

Masonry Testing Technician Certification

Raising the Bar for Testing and Quality Assurance

By Nicholas R. Lang, P.E.

It is a familiar situation for anyone who has been involved in a masonry construction project. Things have progressed through design, bidding, and contracting, and are in the construction phase. One day, as part of the specified quality assurance program, a testing laboratory technician visits the job, samples materials, and takes them away for testing. Sometime later, usually after 28 days, the dreaded call is made – the materials are not compliant. The project shuts down, meetings ensue, and further evaluation, usually costly destructive testing, is performed. Finally, additional testing shows satisfactory results and the project resumes. However, this process has caused significant lost time and testing.

There can be ways to reduce the frequency of situations such as the ones described above. A crucial part of improving quality assurance and testing of masonry products is ensuring the person performing the testing is knowledgeable about masonry testing procedures and is qualified to perform this testing. A relatively new tool for qualifying technicians is the American Concrete Institute (ACI) Masonry Testing Technician Certification Program. Developed by ACI in conjunction with industry experts from The Masonry Society (TMS), Portland Cement Association (PCA), and the National Concrete Masonry Association (NCMA), this program provides a mechanism for testing technicians to be certified to test masonry products.

Why is Testing Necessary?

It is important to understand why testing of masonry products is necessary. Testing can be performed for a wide variety of reasons, such as product development, quality control on behalf of the manufacturer, and compliance with various specifications. When performed on a specific project, testing is usually part of the overall quality assurance program.

As defined by masonry building codes, quality assurance is “The administrative and procedural requirements established by the contract documents to assure that constructed masonry is in compliance with the contract documents.” There are three levels of masonry

quality assurance programs. The level for a given project is defined in TMS 402, *Building Code Requirements for Masonry Structures*. The level required depends on the type of design used as well as the Risk Category for the building. For example, an empirically designed structure in Risk Category I, II, or III requires Level 1 Quality Assurance; while a building designed using Strength Design in Risk Category IV requires Level 3 Quality Assurance.

The requirements for each level of quality assurance are found in TMS 602, *Specification for Masonry Structures*. The quality assurance program can contain a variety of things, from a review of project submittals to inspection requirements to testing. All levels of masonry quality assurance require at least some material testing. Ensuring that this testing is done properly, in accordance with ASTM standards and test methods, is of utmost importance. Depending on the applicable level of quality assurance, tasks related to material evaluation and testing from TMS 602, Table 3, include:

- Prior to construction, verify f'_m and f'_{AAC} unless exempted by code
- During construction, verify grout slump flow and Visual Stability Index for self-consolidating grout
- During construction, verify f'_m and f'_{AAC} for every 5,000 square feet of masonry
- During construction, verify proportions of materials for preblended mortar, prestressing grout, and grout other than self-consolidating grout

Unfortunately, testing of masonry materials is sometimes performed incorrectly. This is primarily due to a lack of familiarity with specific testing requirements for masonry. Testing labs, in general, are usually more familiar with testing for poured concrete, and there are some specific differences in how masonry materials are tested. The goal of the ACI Masonry Testing Technician Program is to evaluate the knowledge of individuals on the proper testing requirements and to recognize those that demonstrate command of that knowledge.



Nicholas Lang of the National Concrete Masonry Association discusses critical measurement verifications for concrete masonry units.

Scope of Certification Program

There are two separate certification programs; the Masonry Field Testing Technician (MFTT) program, which is designed to evaluate technicians sampling and testing in the field, and the Masonry Laboratory Testing Technician (MLTT) program, which evaluates the knowledge of technicians who test materials in the laboratory. The test methods for determining properties of masonry materials have been developed through ASTM International. Many of these standards have both field and laboratory components. Because of this, there is overlap in the actual methods between the two certification programs, although there is no overlap of actual content. The MFTT program evaluates knowledge based on the field components of the relative standards, and the MLTT program evaluates knowledge based on the lab components.

The ASTM standards used by the programs are:

- ASTM C67 – Sampling and Testing Brick and Structural Clay Tile (MFTT only)
- ASTM C90 – Loadbearing Concrete Masonry Units (MLTT only)
- ASTM C140/C140M – Sampling and Testing Concrete Masonry Units and Related Units (MFTT & MLTT)
- ASTM C270 – Mortar for Unit Masonry (MLTT only)
- ASTM C780 – Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry (MFTT & MLTT)
- ASTM C1019 – Sampling and Testing Grout (MFTT & MLTT)
- ASTM C1314 – Compressive Strength of Masonry Prisms (MFTT & MLTT)

- ASTM C1552 – Capping Concrete Masonry Units, Related Units and Masonry Prisms for Compression Testing (MLTT only)

These test methods were selected because they are the ones most commonly performed on masonry materials. For some methods, such as ASTM C140/C140M, only part of the standard is covered. ASTM C140/C140M contains test methods for a wide variety of concrete masonry products, including concrete masonry units (CMU), concrete pavers, segmental retaining wall units, and more. The certification, however, only covers testing of CMU. CMU is the product tested most frequently by a wide variety of laboratories and is required for quality assurance on many projects by TMS 602. Future certification programs may cover more products and methods.

