

**Materials and Research Division
Geotechnical Section**

Date: January 2, 2020
To: NDOT Earthwork Level I & II Certified Personnel
From: Mark Lindemann, Geotechnical Engineer
Subject: 2020 Earthwork Certification 5-Year Renewal

Happy 2020! This is the tenth year of the NDOT Earthwork Certification classes for our field (Level I) and soil lab testing (Level II). For those technicians and inspectors needing a certification renewal if it has been five or more years since their initial certification, the following information is meant to provide a summary of any changes that may affect earthwork inspection and testing and provide some useful information for the upcoming year.

Please have your staff read/ review and provide to me a list of names of those that have done so either via email (mark.lindemann@nebraska.gov) or fax (402-479-3975). If you have any questions, feel free to email or give me a call at 402-479-4752.

Thanks and have a safe year!



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TEST METHOD CHANGES

AASHTO T 99, 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 has been modified with minor language changes regarding the removal of the soil from the compaction mold.

AASHTO T 180, 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 has been modified with minor language changes regarding the removal of the soil from the compaction mold.

AASHTO T 310, Standard Method of Test for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth). Minor modification in the Report section that no longer requires date of last instrument calibration or calibration verification.

LIGHTWEIGHT DEFLECTOMETER (LWD) TESTING

The list of Target Deflection Values (DTV's) for several different soil types using the Nebraska Group Index (NGI) classification system continues to grow. When available, NDOT Branch and Central Labs will provide the estimated DTV's along with the lab test information. As always, we want to emphasize that it is important that field samples are brought to the labs to get the optimum moisture content and NGI value for your samples so we can continue the DTV correlations. Note that due to some variability in soil types, you may still need to perform a test strip to determine the DTV if the values obtained in the field do not match. We encourage staff to please give us a call if you have questions or are having problems in the field using the LWD.

SITE MANAGER

There has been some changes made to the Moisture and Deflection Template (LWD) in Site Manager when Foundation Course is being tested. If the material is either Crushed Concrete or Bituminous Foundation Course, you now select that respective material from the NGI cell in the template. Once either of these has been selected, the template does not require a proctor (proctor's aren't performed for these materials in the lab). Note that the optimum moisture is determined in the field and is not automatically populated in the template. Therefore the optimum determined in the field needs to be added manually.

NDOT'S QUALITY ASSURANCE PROGRAM FOR CONSTRUCTION INSPECTION

This is a repeat of what we include every year but is a good reminder.

Acceptance Testing, Quality Testing, Verification Testing – The following is a brief reminder for Project Personnel on The NDOT'S Quality Assurance Program with regard to the requirements for Project Inspector's Certifications and Testing.

For all transportation construction projects on the State and National Highway Systems and all local projects let through the NDOT Construction Division's electronic bidding system, we are required by the Federal Highway Administration's policy guide 23 CFR 637 (B) to establish and follow a Quality Assurance (QA) Program to ensure that materials and workmanship in our transportation projects conforms to the requirements of the plans and specifications. The three parts of the QA Program are: 1) qualified labs and testing personnel, 2) independent assurance, and 3) verification sampling and testing. The qualified labs and testing personnel (both lab and field) make sure that both equipment and testing personnel are capable of performing tests properly (part of the reason we have required Certifications and Training). This also ties into the required frequency of tests and responsibilities of the Contractor, field inspectors, testing labs,

and their roles. When NDOT is required to perform the acceptance testing, acceptance tests are performed by field personnel and at certain intervals NDOT Branch Labs perform verification tests of split-samples from the field tests to ensure the test results correlate to provide assurance that proper procedures, methods, and equipment are being used. The NDOT Central Lab performs quality testing on some materials to ensure the materials meet certain chemical and physical requirements. For example, quality testing of granular material (rock, sand, gravel) is performed by the Aggregate Lab in the Central Complex. These tests confirm the durability and strength of the granular material. Finally, Independent Assurance (IA) evaluates personnel and equipment that are used as part of the acceptance process of materials and workmanship. The IA can be performed by two different approaches; system or project-based. The system approach is used unless the specifications specifically require a project-based approach for IA sampling and testing. The system approach requires that an IA be performed based on time, generally on an annual basis, this is why the NDOT performs annual IA Rodeos at the Districts located across the state, and also goes to both consultant and contractor labs to inspect their equipment, and all of NDOT's 8 District's.

