

Summary

Mortar tested in the field should not be expected to be as high-strength as the design strength that was done by a procedure in the laboratory. This fact is often misunderstood and causes difficulties on jobsites. Sometimes jobsites are actually shut down due to the incorrect interpretation of the field results.

HERE ARE THE FACTS:

1. Mortar should be designed to meet the requirements of ASTM C-270 Standard Specification for Mortar Unit Masonry. (This is the lab procedure)
2. Mortar is tested in the field by ASTM 780 Standard Test method for Preconstruction and Construction Evaluation of Mortar for Plain and Reinforced Unit Masonry.
3. There is nothing in the field test (ASTM C-780) that requires the mortar strength to equal the Design strength as developed in the laboratory under ASTM C 270. This is clearly stated in the standards.

MSJC TMS 402/602-13

The MSJC TMS 402 Building Code Requirements for Masonry Structures is the National Code which is referenced in all Model Codes and is the code that basically governs most masonry construction. The requirements for mortar are as follows:

The MSJC TMS 602 Code says: "Provide mortar of the type and color specified, and conforming with ASTM C-270" (Ref. MSJC TMS 602-14 Sect 2.1A)

ASTM C-270 – 08a

A review of ASTM C-270 will reveal that the strength developed in this laboratory procedure will exceed the strength developed from field tested mortar. Following is the specific reference:

ASTM C-270 – 5.3.1 Note 4: "Laboratory prepared mortar mixed with a quantity of water to produce a flow of 110+/- 5%. This quantity of water is not sufficient to produce a mortar with a workable consistency suitable for laying masonry units in the field. Mortar for use in the field must be mixed with the maximum of water, consistent with workability, in order to provide sufficient water to satisfy the initial rate of absorption (suction) of the masonry units."

"The properties of field prepared mortar mixed with a greater quantity of water, prior to being placed in contact with the masonry units, will differ from the property requirements in Table 2. Therefore, the property requirements of Table 2 cannot be used as requirements for quality control of field prepared mortar."..."Test Method C-780 may be used for this purpose."

ASTM C-270 Section 3. Specification Limitations: 3.1 "Specification C270 is not a specification to determine mortar strength through field testing." And ASTM C-270 Section 8.3

"Test method C780 is suitable for the evaluation of masonry mortars in the field. However, due to the procedural differences between specification C270 and C780, the compressive strength values resulting from the field sample mortars are not required or expected to meet the compressive strength requirements of the property specification in C270." Another way to state this is: *Lab prepared mortar has less water (a lower water/cement ratio), therefore it will test stronger than the field sampled mortar.*

ASTM C-780-12a

A review of ASTM C-780 will reveal that the strength developed in this field procedure is for "EVALUATION" and that no absolute numerical strength is required from this field procedure. The appropriate reference paragraphs in C-780:

ASTM C-780 Introduction: ... "No attempt is made to claim specific correlation between measured properties and mortar performance in the masonry. However, data from these test methods can be combined with other information to formulate judgments about the quality of the masonry."

ASTM C-780 Item 4.2: ... "The test results permit further verification of preconstruction testing and reflect batch-to-batch variations introduced during mortar production and use at the construction site."

ASTM C-780 Item 6.2: ... "the principal purpose of this test method is to provide a means to identify, measure, evaluate and control differences that exist between laboratory and jobsite mortars."

EVALUATION

The key word in this test method is "EVALUATION". It should also be noted that there are eight (8) test methods of evaluation in this standard and probably the most important one is the "Mortar Aggregate Ration Test Method A4". The Mortar Aggregate Ration Test provides quicker, timely results and is probably the best test method.

REFERENCES:

MSJC TMS 402-13, TMS 602-13, ASTM C-270-08a, ASTM C-780-12a.