



Standard Guide for Quality Assurance of Mortars¹

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1. Scope

1.1 This document provides guidance regarding the proper use of Specification C 270 and Test Method C 780 for evaluating masonry mortar produced in the laboratory and at the construction site.

2. Referenced Documents

2.1 ASTM Standards:²

C 144 Specification for Aggregate for Masonry Mortar

C 270 Specification for Mortar for Unit Masonry

C 780 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 C 270 and Test Method C 780 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 C 270 and Test Method C 780 to help promote their proper use and interpretation.

4. Specifying Masonry Mortar

4.1 Use Specification C 270 to specify masonry mortar by either the Proportion or Property Specifications of that standard, but not both. If neither the Proportion nor Property specification is given, Specification C 270 the Proportion specification to be used.

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 Table 1, Proportion Specifications, of Specification C 270 for the Type of mortar specified. This procedure of specifying mortar requires no sampling and testing of mortar, and hence, no measurement of mortar properties in the laboratory or the field is required.

4.3 *Property Specifications*—These Specifications require testing of laboratory-prepared mortar for compliance with the requirements of Table 2, Property Specifications, of Specification C 270 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 C 270 Property Specifications testing.

4.3.2 Do not use the Specification C 270 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 C 270.

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 C 270. 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 C 270, the Proportion Specifications can not be used. Specification C 270 specifically permits the use of masonry sands that do not comply with the gradation requirements of Specification C 144 provided that the Property Specifications of Specification C 270 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 C 270

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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.

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 C 780, not Specification C 270, to evaluate mortars prepared at the construction site.

5.5.2 Use Test Method C 780 to evaluate masonry mortar prepared at the construction site for the following properties: mortar aggregate ratio (Test Method C 780, Annex A4) and mortar water content (Test Method C 780, Annex A5). By measuring the mortar aggregate ratio and mortar water content, 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 C 270 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 C 780, Annex A7, is not the appropriate test method to determine the compliance of the mortar with the compressive strength requirements of Specification C 270; 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 C 270 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 C 780 to evaluate mortar properties of a mortar mixed to a field consistency.

6.2 Annex A1 and A3 of Test Method C 780 are used to measure consistency (sometimes called plasticity or flow). Annex A6 is used to measure air content. Annex A7 is used to measure 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 C 780 are not required nor expected to meet the Property Requirements of Table 2 in Specification C 270.

7. Keywords

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

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