

Background

Occasionally, concerns about the compressive strength of jobsite masonry mortar samples arise on projects. This is typically due to the confusion between ASTM test methods and ASTM standards for masonry mortar. This document has been developed to clarify the differences for better understanding of jobsite testing versus ASTM standard specifications. First, a review of the ASTM specifications and test methods relating to masonry cements.

ASTM C 91 “Specification for Masonry Cement” is the standard specification for masonry cement. WORKRITE® masonry cement products are certified to meet this specification.

ASTM C 270 “Specification for Mortar for Unit Masonry” is the specification for masonry mortars. It can be specified under either the proportion or property specification. However, the strength requirements of the property specification cannot be used for field evaluation of mortars.

ASTM C 780, “Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry” is the test method that can be performed at jobsites. The C 780 test is to “reflect batch to batch variations occurring

during mortar production and use at the construction site” (as stated in Section 4.2 of ASTM C 780.)

Important note: ASTM C 270 is a laboratory specification with specific procedures and conditions. It should be understood that the property requirements of ASTM C 270 are for laboratory specimens and are not for field quality control. The ASTM specification presumes that the proportions developed in the laboratory to yield the required strength, will result in satisfactory performance in the field. Test method ASTM C 780 is a test procedure that can be used in the field or laboratory, but has no strength requirements. Unfortunately, some testing companies combine the two into a jobsite specification.

ASTM C 270 Section 8.3 states, “Test Method C 780 is suitable for the evaluation of masonry mortars in the field. However, due to the procedural differences between Specification C 270 and the test method C 780, the compressive strength values resulting from field-sampled mortars are not required nor expected to meet the compressive strength requirements of the property specification of Specification C 270, nor do they represent the compressive strength of the mortar in the wall.”

History shows a substantial number of masonry jobs are being tested on-site for compressive strength, with the specifier of the tests expecting the jobsite-prepared mortar to meet the specified laboratory strength. In addition to entirely different testing parameters compared to those of C 270, in many cases

the sampling, molding, storage, and testing procedures on a jobsite do not meet the tightly controlled conditions of laboratory testing. This creates errors or misinterpretation of the results.

Compressive Strengths: Field-Mixed Mortar Vs. Mortar “In The Wall.”

There are shortcomings in trying to establish a correlation between the compressive strength of mortar specimens molded from field mixed mortar and the actual compressive strength of the mortar in the wall or masonry assemblage.

ASTM C 780 Section 5.2.6 states, “Compressive strength testing of molded mortar cylinders and cubes allows establishment of the strength developing characteristics of the mortar. The measured strength is dependent upon the mortar water content at the time of set, along with other factors, and reflects the general strength that would be attained by the mortar in the masonry.

The measured value shall not, however, be construed as being representative of the actual strength of the mortar in the masonry."

The following is from ASTM C 270 Section X1.6.3.2: "...the importance of compressive strength of mortar is overemphasized. Compressive strengths should not be the sole criterion for mortar selection. Often overlooked is the size/shape of mortar joints in that the ultimate compressive load carrying capacity of a typical 3/8 inch bed joint will probably be well over twice the value obtained when the mortar is tested as a 2 inch cube. Mortars should typically be weaker than the masonry units, so that any cracks will occur in the mortar joints where they can be more easily repaired."

Mortar prepared to the ASTM C 270 specification is made to a required laboratory flow that would be much too stiff to utilize at the jobsite. The flow of the lab-prepared mortar more nearly equals what one would expect in mortar in a joint between two masonry units after the units had absorbed water from the mortar.

Variables Can Affect Testing Results

There are a number of testing variables that can affect ASTM C 780 strength results in addition to the increased amount of water in the mortar.

Whether testing with cubes or cylinders, the mold is an impermeable unit that holds in the moisture, unlike the masonry unit that will absorb some of the mix water. Making 2-inch test cubes is an exacting process, requires considerable skill, and is seldom done on a jobsite. Cylinders are the preferred specimens when performing jobsite testing.

The actual field sampling procedure for obtaining the mortar sample can be a large variable. Taking a sample obtained during or immediately after discharge of the mortar from the batch mixer is the preferred method, as long as the mortar is completely mixed and free of unmixed materials and/or

lumps and sand streaks. Mortar board samples however, are obtained from the mortar board after some time period from the end of mixing. The length of time this mortar has been on the board (along with the current weather conditions) can make a big difference.

The elements above will have a significant effect on the final compressive strength analysis of field-tested mortar samples. For that reason, low and/or variable strengths in field testing should not be considered a criterion for rejection.

C 780 Does Not Equal C 270

Section 1.4 of ASTM C 780 states, "The test results obtained under this test method are not required to meet the minimum compressive strength values in accordance with the property specifications in Specification C 270." In addition, Section A6.1.1 of ASTM C 780 states, "Strength values for mortars obtained through these testing procedures are not required, nor expected, to meet strength requirements of laboratory Specification C 270 mortars."

For more information on verifying mortar quality on a jobsite, please refer to ASTM C 1586, "Standard Guide for Quality Assurance of Mortars."

Workrite® makes every effort to insure the accuracy of the information provided to you. While this advice is intended to assist you in your business decisions, the formulation of mortar and its application must be the responsibility of the customer. The customer acknowledges this and agrees to accept Workrite's technical advice at their own risk.