

# **National Institute For Certification In Engineering Technologies**

*A division of the National Society of Professional Engineers*



## **Candidate Performance Examination Guidelines**

**for**

### **Construction Materials Testing Asphalt, Concrete, Soils, & Aggregates**

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## **A. General**

The National Institute for Certification in Engineering Technologies (NICET), a division of the National Society of Professional Engineers (NSPE), seeks to promote excellence in the delivery of engineering technology services by determining nationally applicable practices and standards for various engineering technology roles; applying sound methods for assessing the knowledge and experience of individual practitioners; and providing recognition to those who have met the established standards. NICET, through its Construction Materials Testing Industry Advisory Group, recognizes that construction materials engineering technicians, employers, stakeholders or others may wish to include performance specific achievements as evidence of qualification, and that these achievements may include the passing of one or more properly-conducted performance examinations.

NICET is not in a position to directly administer performance examinations to candidates; therefore it is necessary to delegate this authority to approved Performance Examination Administrators to act on behalf of NICET. Performance Examination Administrators and NICET share an interest in recognizing qualifications through the proper conduct of fair, valid, and reliable assessment procedures.

In developing the Construction Materials Testing certification programs NICET has set forth minimum criteria by which an individual's competencies are evaluated and recognized. An optional component for the assessment of competency is a *hands-on* Performance Examination covering specific and applicable ASTM and/or AASHTO test methods.

## **B. Performance Examination General Criteria**

Performance Examinations address testing methods, calculations, equipment, criteria, and content of the relevant ASTM and/or AASHTO standards.

An evaluation checklist is used by the examiners to conduct the exam for each ASTM and/or AASHTO testing standard.

Performance Examinations do not address general asphalt, concrete, soils, or aggregate technology.

Information contained in the *notes* of the referenced resource standards shall be subject to examination. However, information contained in the *appendices* of the aforereferenced resource standards shall not be subject to examination.

Each Performance Examination has an established completion time. The completion time is determined by the relevant ASTM and/or AASHTO standard or that which is normally practiced by the industry in performing the subject test method.

NICET is solely responsible for establishing the content, administration policies, and procedures for all Performance Examinations.

Chief Examiners, Assistant Examiners, and the Exam Administration Committee have no authority to alter any Performance Examination checklists or procedures, nor waive any NICET policies or procedures. While the Chief Examiner and Assistant Examiners are responsible for interpreting NICET Performance Examination Guidelines, NICET maintains responsibility and authority for final acceptance and reporting of results.

Candidates shall be notified of their results on the specific Performance Examination(s) upon completion of that examination.

The candidate is responsible for scheduling, rescheduling, and making payment of associated fees directly with the Recognized Performance Examination Administrator.

### **C. Performance Examination Content**

The contents of Performance Examination checklists are derived directly from the applicable ASTM and/or AASHTO standards. The candidate may choose to schedule and test one or more of the listed ASTM and/or AASHTO test standards.

The following ASTM and/or AASHTO standard test methods and standard practices are available for testing:

#### **Asphalt (ASTM)**

- ASTM D2041 / D2041M-11 Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- ASTM D2726 / D2726M-17 Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures
- ASTM D4125 / D4125M-10 (2016) Standard Test Method for Asphalt Content of Bituminous Mixtures by the Nuclear Method
- ASTM D4867 / D4867M-09 (2014) Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
- ASTM D5444-15 Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
- ASTM D6307-16 Standard Test Method for Asphalt Content of Asphalt Mixtures by Ignition Method

#### **Asphalt (AASHTO)**

- AASHTO T 30-19 Standard Method of Test for Mechanical Analysis of Extracted Aggregate
- AASHTO T 166-16 Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
- AASHTO T 209-19 Standard Method of Test for Theoretical Maximum Specific Gravity (Gmm) and Density of Asphalt Mixtures
- AASHTO T 283-14 Standard Method of Test for Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- AASHTO T 287-14 Standard Method of Test for Asphalt Binder Content of Asphalt Mixtures by the Nuclear Method
- AASHTO T 308-18 Standard Method of Test for Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method

