

FIELD SAMPLING AND TESTING PROGRAM

SECTION 500

RIGID PAVEMENT

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**SECTION 500
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Section 550 Concrete Pavement

550.01 Description.

This work consists of constructing concrete pavement.

550.02 Acceptance Samples and Tests.

A. Engineer Responsibility.

The Engineer will collect material and conduct testing to verify that the material meets the requirements in Sections 802, 804, 812, and 826 of the NDDOT *Standard Specifications for Road and Bridge Construction*.

Aggregate:

Aggregate samples will be obtained randomly and split according to ND T 2, "Sampling of Aggregates" and ND T 248, "Reducing Samples of Aggregate to Testing Size." Table 550-1 shows test method and frequency.

Table 550-1	
Test	Frequency
ND T 27, "Sieve Analysis of Fine and Coarse Aggregates"	1 test result per 5,000 S.Y. rural or 1,500 S.Y. urban of concrete pavement.
ND T 11, "Materials Finer Than No. 200 Sieve in Mineral Aggregates by Washing"	1 test result per 5,000 S.Y. rural or 1,500 S.Y. urban of concrete pavement.

Report results to the District Materials Coordinator on SFN 2455, "Concrete, Sand, and Gravel Worksheet."

One composite aggregate sample will be submitted to Materials and Research. The sample will be tested for L.A. abrasion and soundness during the beginning of aggregate stockpiling.

Cement:

Submit one random sample of cement per project from the silo, truck, or hopper to Materials and Research. This sample shall be a minimum of 15 lbs. and placed in a moisture proof air tight container so as to avoid absorption of moisture and aeration of the sample.

Mix Water:

Obtain one sample per water source according to Section 812 of the NDDOT *Standard Specifications for Road and Bridge Construction* and submit to Materials and Research.

Concrete:

The Engineer will randomly select locations to conduct testing. Table 550-2 shows test method and frequency.

Test	Frequency
ND T 119, "Slump of Hydraulic Cement Concrete"	*1 test result per 2,000 S.Y. of concrete pavement.
ND T 152, "Air Content of Freshly Mixed Concrete by Pressure Method"	*1 test result per 2,000 S.Y. of concrete pavement.
ND T 121, "Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete"	*1 test result per 2,000 S.Y. of concrete pavement.

*Perform this testing a minimum of one test per day, or a maximum of three tests per day.

Opening to Traffic:

For determining pavement strength for opening to traffic there are three options. They are as follows:

- Maturity Curve – Verify the maturity curve from the mix design by making cylinders or beams and break near the time that the mix design criteria is met. If the results are within 50 psi flexural or 300 psi compression the curve is valid to use. If the results vary by more than 50 psi flexural or 300 psi compression than a new maturity curve must be developed.
- Cylinders or Beams – Each day make additional cylinders or beams to break to determine strength. The samples must be field cured.
- Cores – Take cores from roadway and break to determine strengths are met for opening to traffic.

Cores:

Obtain cores for thickness and strength. Measure the pavement width at all points where cores are taken. Submit cores to Materials and Research for testing, along with pertinent information on SFN 19404, "Concrete Core Specimen Worksheet."

Table 550-3 shows test method and frequency.

Table 550-3	
Test	Frequency
AASHTO T 24 "Obtaining and Testing Drilled Cores and Sawed Beams of Concrete"	*One core per lot.

*Definition of a lot:

- 4,000 square yards of concrete.
- If final lot is less than 1,000 square yards include it in the previous lot.
- If final lot is greater than 1,000 square yards it is a separate lot.

Joint Sealant:

Obtain one random sample of hot applied joint sealant for each lot. Submit samples to Materials and Research.

B. District Materials Coordinator Responsibility.

The Engineer will obtain these samples and provide them to the District Materials Coordinator.

Samples will be obtained and split according to ND T 2, "Sampling of Aggregates," and ND T 248, "Reducing Samples of Aggregate to Testing Size." Table 550-4 shows test method and frequency.

Table 550-4	
Test	Frequency
NDDOT 3, "Shale, Iron Oxide Particles, Lignite and Other Coal, Soft Particles, Thin or Elongated Pieces"	Minimum of 1 test result per day.
ND T 113, Lightweight Pieces in Aggregate"	Minimum of 1 test result per day.

