

Concrete Quality Technical Manager Certification

Are you a Concrete Specialist or Expert? Materials Scientist or Mixture Design Manager?

by Alfred L. Kaufman Jr. and Michael J. Morrison

The concrete industry employs many individuals who specialize in concrete materials. Through years of experience and exposure to industry standards and procedures, they have become experts in this area. Until recently, no formal qualification existed to identify these individuals and the critical role they serve in using concrete to its fullest potential. A new certification program has been developed by ACI based on the technical knowledge and skills typically employed by these experts enabling them to make quality decisions on all matters pertaining to the design and use of concrete mixtures.

The Concrete Quality Technical Manager (CQTM) certification program is intended to identify and confirm individuals who possess the knowledge and experience necessary to supervise an effective concrete quality assurance/quality control (QA/QC) program, manage those duties on behalf of a ready mixed concrete company, or represent the design professional in technical matters pertaining to the concrete used on a project.

Background

Alfred L. Kaufman Jr., FACI, led the task committee that initiated the CQTM program, and he continues to support the program as Chair of ACI Committee C690, Concrete Quality Technical Manager Certification. Work on the CQTM program started in 2004, but a fatal incident in the “Big Dig” tunnel, Boston, MA, in 2006, forced the redeployment of staff and volunteer resources on the Adhesive Anchor Installer (AAI) Certification Program. Following the launch of the AAI program in 2012-2013, efforts shifted back to the CQTM program.

Candidates for the CQTM program must demonstrate the ability to interpret concrete test data to determine compliance with specifications, formulate effective adjustments to concrete mixture proportions within allowable parameters to achieve desired performance, troubleshoot and identify project-specific issues regarding aspects of concrete use, and formulate solutions to facilitate meeting requirements of project specifications.

Some of the impetus for the structure of this new program was prompted by a request from the nuclear construction industry to re-establish an examination program comparable to the Level III Concrete Inspector exam previously specified by Joint ACI-ASME Committee 359, Concrete Containments for Nuclear Reactors. That exam had been retired with the decline of U.S. civil nuclear power plant construction and is no longer available to the industry. While the American Society of Mechanical Engineers (ASME) had already incorporated ACI’s Concrete Construction Special Inspector certification into their current Level III requirements, industry stakeholders also indicated via a survey that there was a need for inspectors who had a more thorough knowledge of concrete mixture design, concrete constituents, and the performance of concrete after placement—a need that was precipitated by the concrete industry’s ongoing initiative to transition from prescriptive to performance (P2P/PEM) specifications. Subsequently, the ACI task committee decided to shape a program that would be useful not only to the nuclear construction industry, but also the general concrete industry at large, covering greater overall knowledge of concrete materials science.



A compression test specimen. Is this failure mode acceptable? Is there evidence of preparation errors that would impact the test result? A certified CQTM is expected to know the answers

Expectations and Requirements

Potential candidates for this certification include technical service engineers from the cementitious materials industry, admixture manufacturers, ready mixed suppliers, repair materials manufacturers, concrete consulting engineers, materials consultants, managers of construction materials testing laboratories, and ready mixed plant operators/supervisors. These individuals will have seasoned experience and knowledge related to normal, heavy, and lightweight concrete; high-strength concrete; cement, slag, fly ash, and silica fume; and use of admixtures in concrete and how they may or may not work in specific applications. They will also be expected to have a general understanding of controlled low-strength materials (CLSM), self-consolidating concrete (SCC), and pervious concrete. By passing the required examinations, Certified Concrete Quality Technical Managers will demonstrate to the industry their thorough technical knowledge of concrete materials, mixture design, and performance.

The CQTM Program content is extensive and draws from 21 ACI documents, including guides, specifications, codes, and standards. A Job Task Analysis (available at www.concrete.org) identifies the body of knowledge associated with this program. The following documents are referenced in the CQTM program:

- ACI 117 – Specification for Tolerances for Concrete Construction and Materials and Commentary;
- ACI 121R – Guide for Concrete Construction Quality Assurance Systems in Conformance with ISO 9001;
- ACI 201.2R – Guide to Durable Concrete;
- ACI 211.1 – Standard Practice for Proportions for Normal, Heavyweight, and Mass Concrete;
- ACI 211.3R – Guide for Selecting Proportions for No-Slump Concrete;
- ACI 211.4R – Guide for Selecting Proportions for High-Strength Concrete Using Portland Cement and Other Cementitious Materials;
- ACI 211.5R – Guide for Submittal of Concrete Proportions;
- ACI 212.3R – Report on Chemical Admixtures for Concrete;
- ACI 213R – Guide for Structural Lightweight-Aggregate Concrete;
- ACI 214R – Guide to Evaluation of Strength Test Results of Concrete;
- ACI 214.4R – Guide for Obtaining Cores and Interpreting Compressive Strength Results;
- ACI 221R – Guide for Use of Normal Weight and Heavyweight Aggregates in Concrete;
- ACI 225R – Guide to the Selection and Use of Hydraulic Cements;
- ACI 229R – Report on Controlled Low-Strength Materials;
- ACI 232.2R – Use of Fly Ash in Concrete;
- ACI 233R – Slag Cement in Concrete and Mortar;
- ACI 234R – Guide for the Use of Silica Fume in Concrete;
- ACI 237R – Self-Consolidating Concrete;



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- ACI 301 – Specifications for Structural Concrete;
- ACI 318 – Building Code Requirements for Structural Concrete; and
- ACI 522R – Report on Pervious Concrete.