#### **Concrete (ASTM)**

- ASTM C31 / C31M-17 Standard Practice for Making and Curing Concrete Test Specimens in the Field (AASHTO T 23-18)
- ASTM C39 / C39M -18 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens (AASHTO T 22-17)
- ASTM C78 / C78M-18 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading) (AASHTO T 97-18)
- ASTM C138 / C138M-17a Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- ASTM C143 / C143M-15a Standard Test Method for Slump of Hydraulic-Cement Concrete (AASHTO T 119M / T 119-18)
- ASTM C172 / C172M-17 Standard Practice for Sampling Freshly Mixed Concrete
- ASTM C173 / C173M-16 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method (AASHTO T 196M / T 196-11)

- ASTM C231 / C231M-17a Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method (AASHTO T 152-19)
- ASTM C617 / C617M-15 Standard Practice for Capping Cylindrical Concrete Specimens (AASHTO T 231-17)
- ASTM C1064 / C1064M-17 Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
- ASTM C1231 / C1231M-15 Standard Test Method for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Cylindrical Concrete Specimens

#### **Concrete (AASHTO)**

- AASHTO R 60-12 Standard Practice for Sampling Freshly Mixed Concrete
- AASHTO T 22-17 Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens (ASTM C39 / C39M-18)
- AASHTO T 23-18 Standard Method of Test for Making and Curing Concrete Test Specimens in the Field (ASTM C31 / C31M-17)
- AASHTO T 97-18 Standard Method of Test for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading) (ASTM C78 / C78M-18)
- AASHTO T 119M / T 119-18 Standard Method of Test for Slump of Hydraulic Cement Concrete (ASTM C143 / C143M-15a)
- AASHTO T 152-19 Standard Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method (ASTM C231 / C231M-17a)
- AASHTO T 196M / T 196-11 Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method (ASTM C173 / C173M-16)
- AASHTO T 231-17 Standard Practice for Capping Cylindrical Concrete Specimens (ASTM C617 / C617M-15)
- AASHTO T 309-15 Standard Method of Test for Temperature of Freshly Mixed Portland Cement Concrete

#### **Soils (ASTM)**

- ASTM D698-12e2 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
- ASTM D854-14 Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer (AASHTO T 100-15)
- ASTM D1556 / D1556M-15e1 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
- ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
- ASTM D1883-16 Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils
- ASTM D2166 / D2166M-16 Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
- ASTM D2216-19 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D2488-17e1 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)
- ASTM D4318-17e1 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

#### **Soils (AASHTO)**

- AASHTO R 58-19 Standard Practice for Dry Preparation of Disturbed Soil and Soil-Aggregate Samples for Test
- AASHTO T 88-13 Standard Method of Test for Particle Size Analysis of Soils

- AASHTO T 89-13 Standard Method of Test for Determining the Liquid Limit of Soils
- AASHTO T 99-19 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 T 100-15 Standard Method of Test for Specific Gravity of Soils (ASTM D854-14)
- AASHTO T 180-19 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 191-14 Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method
- AASHTO T 193-13 Standard Method of Test for The California Bearing Ratio
- AASHTO T 208-15 Standard Method of Test for Unconfined Compressive Strength of Cohesive Soil
- AASHTO T 265-15 Standard Method of Test for Laboratory Determination of Moisture Content of Soils

