

**FIELD SAMPLING AND TESTING MANUAL**  
**MATERIALS AND RESEARCH DIVISION**  
**MEMORANDUMS**

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## MATERIALS AND RESEARCH MEMORANDUMS

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MATERIALS AND RESEARCH MEMORANDUM 1-1993

TO: District Engineers, District Materials Coordinators  
FROM: Ron Horner, Materials and Research Engineer  
DATE: June 28, 1993  
SUBJECT: Shale Testing on Progress Samples

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On all progress samples sent to the Materials and Research Division Laboratory, please indicate the shale percentage obtained by your testing. If the sample has 2% or less shale, a test on the shale will not be run by the Materials and Research Lab to save on the cost of zinc chloride and testing time. This will be the practice on state projects.

The Sampling and Testing Manual will be modified reflecting this change.

If you have any questions, please contact Materials and Research at 328-6904.

91/st

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MATERIALS AND RESEARCH MEMORANDUM 1-1996

TO: District Engineers, Project Engineers/Managers, Consultants  
FROM: Ron Horner, Materials and Research Engineer  
DATE: May 10, 1996  
SUBJECT: Mix Design Reports on State and Federal Highways

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Please include all gradation worksheets for the individual splits when mix design reports are submitted to the Materials and Research Division.

We are also requesting that all specific gravity worksheets for each component of the aggregate blend be included with your mix design report.

If you have any questions, call the Materials and Research Division at 701-328-6912.

grw

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MATERIALS AND RESEARCH MEMORANDUM 2-1996 (Revised)

TO: District Engineers, Project Engineers/Managers  
District Materials Coordinators

FROM: Ron Horner, Materials and Research Engineer

DATE: February 1, 2011

SUBJECT: Forms placed in Filenet at the Conclusion of Each Project on  
State and Federal Highways (Excluding Urban)

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Materials and Research Division requires the following:

1. The attached microfilm checklist, for the Materials and Research Division shows the test reports to be placed in filenet (not to be confused with Construction's checklist).
2. Use Record Control Number (RCN) 800334 when indexing these reports.
3. A link is no longer required to be sent when placed in filenet.
4. Materials and Research Division staff will input the consultants' final concrete cylinder reports into filenet.
5. We no longer need hard copies of the following:

SFN 13889 Project Records Samples/Tests Report  
SFN 59132 Density Pay Factor  
SFN 50289 Maximum Density Worksheet  
Project Completion Letter to FHWA  
Project Material Acceptance Letter to FHWA

If you have any questions, please contact Gerri Weisgerber, Materials and Research Division, at 701-328-6901.

91/grw



MATERIALS AND RESEARCH MEMORANDUM 1-1997 (Revised)

TO: District Engineers, Project Engineers/Managers  
FROM: Ron Horner, Materials and Research Engineer  
DATE: January 6, 2012  
SUBJECT: Acceptance of Edge Drains Using the Optical Camera

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There have been a number of edge drains inspected with the optical camera in the past few years. A substantial number of these edge drains have deficiencies, such as crushed pipe or excessive horizontal grade variances, which have been discovered with the optical camera.

**Standard Specification 714.04E** states the edge drains will be measured by the linear foot installed and accepted by the engineer. We recommend all project engineers/managers use the optical camera to help them determine acceptance of edge drains. Contact Materials and Research Division as soon as possible to make arrangements for the optical camera. We will then ship the camera to your project and, if necessary, send someone along to train your field personnel in its use.

grw

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## MATERIALS AND RESEARCH MEMORANDUM 1-1999

**TO:** District Materials Coordinators

**FROM:** Joe Davis  
Materials & Research Division

**DATE:** May 20, 1999

**SUBJECT:** PG Asphalt Sampling and Testing on County Projects with Federal Aid

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The following guidelines for PG asphalt sampling and testing will apply to all county projects with federal aid.

The sampling rate will be the same as required in the Combined State Binder Test Group procedures. Project personnel will observe the contractor obtain samples from material delivered to the job site. The sampling rate will be a minimum of one sample for every 250 tons for each supplier and grade of asphalt cement, or fraction thereof. The sample will be taken randomly within each 250 tons of material. A sample will consist of taking two 1-liter (1-quart) samples from the designated transport. The samples will be retained until the end of the project.

PG asphalt can be accepted on certification from any supplier that is participating in the Combined State Binder Test Group program.

