

Job Task Analysis (JTA) for ACI Concrete Quality Technical Manager Certification

ASSESSMENT METHODS:

Written exam—general (understand concepts) or working (know specific facts) knowledge
Performance exam— perform specific tasks (or describe verbally, where allowed)

RESOURCES:

ACI 117 – Specification for Tolerances for Concrete Construction and Materials
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 214 – 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
ACI 301 – Specifications for Structural Concrete
ACI 318 – Building Code Requirements for Structural Concrete
ACI 522R – Report on Pervious Concrete

ACI 117 – Specification for Tolerances for Concrete Construction and Materials

- Know required concrete batching tolerances of concrete constituent materials.
- Know slump tolerances.
- Know air content tolerances.
- Understand scope of tolerances presented in ACI 117.

ACI 121R – Guide for Concrete Construction Quality Assurance Systems in Conformance with ISO 9001

- Understand the documentation that governs a quality management system (QMS).
- Know the steps required to set up a QMS.
- Know how to properly document a QMS.
- Understand the importance of proper information flow within a QMS.
- Know what a quality plan is, what it is comprised of and how to develop one.
- Understand the importance of proper document handling and control within a QMS.
- Know the elements of a quality manual.
- Know the responsibilities of top management in a QMS.

Job Task Analysis (JTA) for ACI Concrete Quality Technical Manager Certification (Continued)

- Know the key elements of, and how to develop a quality policy.
- Understand the importance of, and how to set realistic quality objectives.
- Understand the key steps of project planning.
- Understand the importance of setting and communicating responsibilities.
- Understand the importance of maintaining consistent, complete, and timely communications.
- Know the importance of, and how to conduct and document a review of a QMS.
- Understand the types of resources needed within a QMS and how to provide them.
- Understand the importance of training and competency assessment in a QMS.
- Understand the importance of monitoring (measuring and inspecting) suppliers' work product and operations.
- Understand the role and value of industry credentialing programs for personnel, products, and processes.
- Understand the importance of verifying all measurement tools are compliant with calibration requirements.
- Understand the importance of, and how to conduct an internal audit of the QMS.
- Understand the importance of data analysis in determining compliance and mitigation of nonconformance.
- Understand the need for continuous improvement (corrective and preventative action).

ACI 201.2R – Guide to Durable Concrete

- Understand porosity and permeability and their effect on the durability of concrete.
- Understand the effects of proportioning, mixing, placing, and consolidation on concrete durability.
- Understand the effects of concrete constituent materials quality and properties on concrete durability.
- Understand the effects of finishing and curing on concrete durability.
- Understand the effects of freezing and thawing on fresh concrete.
- Understand what may be done to mitigate damage to concrete caused by freezing and thawing.
- Understand the difference between entrained air and entrapped air in concrete.
- Understand what can decrease entrained air.
- Understand how design and maintenance can have an effect on concrete durability.
- Understand what D-cracking is, how it is identified, and how it may be mitigated.
- Understand what alkali-aggregate reaction (AAR) is, how it is identified, and how it may be mitigated.
- Understand the various types of chemical attack, how they are identified, and how they may be mitigated.
- Understand what causes metals embedded in concrete to corrode, and how corrosion may be mitigated.
- Understand what can affect concrete's resistance to abrasion, and how to increase abrasion resistance.
- Understand micro- and macro-texture of concrete surfaces and their effect on skid resistance.

ACI 211.1 – Standard Practice for Proportions for Normal, Heavyweight, and Mass Concrete

- Know concrete's basic constituent materials and their behavior in concrete in the plastic and hardened state.
- Know the physical properties of concrete in the plastic and hardened state and how they may be adjusted.

Job Task Analysis (JTA) for ACI Concrete Quality Technical Manager Certification (Continued)

- Know the potential effects of admixtures and supplementary cementitious materials (SCMs) on the basic material proportions and concrete properties.
- Understand the interactions between the various admixtures and SCMs.
- Know how the project specifications may affect proportioning decisions.
- Understand how project-specific conditions may affect proportioning decisions.
- Understand the importance of verifying a mix through the testing of trial batches.
- Know how to convert a water/cement ratio to a mass or volume of water for a mix.
- Know how to calculate cementitious materials content for a mix.
- Know how to estimate coarse and fine aggregate content for a mix.
- Know how to adjust the mix to account for aggregate moisture.
- Know what tests to conduct on the trial batches and how to interpret the results.
- Understand the importance of maintaining workability and finishing properties, and minimizing segregation.
- Know how to adjust a trial batch to achieve desired plastic and hardened concrete properties.

