

Job-Task Analysis (JTA) for ACI Aggregate Base Testing Technician Certification

HOW TO USE THIS JTA:

On the written examination, the Candidate must:

- **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:

AASHTO R 90/ASTM D75 – Standard Method of Test for Sampling of Aggregates

AASHTO T 76/ASTM C702/C702M – Standard Method of Test for Reducing Samples of Aggregate to Testing Size

AASHTO R 58/ASTM D421 Dry Preparation of Disturbed Soil and Soil-Aggregate Samples for Test

AASHTO T 89/ASTM D4318 Standard Method of Test for Determining the Liquid Limit of Soils

AASHTO T 90/ASTM D4318 Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils

AASHTO T 88/ASTM D422 Standard Method of Test for Particle Size Analysis of Soils

AASHTO T 265/ASTM D2216 Standard Method of Test for Laboratory Determination of Moisture Content of Soils

AASHTO T 180/ASTM D1557 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

AASHTO T 99/ASTM D698 Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

AASHTO R 90/ASTM D75 – Standard Method of Test for Sampling of Aggregates

- Understand scope of practice
- Understand distinction between "maximum" and "nominal maximum" aggregate sizes
- Understand significance and use of this practice
- Know general sampling requirements
- Know general inspection requirements of sample
- Know sampling requirements for a flowing aggregate stream
- Know sampling requirements for a conveyor belt
- Know sampling requirements for stockpiles and transportation units
- Understand scope of sampling practice from stockpiles and transportation units
- Know procedure for sampling aggregate from stockpiles
- Know procedure for sampling aggregate from transportation units
- Understand number and masses of field samples
- Know how to determine mass of field samples
- Understanding shipping requirements of samples

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AASHTO T 76/ASTM C702/C702M – Standard Method of Test for Reducing Samples of Aggregate to Testing Size

- Understand scope of practice
- Understand significance and use of practice
- Reduction in size may not be recommended in some circumstances
- Know requirements for reducing fine aggregates
- Know reducing requirements for coarse aggregate
- Know equipment requirements for mechanical splitters
- Know and perform the procedure for introducing sample to splitter
- Know and perform procedure for quartering sample
- Understand alternative procedure for quartering sample
- Know and perform procedure for miniature stockpile samples

AASHTO R 58/ASTM D421 Dry Preparation of Disturbed Soil and Soil-Aggregate Samples for Test

- Understand scope of procedure
- Understand significance and use
- Know requirements for the balance
- Understand that use of a mortar and rubber-covered pestle may be required
- Know what sieve sizes will be required
- Understand sample reduction by riffle sampler or quartering
- Know how to air-dry sample, break up aggregations with mortar and pestle and how to reduce sample to representative amounts for testing
- Know required amounts of material passing the No. 10 sieve that are needed for particle size analysis of sandy soils and silt/clay soils
- Know required amounts of material passing the No. 40 sieve needed for testing of soil constants
- Know how to initially prepare the sample by separating material on the No. 10 sieve, washing material retained on the No. 10 sieve and then sieving over the No. 4 sieve, after drying, to obtain the mass retained on the No. 4 sieve
- Know how to select representative portions passing the No. 10 sieve of proper size for sandy soils and silt/clay soils
- Know how to select material passing the No. 40 sieve for determination of soil constants

AASHTO T 89/ASTM D4318 Standard Method of Test for Determining the Liquid Limit of Soils & AASHTO T 90/ASTM D4318 Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils

- Understand scope of the procedure
- Understand terminology and definitions
- Know the summary of how liquid limit, plastic limit and plasticity index are determined
- Understand the significance and use
- Understand the requirements for equipment used to determine liquid limits
- Understand the requirements for equipment used to determine plastic limit
- Know how to obtain a representative sample of material passing the No. 40 sieve
- Understand how to check the liquid limit device and tools for wear
- Know how to check and adjust the height of drop for the cup

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- Know how to prepare an appropriate sized sample of material passing the No. 40 sieve using the wet preparation method
- Know how to prepare an appropriate sized sample of material passing the No. 40 sieve using the dry preparation method
- Know how to obtain multi-point liquid limit values (method A) by adjusting water content so as to close the soil groove in the cup in 25 to 30 blows; 20 to 30 blows; and 15 to 25 blows
- Know how to obtain and perform moisture content on soil samples obtained from each trial within the required blow count range
- Know how to perform the one-point liquid limit determination (method B) by adjusting moisture of the soil to produce closure of the soil groove after 20 to 30 blows
- Know how to calculate the liquid limit using the average of two moisture samples and Table 1 factors
- Know how to select a 20g sample for plastic limit determination
- Know how to roll a portion of the sample into a thread of uniform diameter until 1/8" diameter is achieved
- Know how to break up the soil-thread and reform mass in order to repeat the rolling operation until (due to drying) the thread breaks apart before reaching 1/8" diameter
- Know how to gather broken soil thread pieces and retain them for moisture content testing
- Know how to roll additional samples to end point, and retaining pieces in a covered container until at least 6 g of soil is obtained for conducting a moisture content test
- Know how to calculate the average of two moisture content tests each containing at least 6 g of soil from the rolling operation (This moisture content is the plastic limit)
- Know how to calculate the plasticity index using the moisture content values from the liquid limit and plastic limit determinations
- Understand information required on the report
- Understand the variances between ASTM D4318 and AASHTO T89 and T90

AASHTO T 88/ASTM D422 Standard Method of Test for Particle Size Analysis of Soils