For each project over 20,000 ton of HMA, one sample will be randomly selected for verification testing. The county will send the sample to a certified private lab for complete AASHTO MP 1 testing. A list of certified testing labs is on file at the NDDOT Bituminous Section of the Materials and Research Division.

The NDDOT may randomly select asphalt samples from county projects with federal aid. These samples will be tested, at no cost, to ensure supplier compliance with the Combined State Binder Test Group requirements.

If you have any questions call me at (701)328-6912.

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## MATERIALS AND RESEARCH MEMORANDUM 1-2008

**TO:** District Engineers

**ATTN:** District Materials Coordinators

**FROM:** /s/Ron Horner  
Materials & Research Engineer

**DATE:** July 8, 2008

**SUBJECT:** Physical Property Testing of Aggregates

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The following is an addendum to the most updated version of Section 400 of the "Field Sampling and Testing Manual."

During mix production, the current manual requires physical property testing of aggregates to be completed by the field laboratory conducting the Quality Assurance on the project. There may be instances where the appropriate testing equipment may not be available to conduct these tests.

If the physical property results are found to be satisfactory and consistent during aggregate production, the Project Engineer can waive this testing in the field lab. Quality Assurance testing for physical properties shall continue to be conducted in the appropriate District Laboratory.

If the Quality Assurance testing within the field lab is not waived, then all current frequencies and tolerances shall be in effect, as found in the current version of the "Field Sampling and Testing Manual."

The manual will be updated to reflect this change.

If you have any questions, please contact the Materials and Research Division.

7/8/2008

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## MATERIALS AND RESEARCH MEMORANDUM 1-2009

**TO:** District Engineers, District Materials Coordinators

**FROM:** Ron Horner, Materials and Research Engineer

**DATE:** July 29, 2009

**SUBJECT:** Sampling Soils or Soil Aggregates for Pipe Backfill Acceptance

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According to our Standard Drawings for Pipe Backfill, Approved Backfill shall meet the requirements of AASHTO M 145 for A-1, A-2, and A-3 soils. Each District has AASHTO reference standards to determine specification requirements for acceptance. For acceptance, this material must be submitted a minimum one week prior to use. The following shall be tested by District Materials Coordinators or their designated representative:

The project engineer, or designated representative, must obtain and split aggregate samples according to AASHTO T 2, "Sampling of Aggregates," and AASHTO T 248, "Reducing Samples of Aggregate to Testing Size," respectively. Samples are obtained from material delivered directly to the project site. Submit one sample to the district laboratory per project for sieve analysis and physical property testing to determine minimum requirements specified within AASHTO M 145.

Test sample according to AASHTO T 27, "Sieve Analysis of Fine and Coarse Aggregates," AASHTO T 11, "Materials Finer Than No. 200 Sieve In Mineral Aggregates by Washing," and AASHTO T 90, "Determining the Plastic Limit and Plasticity Index of Soils." Compute the sieve analysis and physical property results on SFN 9987, "Aggregate Sample Worksheet."

A new sieve analysis and physical property test shall be conducted for each change of soil-aggregate type or source.

The Sampling and Testing Manual will be modified reflecting this change.

If you have any questions regarding this change please contact the Materials and Research Division.

7/29/2009

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**MATERIALS AND RESEARCH MEMORANDUM 2-2009**

TO: Ron Horner  
Materials and Research Engineer

FROM: Joe Davis  
Materials and Research Division

DATE: July 7, 2009

SUBJECT: Rapid and Quick Set Emulsion Testing

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Since 2005, the Districts have been allowed to waive the sieve and viscosity requirements for CRS-2P emulsion if successful application of the material is achieved in the field. The reason for allowing waiving the sieve and viscosity is that both tests are construction indicators measuring properties related to consistency, handling, and field use of the emulsion. The viscosity test indicates if the material is capable of being pumped and sprayed without breakdown or run off. The sieve test is used to find the amount of asphalt in the form of large globules that could clog the distributor spray nozzles. If the emulsion is fluid enough to be pumped into a distributor and the spray pattern is even, the sieve and viscosity tests are considered redundant and are allowed to be waived.

Several Districts are now using CRS-2 emulsion, which is a rapid setting, non-polymer modified material. They agreed that the material is hard to test because it is a rapid set emulsion that can break in the sample bucket and on the sieve used for testing. The Districts do not want to penalize the supplier for sieve or viscosity if successful application is achieved in the field and want a similar policy as used with CRS-2P emulsion.