For further information about NDOT'S QA Program see Section 28 of the Materials Sampling Guide. <http://dot.nebraska.gov/business-center/materials/sampling-guide/>

Personnel performing the tests must be certified and maintain their certification for performing the work, this includes continuing in the recertification process, attending required IA Rodeos or testing, inspection or split sample protocols and staying current on any changes to the standard methods of tests as implemented by The Materials and Research Division.

REQUIRED TESTS AND FREQUENCIES

A final item that needs to be emphasized is providing the right tests as well as the proper number of tests on our projects. Again, this information is provided in the NDOT Materials Sampling Guide (MSG) and on your project's sampling checklist. This relates back to the NDOT QA Program and the responsibility to ensure materials and workmanship are in conformity with the plans and specifications. In other words, if our documents require a certain number of tests be performed for every cubic yard, it needs to be accomplished. The type of tests and the frequency for the Contractor, field inspectors, and labs are provided in the Materials Sampling Guide. Note that the applicable MSG version for each project is based on the letting date of that project. The MSG is updated once a year. Table 1 provides the tests and frequencies for both the field and laboratories for earthwork related materials from the MSG dated July 1, 2019. Note that all lab samples of soil and granular material must be submitted with a Site Manager Ticket, in a clean, labeled, tied canvas bag or five gallon bucket with a lid. All lime shall be submitted in a tied plastic bag before placement in a canvas bag.

CONTACTS

Below is a list of contacts from the Geotechnical Section's Central Labs and the Branch Labs. These folks are a great resource and great to work with.

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Table 1 – Sampling and Testing Requirements and Frequencies for Earthwork Materials

Section #	Material Descriptio	Type of Tests	Field Responsibility	Branch Lab	Central Lab
8-1 & 8-2	Crushed Rock and Crushed Rock Screenings for Base Course	Quality, Gradation & Compaction	One field test for every 1,500 ton. (Sample size 25-lb for Crushed rock for Base Course, 10-lb sample for Crushed Rock Screenings). Send 60-lb split sample to central lab every 4,500 ton.		One 60-lb sample for quality & gradation tests for every 4,500 ton. This shall be a split-sample from the field for verification of field gradation
9-1	Embankment – Cohesive and Granular	Moisture-Deflection or Moisture-Density	In-place test every 1,500 CY. Send 60-lb sample to Branch Lab or Central Lab for compaction curve of each soil type	Compaction Curve & Index Tests	Compaction curve & Index Tests. DTV provided when available or determined in field.
9-1	Embankment – Cohesive and Granular	Gradation (if specified)	One field test every 500 CY. Send one split-sample to Branch or Central lab for verification test every 2,500 CY.	One 10-lb sample for verification every 2,500 CY.	One 10-lb sample for verification every 2,500 CY.
10-1	Subgrade compaction and subgrade reconstruction	Moisture-Deflection or Moisture-Density	In-place test every 1,500 SY and every 750 SY for each shoulder Send required sample to Branch Lab or Central Lab for compaction curve of each soil type	60-lb sample for compaction curve & Index Tests	60-lb sample for compaction curve & Index Tests. DTV provided when available or determined in field.
10-3	Subgrade Soil & Fly Ash Mix Design	Quality	Send one 150-lb sample of subgrade soil and one 15-lb sample of fly ash to central lab 21 days prior to construction.		One 150-lb sample of subgrade soil and one 15-lb sample of fly ash for verification and mix design.
10-5	Subgrade Soil & Hydrated or Pebble Quicklime for Mix Design	Quality	Send one 100-lb sample of subgrade soil and one 5-lb sample of lime to central lab 21 days prior to construction.		One 100-lb sample of subgrade soil and one 5-lb sample of lime to form testing for mix design.

