In 2004, the American Society for Testing and Materials published a new document to help designers, specifiers, inspectors, testing agencies, producers, and users in specifying and evaluating masonry mortar. Designated C 1586, the Standard Guide for Quality Assurance of Mortars, it is a road map of how to use specification C 270 and test method C 780, two of the primary ASTM documents on mortar. The Guide seeks to promote the proper use and interpretation of C 270 and C 780, noting that they are often confused and sometimes inadvertently misused.

C 1586 clarifies that qualifications of mortar as meeting C 270 requirements and verification of site proportioning should be viewed as two distinct paths. Both are necessary and may require similar activities, but their purposes are different (see flow chart). C 270 establishes requirements for materials and mortar mix designs (proportions), and C 780 provides methods to evaluate consistency of site proportioning. Used together, the three documents are meant to take us from concept (design) to finished structure.

Specifying Mortar: Proportions or Properties

In the United States, mortar can be specified (by C 270) in one of two ways: by proportions or by properties. Proportions allow people to choose a recipe without any mortar testing as long as each
material meets established criteria (specifications). Properties allow people a little more discretion in determining the mortar mix design, but this approach necessitates that (lab) tests be run on the mortar. That mix design is then converted to (volumetric) proportions for use in field mixing.

There is confidence in the proportioning method because experience has shown that if we follow a recipe spelled out in Table 1 of ASTM C 270, we can consistently obtain mortar that has certain performance characteristics. Then the mortar in the finished wall, and hence, the wall, will perform as intended.

An alternate specification method is to use Table 2, the property table, which sets criteria for mortar. Sample mortar mixes are tested for: minimum average compressive strength, minimum water retention, and maximum air content. The property specification provides a means of qualifying mortars for use when sand does not meet gradation requirements of C 144 and permits a slightly higher sand content than the proportion method.

Evaluating Mortar

C 780 is a collection of mortar tests for both fresh and hardened properties. It can be used to establish the characteristics of mortar before construction begins. Perhaps more importantly, C 780 is used during construction to assess whether the mortar is proportioned as intended.

C 1586 adds a caution regarding test results: the properties and the mortars in C 270 Table 2 are established based on laboratory values, not field values. However, once those properties are established for (lab) mortar, there is a temptation to determine compressive strengths for field mortars (C 780 testing) and compare directly to the lab values, because the mortar appears to be the same. That should not be done because the water content, mixing, placement of the mortar in contact with masonry units, and environment all affect the mortar characteristics. Instead, C 1586 recommends that mortar quality be verified by either inspection (visual observation) or testing (preferably mortar aggregate ratio and water content) or both inspection and testing.

The value of C 1586 is that it helps to clarify the proper use of C 270 and C 780. It reinforces the fact that C 270 leads to a mix design (proportions) for mortar. It further clarifies that C 270 is a test document for lab mortars and that C 780 is for determining properties of field mortars, helpful in a quality assurance program.

References

ASTM C 270, Specification for Mortar for Unit Masonry
ASTM C 780, Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C 1586, Standard Guide for Quality Assurance of Mortars