table 2 in Specification **C270**.

6.4 **Appendix X1** provides guidance on how to properly use ASTM **C270** and **C780** in a quality assurance program. The left hand side of **Fig. X1.1** provides guidance on laboratory qualification of materials and mix designs of mortar. The right hand side of **Fig. X1.1** provides guidance for verification of job site mortar proportions.

## 7. Keywords

7.1 aggregate ratio; compressive strength; consistency; field testing; laboratory testing; masonry; mortar; quality; specifying; water content