Section #	Material Descriptio	Type of Tests	Field Responsibility	Branch Lab	Central Lab
11-1	Stabilized Portion of Granular Subgrade	Moisture-Deflection or Moisture-Density	In-place test every 1,500 SY. Retests shall be taken if layer disturbed by construction, rain, etc. Send one 60-lb sample of granular and one 20-lb sample of soil binder to Branch or Central Lab.	One 60-lb sample of granular and one 20-lb sample of binder for compaction curve & Index Tests.	One 60-lb sample of granular and one 20-lb sample of binder for compaction curve & Index Tests. DTV provided or determined in field.
11-1	Stabilized Portion of Granular Subgrade	Quality & Gradation (Specified)	One field test every 1,000 SY. Send a split sample to Branch or Central Lab for verification tests (every 5,000 SY).	One 10-lb split sample for verification gradation test.	One 10-lb split sample for verification gradation test (every 5,000 SY).
11-2	Soil Binder	Gradation and Plasticity Index	One sample for gradation test for every 50 CY. If less than 10% is retained on No. 200 sieve, one sample every 200 CY for gradation. Send sample to Branch or Central Lab for gradation verification and run Lab PI.	One 10-lb split sample for gradation test verification and run a lab PI every 1,000 CY.	One 10-lb split sample for gradation test verification and run a lab PI every 1,000 CY.
12-1	Foundation Course	Moisture-Density or Moisture-Deflection	In-place test every 1,500 SY and every 1,500 SY per side of widening. Retests taken after layer disturbed by construction, rain, etc.		DTV provided when applicable or determined in field.
12-2	Crushed Concrete Foundation Course	Gradation	One field test each 500 CY. Send one split sample to Central lab every 2,500 CY.		Split of 60-lb sample for gradation test verification every 2,500 CY.
12-3	Bituminous Foundation Course	Gradation	One sample for testing each 500 CY. Sample size 35-lbs		NA

Section #	Material Descriptio	Type of Tests	Field Responsibility	Branch Lab	Central Lab
12-4	Aggregate Foundation Course-D	Gradation, FAA, & Compaction	One field gradation every 750 CY. Prior to construction send initial 60-lb sample for FAA and compaction to Central Lab. Send split sample to Central Lab every 3,750 CY for verification tests.		First sample will be one 60-lb sample for, FAA, Quality, and Compaction Curve tests. Remaining samples shall be one-20 lb. split sample every 3,750 CY for field gradation verification.
13-2	Mineral Aggregates (Commercial Production)	Quality and Gradation (if specified)	One field test every 300 CY (25-lb sample size). First sample send one 60-lb sample for quality tests and thereafter send one 10-lb split sample to Central Lab.		One 60-lb sample for quality tests or when a change in quality or characteristics is observed. One 10-lb split sample every 1,500 CY for verification.
13-3	Coarse Sand	Quality and Gradation (if specified)	One field test every 300 CY (25-lb sample). Send first sample 60 sample to Central Lab for quality an thereafter send 10-lb split sample for gradation verification every 1,000 CY.		60-lb sample for quality tests or when a change is observed. One 10-lb split sample for gradation tests every 1,500 CY.
13-4	Fine Sand	Gradation (if specified)	One field test every 300 CY. Sample size of 25 lbs. Send 10-lb split sample to Central Lab every 1,500 CY.		One 10-lb split sample for gradation verification every 1,500 CY.