ACI 211.3R – Guide for Selecting Proportions for No-Slump Concrete

- Know the typical applications for no-slump concrete and how the application may affect proportioning decisions.
- Know the tests and devices that are used to measure the consistency of no-slump concrete.
- Know what methods of consolidation are suitable for use on no-slump concrete.
- Know how to estimate the quantity of coarse aggregate if no investigative data is available.

ACI 211.4R – Guide for Selecting Proportions for High-Strength Concrete Using Portland Cement and Other Cementitious Materials

- Understand how the ingredients of high-strength (HS) concrete typically differ from normal-strength concrete.
- Understand the criteria that identifies HS concrete.
- Understand that HS concrete typically develops strength slower than normal strength concrete.
- Know how to consider the required average compressive strength when proportioning HS concrete.
- Know what other properties of fresh and hardened concrete may influence the proportioning of HS concrete.
- Understand chemical and physical properties of cementitious materials and their impact on HS concrete.
- Understand ternary and quad blend mix designs and be able to define them.
- Knowledge of aggregates and gradation optimization and the impact on HS concrete.
- Knowledge of admixtures, cement-admixture interactions, and incompatibilities.

ACI 211.5R – Guide for Submittal of Concrete Proportions

- Know how to read and interpret submittal documents relative to materials used in submitted mix design.
- Know proper submittal procedures.
- Know how to present documentation of trial batches and related compressive strength.
- Know how to present past performance of proposed concrete mix (Field report).
- Know how to navigate the process of resubmittals, compliance, and transmittals.

Job Task Analysis (JTA) for ACI Concrete Quality Technical Manager Certification (Continued)

ACI 212.3R – Report on Chemical Admixtures for Concrete

- Know the different types of admixtures, their use, effect, and benefits.
- Know how to read and understand specifications for admixtures (C494 and C260).
- Understand the cost effectiveness of admixture use.
- Know how admixtures interact: compatibility and incompatibility.
- Understand how admixture dispensing systems operate at concrete making facilities.
- Know how admixture dispensing systems are maintained and calibrated.

ACI 213R – Guide for Structural Lightweight-Aggregate Concrete

- Know the types of lightweight aggregates (natural and man-made).
- Know dry-loose bulk density, relative density, and saturated surface-dry (SSD).
- Know the types of lightweight concretes (LWC): structural, masonry, and insulating.
- Know the properties of lightweight aggregate and their impact on concrete performance.
- Know absorption and its impact and ability to work with or compensate for highly-absorptive materials.
- Understand rate of absorption and its possible effect.
- Understand porosity of lightweight aggregates.
- Know unit weight and compressive strength requirements.
- Knowledge of density: equilibrium, oven dry, and fresh.
- Understand gradation requirements and impact on concrete performance.
- Understand mixture proportioning: all lightweight materials, and blends of normal and lightweight.
- Understand the difference between absolute volume and volumetric.
- Understand the properties of lightweight aggregate and its impact when pumping LWC.
- Know the general rules when proportioning a pumpable LWC mix.

ACI 214 – Guide to Evaluation of Strength Test Results of Concrete

- Know the conditions that affect variations in strength.
- Know how to apply statistical analysis to strength data.
- Understand how various statistical values are calculated.

ACI 214.4R – Guide for Obtaining Cores and Interpreting Compressive Strength Results

- Know how bleeding, consolidation, curing, and microcracking can affect in-place concrete strength.
- Understand the importance of a sampling plan (locations and number of specimens).
- Understand the coring procedure and know the necessary equipment for coring.
- Know what coring procedures can negatively impact the test results.
- Know proper procedures related to testing concrete cores (ASTM C42).
- Understand the purpose and application of core strength correction factors (ASTM C42).
- Know the impact of moisture condition on test results.
- Understand ACI 318 and project specifications criteria related to core test results for low-strength concrete investigations.

ACI 221R – Guide for Use of Normal Weight and Heavyweight Aggregates in Concrete

- Understand the difference between crushed and natural aggregates relative to performance in concrete.

Job Task Analysis (JTA) for ACI Concrete Quality Technical Manager Certification (Continued)

- Know aggregate tests and specifications.
- Understand the purpose and application of ASTM C33: aggregates for use in concrete.
- Know how to properly obtain samples and prepare sampling plans.
- Understand aggregate properties that can impact fresh concrete properties.
- Understand aggregate properties and how they can impact hardened concrete performance.
- Understand how processing and handling aggregates can affect fresh and hardened concrete properties.