As part of ACI's standard procedure with new programs, a Pilot program was held. Invitations were sent to more than 40 candidates who were identified as meeting the target profile for this program. Twenty candidates participated in the Pilot program with their experience ranging from 8 to 35 years. As part of the process, candidates also provided critical input related to exam questions and program content; 80% of the candidates passed the exams.

CQTM Certification in South Africa

In late 2015, the University of Cape Town in South Africa applied to ACI to become a sponsoring group for ACI certification programs, in part to support an anticipated expansion of the South African nuclear power program. Nuclear power plant construction, slated to follow international standards, carried with it the potential to include U.S. standards, including ACI codes and specifications. For the dual purpose of promoting the use of ACI technical documents and orienting the University to conduct effective educational and certification testing programs, ACI agreed to cosponsor the inaugural educational and testing program at the University.

Al Kaufman, assisted by ACI member Tom Fourre, traveled to Cape Town in April 2016 to conduct an intensive week-long program at the University, delivering education and testing for Concrete Construction Special Inspector candidates including its prerequisite Concrete Field Testing Technician – Grade I program. To increase the impact of the event and its relevance to nuclear power plant construction, the CQTM program was also conducted as well as the other prerequisites for that program: Concrete Strength Testing Technician and Concrete Flatwork Technician certification.

History

During the 1970s and early 1980s, ACI administered a comprehensive written exam that had been developed by Joint ACI-ASME Committee 359 titled “Level III Concrete Inspector.” This exam was 8 hours in length and covered concrete inspection, concrete mixture selection, and proportioning along with concrete and concrete material requirements of ACI 359/ASME Section III, Division 2. As construction of new reactor containment structures diminished throughout the 1980s, the Level III Inspection Engineer exam was no longer in demand. However, the exam was still referenced in the Code until approximately 2004, in spite of the fact that the exam/program was not maintained.

In 2004, recognizing that the Level III Concrete Inspector exam was no longer available, Joint ACI-ASME Committee 359 revised examination requirements for Level III Concrete Inspector to require passing the ACI exam for “Concrete Construction Special Inspector” (the most comprehensive exam on concrete inspection available at the time), as well as requiring candidates to pass examinations on relevant aspects of nuclear quality assurance and the ASME Code as administered by the N-Stamp holder.

To replicate the content of the original Level III Inspection Engineer exam, ACI developed two new exams—“Concrete Quality Technical Manager” and “ASME Code Exam on Concrete”—to act in concert with the previously established “Concrete Construction Special Inspector” (CCSI) exam. Successfully passing all three of these exams and meeting the necessary requisites of each program would be the equivalent of the previous Joint ACI-ASME Committee 359 “Level III Concrete Inspector” exam.

The New CQTM Examination

All exams are open-book and involve multiple-choice questions. It is extensive in content and an entire day (6 to 8 hours) is required for the exams.

A 4-hour period is allotted for a written examination that consists of approximately 100 multiple-choice questions arranged into six sections. To pass the comprehensive examination, the following conditions must be met:

- A minimum score of 60% for each of the six sections; and
- A minimum score of 70% overall.

A 2-hour period is allotted for a practical application examination that consists of approximately 25 multiple-choice questions that focus on mixture design requirements and calculations. The minimum passing grade for the practical application examination is 70%.

In addition to work experience requirements, certification as a CQTM requires that the individual has received a passing grade on the written examinations for each of the following ACI certifications at some time in the candidate’s professional career:

- ACI Concrete Field Testing Technician – Grade I,
- ACI Concrete Strength Testing Technician; and
- ACI Concrete Flatwork Technician.



A survey of industry stakeholders indicated a need for inspectors with thorough knowledge of mixture design, concrete constituents, and the performance of concrete after placement

ACI recommends that examinees achieve passing grades on all three exams before taking the CQTM exam; however, CQTM certification does not require full certification as a testing technician or flatwork technician. Individuals who pass the CQTM exams and who also meet the prerequisites associated with this program will be certified as a Concrete Quality Technical Manager.

In addition to ACI certification sponsoring groups offering the exams at locations and dates they arrange, ACI plans on offering the CQTM exam at its Spring Conventions starting in 2018. More information about the CQTM program can be found on the ACI website at www.concrete.org. Click on “Certification” and then select the appropriate program.

Selected for reader interest by the editors.



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