#### **Aggregates (ASTM)**

- ASTM C29 / C29M-17a Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate (AASHTO T 19M / T 19-14)
- ASTM C40 / C40M-16 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete (AASHTO T 21M / T 21-15)
- ASTM C70-13 Standard Test Method for Surface Moisture in Fine Aggregate
- ASTM C117-17 Standard Test Method for Materials Finer than 75- $\mu\text{m}$  (No. 200) Sieve in Mineral Aggregates by Washing (AASHTO T 11-05)
- ASTM C123 / C123M-14 Standard Test Method for Lightweight Particles in Aggregate (AASHTO T 113-18)
- ASTM C127-15 Standard Test Method for Relative Density (Specific Gravity) and Absorption of Coarse Aggregate (AASHTO T 85-14)
- ASTM C128-15 Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate (AASHTO T 84-13)
- ASTM C136 / C136M-14 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates (AASHTO T 27-14)
- ASTM C142 / C142M-17 Standard Test Method for Clay Lumps and Friable Particles in Aggregates (AASHTO T 112-00)
- ASTM C535-16 Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- ASTM C702 / C702M-18 Standard Practice for Reducing Samples of Aggregate to Testing Size
- ASTM C1252-17 Standard Test Methods for Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
- ASTM D75 / D75M-14 Standard Practice for Sampling Coarse Aggregates
- ASTM D2419-14 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
- ASTM D5821-13 (2017) Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate

#### **Aggregates (AASHTO)**

- AASHTO R 76-16 Standard Method of Test for Reducing Samples of Aggregate to Testing Size (ASTM C702 / C702M-18)
- AASHTO R 90-18 Standard Practice for Sampling Aggregate Products
- AASHTO T 11-05 Standard Method of Test for Materials Finer Than 75- $\mu\text{m}$  (No. 200) Sieve in Mineral Aggregates by Washing (ASTM C117-17)
- AASHTO T 19M/T 19-14 Standard Method of Test for Bulk Density ("Unit Weight") and Voids in Aggregate (ASTM C29 / C29M-17a)
- AASHTO T 21M / T 21-15 Standard Method of Test for Organic Impurities in Fine Aggregates for Concrete (ASTM C40 / C40M-16)

- AASHTO T 27-14 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates (ASTM C136 / C136M-14)
- AASHTO T 84-13 Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate (ASTM C128-15)
- AASHTO T 85-14 Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate (ASTM C127-15)
- AASHTO T 112-00 Standard Method of Test for Clay Lumps and Friable Particles in Aggregate (ASTM C142 / C142M-17)
- AASHTO T 113-18 Standard Method of Test for Lightweight Pieces in Aggregate (ASTM C123 / C123M-14)
- AASHTO T 176-17 Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
- AASHTO T 304-17 Standard Method of Test for Uncompacted Void Content of Fine Aggregate
- AASHTO T 335-09 Standard Method of Test for Determining the Percentage of Fracture in Coarse Aggregate

## **D. Administration Requirements**

A third party administrator (Recognized Performance Examination Administrator) will administer performance examinations coordinated by an employer. The Recognized Performance Examination Administrator will arrange for the use of a qualified facility, appropriate equipment, and required materials. The provided facility will comply with all necessary health and safety regulations as required by OSHA and state/local authorities and will have appropriate liability insurance.

### **1. Accommodations for Candidates with Special Needs**

Candidates with a disability as defined in Title III (Public Accommodations) of the Americans with Disabilities Act who may be placed at a disadvantage when taking a Performance Examination may request a testing accommodation by attaching the ADA/Special Needs Accommodations Request Form or other appropriate correspondence/documentation to their examination application. Every effort will be made to offer reasonable accommodations to qualifying candidates. There will be no additional charges to qualifying candidates for these accommodations.

Candidates who cannot take a Performance Examination on a scheduled test date because of religious or ethical restrictions may request a special accommodation by attaching an explanatory letter to their exam application. Candidates will be contacted to attempt to arrange a mutually suitable accommodation.

## **E. Conducting Performance Examinations**

Performance Examinations shall be conducted by the Chief Examiner and/or Assistant Examiners, as required.

The candidate shall perform each test of the Performance Examination in the direct presence of the Chief Examiner and/or Assistant Examiner.

The candidate's performance shall be evaluated independently by the Chief Examiner and/or Assistant Examiners based on the criteria shown on the applicable Performance Examination checklists.

The examiner(s) must strictly adhere to the provided checklist (see Appendix II) and must provide an objective evaluation. Communication between the candidate and the examiner(s) must be relevant to administering the evaluation. General discussions, comments, direct or indirect guidance, and/or assistance by the exam staff is prohibited.

