

**SECTION 01 45 29  
TESTING LABORATORY SERVICES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory / Geotechnical Engineering Company retained and paid for by Contractor.

**1.2 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
  - T27-06 ..... Sieve Analysis of Fine and Coarse Aggregates
  - T96-02 (R2006) ..... Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  - T99-01 (R2004) ..... The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
  - T104-99 (R2003) ..... Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
  - T180-01 (R2004) ..... Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
  - T191-02(R2006) ..... Density of Soil In-Place by the Sand-Cone Method
- C. American Society for Testing and Materials (ASTM):
  - A325-14 ..... Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - A370-15 ..... Definitions for Mechanical Testing of Steel Products
  - A490-14a ..... Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
  - C31/C31M-15a ..... Making and Curing Concrete Test Specimens in the Field
  - C33/C33M-13 ..... Concrete Aggregates
  - C39/C39M-15a ..... Compressive Strength of Cylindrical Concrete Specimens
  - C109/C109M-13e1 ..... Compressive Strength of Hydraulic Cement Mortars
  - C138/C138M-14 ..... Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
  - C140/C140M-15 ..... Sampling and Testing Concrete Masonry Units and Related Units
  - C143/C143M-15 ..... Slump of Hydraulic Cement Concrete
  - C172/C172M-14a ..... Sampling Freshly Mixed Concrete

- C173/C173M-14.....Air Content of freshly Mixed Concrete by the Volumetric Method
- C330/C330M-14.....Lightweight Aggregates for Structural Concrete
- C567/C567M-14.....Density Structural Lightweight Concrete
- C780-15a .....Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
- C1019-14 .....Sampling and Testing Grout
- C1064/C1064M-12.....Freshly Mixed Portland Cement Concrete
- C1077-15a .....Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- C1314-14 .....Compressive Strength of Masonry Prisms
- D698-12e2 .....Laboratory Compaction Characteristics of Soil Using Standard Effort
- D1188-07(2015).....Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
- D1556/D1556M-15.....Density and Unit Weight of Soil in Place by the Sand-Cone Method
- D1557-12e1 .....Laboratory Compaction Characteristics of Soil Using Modified Effort
- D2166/D2166M-13.....Unconfined Compressive Strength of Cohesive Soil
- D2167-15 .....Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- D2216-10 .....Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- D2974-14 .....Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- D3666-13 .....Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
- D3740-12a .....Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
- E94-04(2010) .....Radiographic Testing
- E164-13.....Ultrasonic Contact Examination of Weldments
- E329-14a.....Agencies Engaged in Construction Inspection and/or Testing
- E543-15.....Agencies Performing Non-Destructive Testing
- E709-15.....Guide for Magnetic Particle Examination
- E1155-14.....Determining FF Floor Flatness and FL Floor Levelness

- E. American Welding Society (AWS):  
D1.1-07 ..... Structural Welding Code-Steel
- F. Commonwealth of Pennsylvania, Department of Transportation, Publication 408/2011  
Construction and Materials Specifications, latest edition.

**1.3 REQUIREMENTS**

- A. Accreditation Requirements: Testing Laboratory retained and paid for by Contractor, must be accredited by one or more of the National Voluntary Laboratory Accreditation Program (NVLAP) programs acceptable in the geographic region for the project. Furnish to the Contracting Officer or Contracting Officer's Representative (CO/COR) a copy of the Certificate of Accreditation and Scope of Accreditation. For testing laboratories that have not yet obtained accreditation by a NVLAP program, submit an acknowledgement letter from one of the laboratory accreditation authorities indicating that the application for accreditation has been received and the accreditation process has started, and submit to the CO/COR for approval, certified statements, signed by an official of the testing laboratory attesting that the proposed laboratory, meets or conforms to the ASTM standards listed below as appropriate to the testing field.
  - 1. Laboratories engaged in testing of construction materials shall meet the requirements of ASTM E329.
  - 2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C1077.
  - 3. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of ASTM D3666.
  - 4. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D3740.
  - 5. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to ASTM A880.
  - 6. Laboratories engaged in non-destructive testing (NDT) shall meet the requirements of ASTM E543.
  - 7. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA.
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by CO/COR. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of CO/COR to such failure. The services provided shall include, but not be limited to the testing and onsite observations required to ensure that the critical element of placement of "Approved General Fill" on and

around the new Section 6 and 7 preplaced crypt fields. The Earth Moving specifications and drawing details on L-800 have very specific requirements for the material to be placed on the sides and on the top of the crypts. This material is one of the most important elements for this project as it has to be removed and replaced throughout the year by the Cemetery staff as they are performing interments in these preplaced crypt sections. This soil is critical so the Cemetery interment operations do not have to be performed in poor soil that becomes muddy and mucky when it has been raining. The testing and observation services contained herein are to include sufficient testing and observations to ensure the work is according to the contract documents. Of great importance is the testing of the borrow soil "Approved General Fill" to be placed in Sections 6 and 7, and monitoring and observation activities required to ensure that all of the trucks bring soil from borrow locations are carrying material that has been approved as "Approved General Fill" and that the if the soil appears to be varying from the approved soil that it will be set aside and retested to verify conformance with the "Approved General Fill" standards for this project. If conditions during construction vary by higher amounts than the estimated quantities of testing and observation hours provided herein for the interval when the borrow soil for the crypt fields is occurs, immediate notification of the CO/COR is required so arrangements can be made as required. In no case should the Contractor be allowed to bring this critical borrow material to the site without assurance by the Independent Testing Lab that the material is in conformance with the specifications.

