

## Job-Task Analysis (JTA) for ACI Certification of Concrete Laboratory Testing Technician—Level 2

### HOW TO USE THIS JTA:

For each of the following assessment methods, the Candidate must:

#### On the written examination:

- **Understand** the following general concepts, which may not have specified values, procedures, or measurements; *and*
- **Know** the following specific procedures or values; performance of these items may also be assessed on the performance examination.

#### On the performance examination:

- **Perform**—or describe verbally, where allowed—the following tasks or steps, which are part of the specified procedure; knowledge of these items may also be assessed on the written examination.

### RESOURCES IN THIS PROGRAM:

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

ACI 214R, *Guide to Evaluation of Strength Test Results of Concrete*

ASTM C157/C157M, *Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete*

ASTM C42/C42M, *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete*

ASTM C192/C192M, *Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory*

ASTM C496/C496M, *Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens*

ASTM C470/C470M, *Standard Specification for Molds for Forming Concrete Test Cylinders Vertically*

### **ACI 211.1, *Standard Practice for Selecting 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.
- 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.
- Understand the use of background data.
- Know how to select the appropriate slump if not specified.
- Understand the reasons that dictate the maximum size of aggregate.
- Know how to estimate the approximate mixing water and air content.
- Understand selecting the proper air content for service exposure.
- Understand the evaluation process for the use of chemical admixtures.
- Understand the different exposure conditions.
- Understand the relationship between w/c or w/(c+p) materials ratio and compressive strength of concrete.
- Know how to select the appropriate w/c or w/(c+p).
- Know how to determine the equivalent w/(c+p) to the w/c by equivalent weight.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Laboratory Testing Technician—Level 2 (Continued)**

- 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 proportion mixtures by weight basis and by volume basis.
- 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 verifying a mix through the testing of trial batches.
- 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 214R, Guide to Evaluation of Strength Test Results of Concrete***

- Understand that variations in the measured strength of concrete originate from two sources: batch-to batch variations and within-test variations.
- Understand the principal sources of strength variation due to batch-to-batch variations.
- Understand the principal sources of strength variation due to within-test variations.
- Understand statistical values in relation to strength variations.
- Understand data criteria used to establish minimum required average strength.
- Know criteria for strength requirements.
- Understand evaluation of data.
- Understand quality control charts.

### ***ASTM C157/C157M, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete***

- Understand the scope of the method.
- Know the definition for length change.
- Understand the significance and use of the method.
- Know the equipment required for the procedure.
- Know the requirements for the drying room.
- Understand the assembly and operation of the atmometer.
- Understand the requirements for sampling.
- Know the requirements for test specimen sizes.
- Know the requirements for mixing mortar and concrete.
- Know the procedure for fabricating mortar specimens.
- Know and perform the procedure for fabricating concrete specimens.
- Know and perform the procedure for curing specimens.
- Know and perform required steps for specimen storage.
- Know and perform the procedure for measuring specimen length.
- Know and perform the procedure for calculating length change.
- Know the requirements for and perform reporting.

### ***ASTM C42/C42M, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete***

- Understand scope and significance and use of test method.
- Understand why specimens are required.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Laboratory Testing Technician—Level 2 (Continued)**

- Understand what affects concrete test results.
- Understand results are affected by core orientation (strength lower when parallel).
- Understand parameters that affect strength of concrete.
- Understand core result will typically be lower than molded specimens.
- Understand the length-diameter ratio affects test results.
- Understand that the concrete needs to be sufficiently hardened so that the specimen is not damaged by the removal process.
- Know not to use damaged specimens unless the undamaged portion is long enough.
- Know to report untested specimens and the reason why they are not tested.
- Know not to use cores with rebar unless permitted by the specifier of the test.
- Know requirements for core drilling in terms of orientation and location.
- Know to record the date cored.
- Know the requirements for measuring length, including capping.
- Know the minimum requirements for core diameter.
- Know what to do and how to identify if the core is too long/too short.
- Know the procedure for conditioning the specimens.
- Know the ends of cores need to be sawed perpendicular.
- Know how to calculate density.
- Know that surface preparation is required for the ends of cores.
- Know what to do if the difference between the largest and smallest diameter of a core exceeds 5%.
- Know to test cores according to C39/C39M.
- Know how to apply a L/D correction factor when required.
- Know what is required for reporting.
- Know that bearing surface of cores for splitting-tensile strength are the sides.

### ***ASTM C192/C192M, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory***

- Understand the scope of the procedure.
- Understand the use of the data.
- Know the tolerances for beam or prism molds.
- Understand what determines which size tamping rod to use.
- Know the vibrator requirements, including that the frequency requirements of the vibrators are different depending on whether internal vibration or external vibration.
- Know the accuracy of the scales.
- Understand when a pan mixer is preferable over a revolving drum mixer.
- Understand that the nominal maximum size of the aggregate dictates the specimen size.
- Understand making specimens involving a given variable.
- Know temperature requirements for materials.
- Know cement mixing and sieving requirements.
- Know coarse aggregate proportions for grading.
- Know the conditions under which to maintain aggregates.
- Know how to mix powder admixtures with the cement.
- Understand powdered admixtures.

## **Job-Task Analysis (JTA) for ACI Certification of Concrete Laboratory Testing Technician—Level 2 (Continued)**

- Understand water-soluble and liquid admixtures and how to use them.
- Know what is included in the calculation of the water content of the concrete.
- Know and perform mixing procedure.
- Perform required tests.
- Perform making the required specimens.
- Know the number of layers and the rod size.
- Know the penetration depths of the rodding.
- Know when sufficient rodding has occurred.
- Know the initial curing requirements.
- Know when to remove specimens from molds.
- Know the final curing requirements.
- Know the curing requirement for flexural strength specimens.

### ***ASTM C496/C496M, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens***

- Understand scope of test method.
- Understand that the load is applied along the side of the specimen.
- Understand why tensile failure occurs.
- Understand the typical ranking of splitting tensile strength, tensile strength, and flexural strength.
- Understand the application of splitting tensile strength.
- Understand when the supplementary bearing bar or plate is required.
- Understand the reason and location of the plywood strips.
- Know bearing strips are not to be reused.
- Know the curing procedure for lightweight specimens.
- Know that drawing diametral lines on each end of the specimen is required.
- Know that three measurements of the diameter are required.
- Know that two length measurements are required and that the measurements are taken in the plane containing the lines marked on the two ends.
- Know the rate of loading.
- Know to note type of failure and appearance of concrete.
- Know how to calculate the splitting tensile strength.
- Know what to report.

### ***ASTM C470/C470M, Standard Specification for Molds for Forming Concrete Test Cylinders Vertically***

- Understand scope of the specification.
- Understand there are separate requirements for single-use and reusable molds.
- Understand the durability requirements for the molds.
- Understand dimension requirements.
- Know the flatness requirement of the bottom of the mold.
- Know the maximum dimensions of the fillet.
- Understand that reusable molds need to be tested for water leakage.
- Know the requirements for retesting frequency.
- Know the physical requirements of single-use molds.

**Job-Task Analysis (JTA) for ACI Certification of  
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- Understand there are separate requirements for plastic, paper, and sheet metal single-use molds.
- Know the requirements for using paraffin-coated molds.
- Understand that dry-rodded aggregate is used to evaluate molds' resistance to damage.
- Know the requirements for testing molds for absorption ,elongation, and water-leakage.
- Understand that the purchaser must sample three molds from each shipment.
- Know the reporting requirements.