An alternative testing procedure for testing shale content of coarse and fine aggregate may be used when the pit from which the aggregate samples are obtained has at least a ten-year history of no prior test results which exceed 50% of the specification limit.

If this criterion is met, perform an initial shale test at the beginning of the construction season with three more random tests performed during the remainder of the construction season. If any shale test exceeds 50% of the specification limit or a new portion of the pit is utilized, revert testing to the frequency mentioned previously.

The NDDOT requires District Materials Coordinators to keep a file on pits utilizing this testing procedure. Document the testing performed each year in the file.

C. Materials and Research Responsibility.

Aggregate:

The sample will be tested for L.A. abrasion and soundness during the beginning of aggregate stockpiling. Table 550-5 shows test method and frequency.

Table 550-5	
Test	Frequency
AASHTO T 96, "Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine"	*1 test result per project.
AASHTO T 104, "Soundness" (Sodium Sulfate)"	*1 test result per project.

*If the aggregate source has been tested previously by the Department and the material is within allowable limits testing will not be required.

Cement:

Test Portland cement according to Section 804 of the NDDOT *Standard Specifications for Road and Bridge Construction*.

Water:

Test non-potable water according to Section 812 of the NDDOT *Standard Specifications for Road and Bridge Construction*.

Joint Sealant:

Test joint sealant according to Section 826 of the NDDOT *Standard Specifications for Road and Bridge Construction*.

Cores:

Test cores submitted from the Engineer.

Table 550-6 shows test method and frequency.

Table 550-6	
Test	Frequency
AASHTO T 22, "Compressive Strength of Cylindrical Concrete Specimens"	1 core per lot.
AASHTO T 148, "Measuring Length of Drilled Concrete Cores"	1 core per lot.

550.03 Independent Assurance (IA) Testing.**A. Engineer Responsibility.**

Conduct IA tests on split samples taken by the District Materials Coordinator.

Testing performed will be as directed by the District Materials Coordinator.

B. District Materials Coordinator Responsibility.

The District Materials Coordinator will obtain these samples and conduct these tests. These samples will be an equal split sample with the Engineer.

Samples will be obtained and split according to ND T 2, "Sampling of Aggregates," and ND T 248, "Reducing Samples of Aggregate to Testing Size." Concrete samples shall be obtained according to ND T 141, "Sampling Freshly Mixed Concrete". Table 550-7 shows test and frequency for IA.

Test	Frequency
ND T 27, "Sieve Analysis of Fine and Coarse Aggregates"	1 test result per 50,000 S.Y. rural or 15,000 S.Y. urban of concrete pavement.
ND T 11, "Materials Finer Than No. 200 Sieve in Mineral Aggregates by Washing"	1 test result per 50,000 S.Y. rural or 15,000 S.Y. urban of concrete pavement.
ND T 119, "Slump of Hydraulic Cement Concrete"	1 test result per 3 miles rural or 15,000 S.Y. of concrete pavement on urban projects.
ND T 152, "Air Content of Freshly Mixed Concrete by Pressure Method"	1 test result per 3 miles rural or 15,000 S.Y. urban of concrete pavement.
ND T 121, "Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete"	1 test result per 3 miles rural or 15,000 S.Y. urban of concrete pavement.

The District Materials Coordinator and the Engineer will compare the test results for IA tolerances in Table 550-8.

Test	Tolerance
ND T 27, "Sieve Analysis of Fine and Coarse Aggregates," and ND T 11, "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing": No. 8 sieve and larger No. 50 sieve No. 200 sieve	±5 ±3 ±2
ND T 119, "Slump of Hydraulic Cement Concrete"	±1 inch
ND T 152, "Air Content of Freshly Mixed Concrete by Pressure Method"	±1.0%
ND T 121, "Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete"	±2.5 lb./ft ²

C. Materials and Research Responsibility.

The District Materials Coordinator will obtain and split this sample. Sample will be submitted to Materials and Research.

Table 550-9 shows frequency for IA testing for physical properties of concrete aggregate.

Test	Frequency
NDDOT 3, "Shale, Iron Oxide Particles, Lignite and Other Coal, Soft Particles, Thin or Elongated Pieces"	Minimum of 1 test per project.
ND T 113, "Lightweight Pieces in Aggregate"	Minimum of 1 test per project.