- C. Written Reports: Testing laboratory shall submit test reports to CO/COR, Contractor, within 24 hours after each test is completed unless other arrangements are agreed to in writing by the CO/COR. Submit reports of tests that fail to meet construction contract requirements on colored paper. Provide test results in electronic format to the CO/COR as agreed following award of contract.
- D. Verbal Reports: Give verbal notification to CO/COR immediately of any irregularity.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 EARTHWORK**

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:
  - 1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the CO/COR regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable

results are observed, witness excavation of unsuitable material and recommend to CO/COR extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.

2. Provide full time observation and/or follow other procedures to insure that the "Approved General Fill" for Sections 6 and 7 meets the specifications. Provide compaction and field density testing of the earth placed around and on top of the crypts either in lifts or by excavation and testing at about half of the depth for the material on top and the surface when completed. Test the fill around the sides as it is placed in lifts. Provide part time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
  3. Provide supervised geotechnical technician to inspect excavation of subsurface and preparation. Be present for proof-rolling for roads and crypt fields.
- B. Testing Compaction:
1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with AASHTO T99, or test section method in Commonwealth of Pennsylvania Department of Transportation, Construction and Materials Specifications.
  2. Make field density tests in accordance with the primary testing method in the Commonwealth of Pennsylvania, Department of Transportation, Construction and Materials Specifications, and/or AASHTO T310 or AASHTO T-191 wherever possible. Should the testing laboratory propose alternative methods, they should provide satisfactory explanation to the CO/COR before the tests are conducted.
    - a. Pavement Subgrade: One test for each 100 linear feet.
    - b. Curb, Gutter, and Sidewalk: One test for each 300 feet, but in no case fewer than two tests.
    - c. Trenches: One test at maximum 100 foot intervals per 4 foot of vertical lift and at changes in required density, but in no case fewer than two tests.
    - f. All other fill, provide at least four tests and establish an acceptable method for the Contractor to place a compact that results in acceptable test results.
- C. Testing Materials: Test suitability of on-site and off-site borrow as follows:
1. For onsite borrow areas for all materials as directed by CO/COR.
  2. For off-site borrow for the "Approved General Fill" for Sections 6 and 7, perform testing of the offsite materials as needed to verify that the material meets the Specifications in SECTION 31 20 00 EARTH MOVING, Paragraph 2.1.C. Confirm by additional testing as needed that there is sufficient quantity of the same material. Should the soil conditions change, provide additional testing as needed to verify that the material is still in

conformance with the specifications as noted above. If not the Contractor shall find other sources that do meet the specifications, at no additional cost the Government.

### **3.2 LANDSCAPING**

- A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.
  - 1. Test for organic material by using ASTM D2974.
  - 2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
  - 3. Provide a determination of whether the tested topsoil meets the specifications, SECTION 32 90 00 PLANTING and if not, recommend soil amendments and/or enhancements that would be required to make soil in compliance with the specifications. If soil is not suitable, according to the specifications, then so indicate in the report following the testing of the soil.
- B. Submit laboratory test report of topsoil to CO/COR.

### **3.3 ASPHALT CONCRETE PAVING**

- A. Aggregate Base Course:
  - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with PTM No. 106, Method B (Pennsylvania Testing Method).
  - 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with AASHTO T191 or T310.
  - 3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in Section 703 of the Commonwealth of Pennsylvania Department of Transportation Construction Specifications.
- B. Asphalt Concrete:
  - 1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with Section 703 of the Commonwealth of Pennsylvania Department of Transportation Construction Specifications for gradation, wear, and soundness.
  - 2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
  - 3. Density: Make a minimum of two field density tests in accordance with Section 409 of the Commonwealth of Pennsylvania Department of Transportation Construction Specifications of asphalt binder and wearing course for each day's paving operation.

**3.15 TYPE OF TEST**

	Approximate Number of Tests Required
A. Earthwork:	
Laboratory Compaction Test, Soils: ASTM D1557	<u>15</u>
Field Density, Soils (AASHTO T191, T205, or T238)	<u>20</u>
Penetration Test, Soils	<u>15</u>
B. Landscaping:	
Topsoil Test	<u>6</u>
C. Aggregate Base:	
Laboratory Compaction, ASTM D1557	<u>2</u>
Field Density; ,ASTM D1556	<u>12</u>
D. Aggregate, Base Course	
Gradation (AASHTO T27)	<u>1</u>
Wear (AASHTO T96)	<u>1</u>
Soundness (AASHTO T104)	<u>1</u>
D. Asphalt Concrete:	
Field Density, ASTM D1188	<u>2</u>
E. Concrete:	
Making and Curing Concrete Test Cylinders (ASTM C31)	
<u>2</u>	
Compressive Strength, Test Cylinders (ASTM C39)	<u>1</u>
Concrete Slump Test (ASTM C143)	<u>1</u>
F. Inspection:	
Technical Personnel (Man days)	<u>20</u>

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