Developing a Certification Program

Once the need for a program is identified, the first step in development is to create a committee. The committee that was tasked with developing this program was ACI 601-C, chaired by Chris Robinson, Executive Director of the Construction Materials Engineering Council in Orlando, FL. This committee was populated with subject matter experts, industry representatives, and testing laboratory personnel. Many interested industry groups were represented and provided support for developing the program: The Masonry Society (TMS), the National Concrete Masonry Association (NCMA), the Portland Cement Association (PCA), and others. TMS took a leadership role in the development and subsequent promotion of the program.

Once the overall scope of the programs, including the test methods listed above, was developed, the next step was to create a Job Task Analysis (JTA). The JTA is a step-by-step walkthrough of a test method, describing in detail the knowledge and skills needed for a technician to perform the work required by the test. Since both certification programs include both a written examination and a performance examination, the JTA identifies the information that a technician needs to know (and is evaluated in the written exam) and those items that are a skill (and is evaluated in the performance exam). Once the committee approves this JTA, exam development begins.

The committee developed a sizable bank of written examination questions that covered the breadth of knowledge for each test method. The question bank was 2-3 times as large as needed for any given exam so

that the questions can be varied for different exam offerings. For the performance exam, checklists were developed that detail each step in the test method. These checklists are used by examiners during the test to ensure that examinees cover all needed steps and demonstrate proficiency in each one.

Following development, ACI staff audited all materials to ensure that questions were fair and instructions were satisfactory. From there, two pilot programs were held in different locations in the U.S. The feedback from the pilot programs was used to refine details of the program further. Finally, after several years of development, the program was approved by ACI's Committees and offered to all interested parties.

Becoming Certified

In order to become certified, an interested individual needs to find a sponsoring group that is offering the program. TMS is a National Sponsoring Group and provides the program in locations around the U.S. on request. In addition, local chapters of ACI (located in the U.S. and throughout the world) may offer the program. The best way to find a class is to check with TMS (www.masonrysociety.org) or a local ACI chapter.

Many sponsoring groups offer optional education/review sessions to help prepare examinees, but there are no required prerequisites for the certifications. The written examination is broken into sections for each test method. A minimum score of 70% overall is required, as well as at least 60% on any individual section, to pass the written exam. For the performance examination, each test is performed. The examinee must achieve 100% on each of the methods, and they have two trials for each method.

Both the written and performance component must be completed in order to achieve certification. This ensures that the technician not only has sufficient knowledge but has the ability to perform necessary testing skills. The certification is good for 5 years, at which time the individual must re-certify by passing the exams again.

The program is maintained regularly by ACI Committee C670, which is comprised much like the original development committee, with representation by testing labs, industry groups, subject matter experts, and other interested parties.

Increasing Demand

For a certification program to be successful, there must be demand. These certification programs have been available since late 2014.

In many aspects, they are still in the early stages of adoption.

There is an identified need for a certification program based on experiences with improper testing and job site problems, as discussed earlier in this article. This primarily relates to field technicians; however, there must also be an incentive for laboratory personnel to participate. The 2016 version of TMS 602 has a new requirement to "Utilize qualified laboratory technicians to perform required laboratory tests." The commentary to the Specification lists the ACI certification programs, or equivalent, as a way to demonstrate that a technician is qualified. With this version of TMS 602 adopted into the 2018 *International Building Code*, demand for these programs will increase.

Additionally, efforts are underway to require certified technicians with ASTM standards. ASTM C1093, Practice for Accreditation of Testing Agencies for Masonry, contains requirements for quality control and assurance for labs. The standard currently includes minimum experience requirements for lab personnel but does not contain certification requirements. The committee charged with maintaining this standard is actively evaluating changes to require certifications for testing personnel, and it is expected that this will be included in C1093 in the future.

Summary

There is a demonstrated need for accurate testing of masonry materials used in construction. Proper equipment must be used, the correct procedures followed, and technicians must be knowledgeable and competent to assure this. The ACI Masonry Field Testing Technician and Masonry Laboratory Testing Technician programs were developed to address knowledge and competency. These programs evaluate the knowledge and skill of technicians on common masonry tests in both the laboratory and the field. Use of qualified, certified individuals will raise the level of testing quality for masonry materials and reduce instances of improper testing. All designers and specifiers are encouraged to require certified testing technicians for masonry testing. ■



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