The District Materials Coordinator will compare the test results for IA tolerances in Table 550-10.

Test	Tolerance
NDDOT 3, "Shale, Iron Oxide Particles, Lignite and Other Coal, Soft Particles, Thin or Elongated Pieces": Shale, Iron Oxide Particles, Lignite and Other Coal, and Soft Particles (each) Thin or Elongated Pieces	±1.0 ±2.5

If the IA testing is not within specified tolerances, the District Materials Coordinator will obtain an additional sample for testing.

The District Materials Coordinator and Materials and Research will examine equipment used and review testing procedures. This will continue until the differences are resolved.

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CONCRETE, SAND, AND GRAVEL WORKSHEET
 North Dakota Department of Transportation, Materials & Research
 SFN 2455 (Rev. 03-2015)

Project	PCN
Submitted By	Date Received

GRAVEL

Pit Location	
Owner	
Sampled From	
Date Sampled	Field Sample Number
Lab. Number	Size Number

Soundness % Loss - AASHTO T-104 Tested By _____	
Specific Gravity - ND T-85 Tested By _____	
% Absorption - ND T-85 Tested By _____	
L.A. Abrasion (Grad.) % Loss - AASHTO T-96 Tested By _____	
Wt. Rodded lb./c.f. (kg/m ³) - AASHTO T-19 Tested By _____	
% Moisture ND T-255 Tested By _____	

(mm)	Ret.	Wt. Ret.		% Ret.	% Pass	ND Spec.
		Non-Cum.	Cum.			
100	4"					
90	3 1/2"					
75	3"					
63	2 1/2"					
50	2"					
37.5	1 1/2"					
25.0	1"					
19.0	3/4"					
16.0	5/8"					
12.5	1/2"					
9.5	3/8"					
4.75	No. 4					
2.36	No. 8					
Minus No. 8						
Wt. Check						
Original Wt.						
Fineness Modulus						

ND T-27 Tested By: _____

SAND

Pit Location	
Owner	
Sampled From	
Date Sampled	Field Sample Number
Lab. Number	

Soundness % Loss - AASHTO T-104 Tested By _____	
Specific Gravity - ND T-84 Tested By _____	
% Absorption - ND T-84 Tested By _____	
Color - AASHTO T-21 Tested By _____	
Wt. Loose lb./c.f. (kg/m ³) - AASHTO T-19 Tested By _____	
% Moisture ND T-255 Tested By _____	

(mm)	Ret.	Wt. Ret.		% Ret.	% Pass	ND Spec.
		Non-Cum.	Cum.			
9.5	3/8"					
4.75	No. 4					
2.36	No. 8					
2.00	No. 10					
1.18	No. 16					
600µm	No. 30					
425µm	No. 40					
300µm	No. 50					
150µm	No. 100					
75µm	No. 200					
Minus No. 200 (75µm)						
Original Wt.						
Wt. After Wash						
Wash Loss						
Wt. Check						
Fineness Modulus						

* Attention Advised

ND T-11 Tested By: _____
 ND T-27 Tested By: _____

<input type="checkbox"/>	_____ District
<input type="checkbox"/>	Central Lab.

Date	Testing Lab Supervisor
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Weight of Plus No. 4 Fraction
Weight of Total Sample

COARSE AGGREGATE			LAB. NO
			G
Grams in Plus 4 Fraction		Maximum % by Weight of the Plus No. 4 Fraction	% by Wt.
	(a) Shale	0.7	
	(b) Iron oxide particles	4.0*	
	(c) Lignite and other coal	0.5	
	(d) Soft particles exclusive of items a, b, c (includes clay and other friable material)	2.5	
	(e) Thin or elongated pieces (maximum thickness less than 1/4 the maximum width, or maximum length more than three times the maximum width)	15.0	
			NDDOT 3 Tested By: _____
	(f) Dry weight before washing - Dry weight after washing - Material passing No. 200 sieve % of total sample	1.0	

ND T-11 Tested By: _____

*Note: For small repairs and for bridgedeck overlays, the maximum iron oxide particles shall be 2.0%.

FINE AGGREGATE	LAB. NO
	S-

	Maximum % by Weight	% by Wt.
(a) Lightweight pieces in aggregate.....	2.0	

- Approved
- Not Approved

ND T-113 Tested By: _____

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