Recommendations:

The Project Engineer monitors the CRS-2 to determine whether there are any problems with pumping the emulsion from the transport. The Project Engineer should also monitor the seal coat construction to determine if the distributor spray bar is plugging, or if there is any streaking of the spray pattern. Any of these would indicate a problem with the consistency of the CRS-2 emulsion. When construction problems are found, the District should immediately start testing sieve and Saybolt viscosity at the frequency specified in the NDDOT Sampling and Testing Manual.

The NDDOT Sampling and Testing Manual's current procedure for sampling and testing emulsified asphalt should be modified to include CRS-2 emulsion.

### Procedures for Sampling and Testing Emulsified Asphalt:

The following is a description of the NDDOT's procedure for sampling and testing emulsified asphalt materials in the Districts and Central Lab (Materials and Research Division Laboratory).

A sample is defined as two 1/2-gallon plastic, screw top containers filled with the material to be tested. The first 1/2-gallon is tested as the original sample and the second 1/2-gallon is used as a check if the original fails.

### District Sampling and Testing

- The District samples each truck load delivered to the project.
- Each sample will be retained until all testing is completed.
- The District labs test the Saybolt viscosity and sieve on one sample from the first truck load delivered to the project and then one random sample from the next four trucks delivered. The testing rate then goes to two random samples from each additional five-truck lot, or fraction of a five-truck lot.
- For CRS-2P and CRS-2 emulsions, the sampling rate will remain at one sample from each truck load delivered to the project. The sieve and Saybolt viscosity will not be tested unless the Project Engineer determines that there is a consistency problem with the emulsion.
- For all emulsions, one sample is randomly selected from the first and second halves of the project and sent to the Materials and Research Lab for assurance testing.

### Materials and Research Lab Testing

- The Materials and Research Lab tests the random sample from both halves of the project. If the samples pass, the entire project is accepted with no further testing.
- If one sample passes from either half of the project then that half is accepted with no further testing.
- If one sample fails, then all samples from that half of the project are submitted to the Materials and Research Lab for testing.
- The Materials and Research Lab will inform the District when sample submittal is required due to failing tests.

- The Materials and Research Lab will then test samples around the one that does not pass to determine a failing lot size. For example:

There are four loads of emulsion delivered during the first half of a project and five for the second half of the project.

FIRST HALF OF PROJECT				SECOND HALF OF PROJECT				
Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5

The District submits Sample 3 from both halves of the project. Sample 3 from the first half passes and all material from the first half is accepted with no further testing. Sample 3 from the second half fails so the Materials and Research Lab will test Samples 2 and 4. If Sample 2 passes, Sample 1 is accepted with no further testing. If Sample 4 fails, Sample 5 is tested. If Sample 5 passes, the failing lot size is made up of loads 3 and 4.

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## MATERIALS AND RESEARCH MEMORANDUM 1-2010

**TO:** District Materials Coordinators

**FROM:** Ron Horner  
Materials & Research Engineer

**DATE:** May 20, 2010

**SUBJECT:** Use of Nuclear Gauges on Soils or Aggregates

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The use of nuclear gauges by consulting firms will be allowed under the following conditions:

- The use of the gauges shall be limited to soil and aggregate density testing only. Testing must be conducted according to AASHTO T 310 "In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)."
- The firm providing the testing shall provide calibration data for nuclear gauges. Nuclear gauges must be calibrated and verified according to Annex A1, A2, and A3 of AASHTO T 310.
- Nuclear gauges contain radioactive materials. Users must follow all applicable safety regulations and protocol required by North Dakota State Health Department.

The in-place density data acquired from each gauge must be compared to conventional methods of determining dry density. The conventional density tests are rubber balloon and sand cone. Oven dry, Speedy, and microwave are used for obtaining moisture content. A series of five (5) side by side comparisons shall be conducted at the beginning of each project. The average of the moisture content tests shall be compared to the nuclear gauge results. If the average differentiates by less than 1.0%, the nuclear gauge may be used without correction. However, if the gauge results differ by more than 1.0%, a correction shall be applied. If the in-place wet density results differ by more than 1.0 lbs/cu.ft, a correction shall be applied as well.

This correlation shall be verified with a single test for every 50 nuclear gauge tests. If the verification differentiates by over 0.5% or 0.5 lbs/cu.ft, a new correction factor shall be established as previously described.

Independent assurance shall be conducted using the conventional in-place density methods.

If you have any questions, please contact Scott Wutzke at 701-328-6902.

5/20/2010

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