- Understand scope of the procedure
- Understand requirements for apparatus
- Understand composition of the dispersing agent
- Understand use of distilled or demineralized water in the test and control of water temperature during the test
- Know how to obtain and prepare a soil sample for the test
- Know how to separate material on the No. 10 sieve and how to conduct a sieving operation on the material retained on the No. 10 sieve
- Understand how to determine a composite correction for hydrometer readings using a mixture of distilled and demineralized water
- Understand how to determine the hygroscopic moisture content of the sample to be used in the hydrometer test
- Understand how to obtain an appropriately sized sample and to pre-soak the sample in a beaker with 125 ml of the dispersing agent for at least 16 hr
- Know how to further disperse the sample in the stirring apparatus after the soaking period
- Know how to transfer the dispersed sample to a 1000 ml glass cylinder, adding distilled or demineralized water to the 1000 ml mark
- Know how to cover the cylinder and agitate the mixture by inverting and then uprighting the cylinder continuously for a period of 1 min.

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- Know how to conduct hydrometer readings and temperature measurements at appropriate time intervals following the agitation procedure (adjust hydrometer readings for the composite correction factor)
- Know how to transfer the suspension mixture to a No. 200 sieve and wash with tap water until clear; then transfer material retained on the No. 200 sieve to a suitable container, dry to constant weight and conduct a sieve analysis
- Know how to determine the portion of the sample that was retained on the No. 10 sieve
- Know how to calculate the hygroscopic correction factor
- Know how to determine the percentages of soil in suspension at each hydrometer reading
- Know how to determine the diameter of soil particles corresponding to the percentages indicated at each hydrometer reading
- Understand how to determine sieve analysis values for the portion of the sample finer than the No. 10 sieve
- Understand how to develop a graph of the test results
- Understand information required on the report
- Understand variances between ASTM D422 and AASHTO T88

AASHTO T 265/ASTM D2216 Standard Method of Test for Laboratory Determination of Moisture Content of Soils

- Understand scope of the test method
- Understand terminology
- Know the summary of the test method
- Understand significance of use
- Understand requirements for apparatus
- Understand proper handling and transporting of samples
- Understand requirements for test specimen size
- Understand guidelines for selection of samples
- Know how to determine the mass of the container (and lid)
- Know how to select a representative sample
- Know how to determine the mass of the container and the moist specimen
- Know how to dry the specimen to constant mass
- Know how to determine the mass of the container and the dry specimen
- Know how to calculate the percent water content (moisture) of the sample
- Understand the information required to be reported
- Understand variances between ASTM D2216 and AASHTO T265

AASHTO T 180/ASTM D1557 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

- Understand scope of methods
- Understand terminology
- Know the summary of the test method
- Understand the significance of use
- Understand requirements for apparatus
- Understand requirements for standardization/calibration of apparatus

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- Understand how to estimate the mass of the test specimen needed and how to select the appropriate method for testing
- Understand how to assemble the compaction mold and check equipment prior to testing
- Understand how to select and prepare 4 or 5 subspecimens using the moist preparation method
- Understand how to select and prepare 4 or 5 subspecimens using the dry preparation method
- Know how to compact subspecimens using the proper size mold for the method selected and the proper number of blows per each layer
- Know how to remove the mold collar and baseplate and how to trim the specimen after compaction
- Know how to determine the mass of the specimen and the mold
- Know how to extract the specimen from the mold and obtain a representative sample for determining the molded moisture content
- Know how to compare wet weight values and conduct additional test points, if necessary, to obtain test point data which will fall on each side of the optimum moisture content
- Understand how to calculate the dry mass of each specimen using the wet mass and the moisture content of the sample
- Understand how to determine the oversize (coarse) fraction percentage
- Understand how to determine the test (finer) fraction percentage
- Understand how to calculate molding water content, moist density, dry density and dry unit weight of each compacted specimen
- Understand how to plot the dry unit weight and molding water content values and how to draw a smooth curve connecting the points; and how to draw the saturation curve
- Understand the information to be included on the report
- Understand variances between ASTM D1557 and AASHTO T180

AASHTO T 99/ASTM D698 Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

- Understand scope of methods
- Understand terminology
- Know the summary of the test method
- Understand the significance of use
- Understand requirements for apparatus
- Understand requirements for standardization/calibration of apparatus
- Understand how to estimate the mass of the test specimen needed and how to select the appropriate method for testing
- Understand how to assemble the compaction mold and check equipment prior to testing
- Understand how to select and prepare 4 or 5 subspecimens using the moist preparation method
- Understand how to select and prepare 4 or 5 subspecimens using the dry preparation method
- Know how to compact subspecimens using the proper size mold for the method selected and the proper number of blows per each layer
- Know how to remove the mold collar and baseplate and how to trim the specimen after compaction
- Know how to determine the mass of the specimen and the mold
- Know how to extract the specimen from the mold and obtain a representative sample for determining the molded moisture content
- Know how to compare wet weight values and conduct additional test points, if necessary, to obtain test point data which will fall on each side of the optimum moisture content

Job-Task Analysis (JTA) for ACI Aggregate Base Testing Technician Certification (Continued)

- Understand how to calculate the dry mass of each specimen using the wet mass and the moisture content of the sample
- Understand how to determine the oversize (coarse) fraction percentage
- Understand how to determine the test (finer) fraction percentage
- Understand how to calculate molding water content, moist density, dry density and dry unit weight of each compacted specimen
- Understand how to plot the dry unit weight and molding water content values and how to draw a smooth curve connecting the points; and how to draw the saturation curve
- Understand the information to be included on the report
- Understand variances between ASTM D698 and AASHTO T99