Candidate observance during testing by other candidates and/or personnel other than the assigned examination staff is not allowed.

Some procedures and test methods, or portions thereof, may be described verbally as indicated on the Performance Examination checklists. If needed, specific instructions and administration procedures will be included with the Performance Examination materials for each session.

The Chief Examiner and/or Assistant Examiners shall not stop a test at any point, even if an error is made. Testing may be stopped if safety is compromised, a complete failure is the predicted outcome or to prevent damage to the equipment and/or instruments.

A candidate shall be permitted to suspend a test one (1) time and begin the procedure over again. This one-time voluntary suspension of a test shall not be counted as a failure of that test. The examiner must document the candidate's explanation for starting over.

A second suspension of the same test by a candidate shall be counted as a failure.

As applicable, some tests may require extended time periods to setup and conduct. A single Performance Examination session may be administered over several days. However, no exam session shall exceed eight (8) calendar days.

### **1. Scoring and Reporting**

Scoring of the Performance Examinations shall be reported on a pass/fail basis, with the Chief Examiner and/or Assistant Examiners recording the symbols 'P' for pass and 'F' for fail for each step of the applicable Performance Examination checklist (see Appendix II) and for the test overall.

Incorrect performance or omission of one or more of the relevant steps on the Performance Examination checklist shall constitute failure of the entire test. Any procedures and/or steps performed out of the scope of the specified standard that may affect the test results will also constitute a failure.

Immediately following the completion of each Performance Examination, the Chief Examiner and/or Assistant Examiners shall inform the candidate of the results. If the candidate fails the Performance Examination, the Chief Examiner and/or Assistant Examiners shall also inform the candidate of the specific step(s) which were performed incorrectly.

The candidate may request, and will be allowed, a second opportunity to conduct the failed test.

Failure of a test after two (2) trials will constitute final failure of the Performance Examination for that test and must accordingly be documented by the examiner.

The candidate shall not be penalized as a result of faulty or incorrect equipment, instrument, materials or other conditions beyond their control which may have affected the outcome of a test.

The Chief Examiner and/or Assistant Examiners shall review the Performance Examination documentation and notify the examinee of the final results.

### **F. Retesting**

Retesting should be conducted by a different examiner, whenever possible, in accordance with the *Scoring and Reporting* subsection.



If the first trial was not successfully completed for each of the applicable tests, the candidate shall be allowed a second trial within the same Performance Examination session.

The second trial, when requested by the candidate for a particular test, shall not be conducted immediately following the first trial. The candidate shall be permitted to leave the examination area between trials to consult notes, test standards, or references.

A second trial, or voluntary repeat of a trial, requires the administration of the Performance Examination for the entire test method/checklist (i.e., not from the point where the error was made).

Retesting of a failed Performance Examination will require a waiting period of at least thirty (30) days for review, training, and practice prior to retesting.

## **G. Appeals**

Appeals must be submitted to the Chief Examiner or the Exam Administration Committee as soon as practical after the completion of the Performance Examination. Verbal appeals are acceptable but must be followed by a detailed written appeal within 48 hours.

The documentation for the appeal must include the candidate's name and contact information (address, telephone number, email, etc.), the date of the Performance Examination session of concern, employer of record (if any), the names of the Chief Examiner and/or Assistant Examiner or others involved, and the complete details and justification for the appeal.

The Chief Examiner will review the appeal, consult with the Assistant Examiners, if necessary, and render a decision to the candidate. In the event that the candidate is not satisfied with the decision of the Chief Examiner, the candidate may submit an appeal to the Exam Administration Committee for review and consideration.

Second level appeals must be submitted in writing, to the Exam Administration Committee within thirty (30) days of the end of the Performance Examination session. The Exam Administration Committee's decision will be considered final and binding.

The handling of appeals must be documented and copies submitted to NICET.

## **H. Validity**

Performance Examination passing results are valid for a period of three (3) years from the date of administration.

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