Section #	Material Description	Type of Tests	Field Responsibility	Branch Lab	Central Lab
13-5	Soil Binder	Gradation and Plasticity Index	One sample for gradation test every 50 CY. If less than 10% is retained on No.		One 10-lb split sample to run gradation verification
13-6	Granular Base, Granular Fill, Granular Backfill, and Sand Blanket	Moisture-Density or Moisture-Deflection	In-place test every 1,500 CY and for each one-foot of thickness. Layers less than 2" thick may be omitted from testing. Send one 60-lb sample to Branch or Central Lab for compaction curve	One 60-lb sample for compaction curve & Index Tests.	One 60-lb sample for compaction curve & Index Tests. DTV provided when available or determined in field.
13-6	Granular Base, Granular Fill, Granular Backfill, and Sand Blanket	Gradation (if specified)	One field test every 750 CY (Sample size 25-lb). Send 10-lb split sample to Central Lab every 3,750 CY for verification test.		One 10-lb split sample to run gradation verification test every 3,750 CY.
13-7	Stabilized portion of Granular Base, Granular Fill, Granular Backfill and Sand Blanket	Moisture-Density or Moisture-Deflection	In-place test every 1,500 CY. Retests shall be taken if layer is disturbed by construction, rain, etc. Send 60-lb sample to Branch or Central Lab for compaction curve.	One 60-lb sample for compaction curve & Index Tests.	One 60-lb sample for compaction curve & Index Tests. DTV provided when available or determined in field.
13-7	Stabilized portion of Granular Base, Granular Fill, Granular Backfill and sand blanket	Gradation (if specified)	Gradation test every 750 CY (sample size 25-lb). Send 10-lb split sample to Central Lab every 3,750 CY for gradation verification		One 10-lb split sample to run gradation verification test every 3,750 CY.

Section #	Material Description	Type of Tests	Field Responsibility	Branch Lab	Central Lab
13-8	Granular Backfill for Structures (Including MSE Walls)	Quality and Gradation	One field test every 500 CY (25-lb sample size). Send 60-lb sample to Central Lab for quality tests and send 10-lb sample every 2,500 CY to Central Lab for gradation verification.		One 60-lb sample for quality or when change in characteristics is observed. One 10-lb split sample every 2,500 CY for gradation verification.
13-8	Granular Backfill for Structures	Moisture-Density or Moisture-Deflection	In place test for each foot of material placed. Send 60-lb sample to Central Lab for		One 60-lb sample for compaction curve test & Index Tests.
13-9	Granular Subdrains	FAA, Quality, Gradation & Compaction	One field test every 250 CY (25-lb sample size). Send one 60-lb sample to Central Lab for compaction curve. Send one 10-lb split sample every 1,250 CY to Central Lab for gradation verification.		One 60-lb sample for FAA, quality and compaction curve. One 10-lb split sample from field every 1,250 CY for gradation verification
13-10	Granular Backfill for Pipe Underdrains	Gradation, Quality & Compaction	One field test every 250 CY (25-lb sample size). Send one 60-lb sample to Central Lab for compaction curve. Send one 10-lb split sample every 1,250 CY to Central Lab for gradation verification.		One 60-lb sample for quality and compaction curve. One 10-lb split sample from field every 1,250 CY for gradation verification
13-11*	Select and Random Granular Backfill for MSE Walls	Quality, Gradation, Compaction, Friction Angle & Chemical	Send one 60-lb sample from per each wall to Central Lab. No further samples required to send if material remains from same source and no changes in characteristics occur. Perform one gradation every 1,000 CY.		One 60-lb sample for quality, gradation, compaction, friction angle, and chemical tests.

Section #	Material Description	Type of Tests	Field Responsibility	Branch Lab	Central Lab
13-11	Select and Random Granular Backfill for MSE Walls	Moisture-Deflection or Moisture-Density	In place test for every foot of backfill placed. In cases of short sections test to confirm compliance with specifications.		One 60-lb sample for index and compaction curve tests. DTV provided when available or determined in field.

*Note- Before the wall is constructed; the Contractor shall furnish test results of Select Granular Backfill. These tests are specified in Sections 714 and 715 of the NDOT Standard Specifications for Highway Construction.