ACI 225R – Guide to the Selection and Use of Hydraulic Cements

- Know the different types of Portland cements.
- Know the different types of blended cements.
- Understand ASTM Specifications C150, C595, and C1157.
- Know the uses of special purpose cements.
- Possess a general understanding of cement chemical and physical properties.
- Understand how chemical admixtures and SCMs can influence cement performance.
- Possess a general understanding of thermal properties of cement (heat of hydration).
- Know cement characteristics that could impact placement of concrete (setting time and fineness).
- Be familiar with cement-aggregate interactions: alkali-silica reactions (ASR), alkali-aggregate reactions (AAR), and alkali-carbonate rock reactions (ACR).
- Know the important factors regarding storage and delivery of cement.
- Know procedures for sampling and testing cement for conformance to specifications.
- Know how to read and comprehend a cement mill report.

ACI 229R – Report on Controlled Low-Strength Materials

- Know the applications for and desirable properties of controlled low-strength materials (CLSM).
- Understand the differences between CLSM and soil-cement.
- Know the typical constituent materials used in conventional CLSM.
- Know how standard materials may be used in CLSM.
- Know how to address the use of non-standard materials in CLSM.
- Understand the typical mix proportions used in CLSM.
- Know the methods of mixing, transporting, and placing CLSM.
- Know what factors must be considered when developing a quality-control (QC) program for CLSM.
- Know what standard tests may be used to measure the plastic and hardened properties of CLSM.
- Understand the properties and applications of low-density CLSM (LD-CLSM).

ACI 232.2R – Use of Fly Ash in Concrete

- Know what fly ash is and understand the differences between the different classes.
- Know the reasons why fly ash is used in concrete.
- Know how fly ash affects the fresh and hardened properties of concrete.
- Know what ASTM Standards are applicable to fly ash.
- Understand how different sources of fly ash produced in different ways can vary in chemical composition.

Job Task Analysis (JTA) for ACI Concrete Quality Technical Manager Certification (Continued)

- Understand how the chemical and physical composition of fly ash affects its performance in concrete.
- Know how concrete is proportioned with fly ash.
- Know how fly ash is sampled and tested.
- Understand what high volume fly ash concrete is, what unique properties it has, and in what applications it is used.
- Understand fly ash's role in high performance concrete.
- Know how fly ash is stored and batched.

ACI 233R – Slag Cement in Concrete and Mortar

- Know what slag cement is.
- Know the reasons why slag cement is used in concrete.
- Know how slag cement affects the fresh and hardened properties of concrete.
- Understand which ASTM Standards are applicable to slag cement.
- Know the factors that influence the cementitious properties of slag cement.
- Understand how concrete is proportioned with slag cement.
- Know how slag cement is stored, handled, and batched.

ACI 234R – Guide for the Use of Silica Fume in Concrete

- Know what silica fume is.
- Know the applications of silica fume in concrete.
- Know how silica fume affects the fresh and hardened properties of concrete.
- Understand which ASTM Standards are applicable to silica fume.
- Know the factors that influence the cementitious properties of silica fume.
- Understand how concrete is proportioned with silica fume.
- Know how silica fume is stored, handled, and batched.

ACI 237R – Self-Consolidating Concrete

- Know what self-consolidating concrete is.
- Know the advantages of and applications for self-consolidating concrete.
- Understand the properties of fresh and hardened self-consolidating concrete.
- Know what test methods apply to self-consolidating concrete.
- Understand how proportions are selected for self-consolidating concrete.
- Know what production issues can affect the properties of self-consolidating concrete.
- Understand how self-consolidating concrete is transported, placed, and finished.

ACI 301 – Specifications for Structural Concrete

- Know the concrete mixture proportions submittals process.
- Know concrete materials requirements and limits.
- Understand performance and design requirements.
- Understand durability exposure requirements.
- Understand temperature requirements.
- Know standard deviation.
- Know how to establish required strength (f'_{cr}).
- Understand the requirements of ASTM C94.
- Understand handling, placing, and construction.

Job Task Analysis (JTA) for ACI Concrete Quality Technical Manager Certification (Continued)

- Understand lightweight concrete.
- Understand mass concrete.
- Understand shrinkage compensating concrete.
- Understand industrial slabs.
- Understand precast concrete (structural and architectural).
- Understand notes to specifiers.

ACI 318 – Building Code Requirements for Structural Concrete

- Understand scope.
- Know durability requirements.
- Know concrete quality.
- Understand general requirements.
- Know selection of proportions.
- Know flow chart for selection and documentations (be able to understand flow chart).
- Know evaluation and acceptance (of low strength results).
- Understand possible effects of seismic strength requirements.

ACI 522R – Report on Pervious Concrete

- Know what pervious concrete is.
- Know the applications for pervious concrete.
- Understand the limitations of pervious concrete.
- Understand the properties of pervious concrete.
- Understand how proportions are selected for pervious concrete.
- Understand how pervious concrete is transported, placed, and finished.
- Know what test methods apply to pervious concrete.
- Understand the factors that impact field performance of pervious concrete.