

Asphalt Emulsion Quality Control/Quality Assurance Program

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Compiled by the
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Revisions

See the website for the latest revision updates:

<https://connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.aspx?Order=MM->

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- Revision 1, May 19, 2009
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I. GENERAL DESCRIPTION

The Asphalt Emulsion Quality Control/ Quality Assurance Program, henceforth called the program, is a comprehensive program designed to verify, assess, and track the quality of asphalt emulsions delivered to North Carolina Department of Transportation (NCDOT) projects and maintenance operations. It is also used as a means for qualifying producers/suppliers, henceforth producer designates producer/supplier, to provide asphalt emulsions in this capacity.

The producers are required to submit Quality Control (QC) plans to the state materials engineer for review, submit signed QC reports when testing is completed (see report requirements in [Appendix F](#)) and Excel spreadsheets ([Appendix J](#)) capturing all required on-site and off-site testing done by the producer to the asphalt quality engineer, and participate in Independent Assurance (IA) activities described in [Section VII \(Independent Assurance \(IA\) – Comparative\)](#).

All laboratories, producers' on-site, off-site, or independent, must meet a minimum set of criteria. The laboratories must either be AASHTO re:Source (formerly AMRL) accredited, henceforth designated as AASHTO re:Source, or NCDOT certified. The NCDOT certification process involves the qualification of all laboratory equipment, protocols, and testing procedures used. The NCDOT will also perform IA assessments and correlations of tests for NCDOT certified labs.

In addition, each facility will have a minimum number of NCDOT certified technicians to perform sampling, testing, and record keeping duties during production of material that are used on NCDOT and Federal Aid projects. The requirements for laboratory and technician certifications are discussed in detail in [Section III\(C\)](#) (Producer Laboratory Initial Certification and Annual Assessments) and [Section III\(D\)](#) (Asphalt Emulsion Producer Technician Assessment) of the program.

The NCDOT is tasked with performing Quality Assurance (QA) verification sampling, testing, and record keeping confirming the operation of the producer’s quality control system. The types of samples and the lot sizes required will be described in detail later in this document. For a comprehensive set of definitions and terminology related to this document, see [Section I\(A\) \(Definitions and Terminology\)](#).

It is the intent of this program that acceptance or rejection of material be based on the total program. Therefore, a comparison of the QC and QA verification and other recent sample data may be used by the NCDOT for acceptance or rejection of a lot of material.

Participation in this program does not relieve the producer of the responsibility of complying with all requirements of the NCDOT Standard Specifications for Roads and Structures. Section 1020 of the NCDOT Specifications is referenced in [Appendix C](#).

A. Definitions and Terminology

Below is common terminology with definitions, which may be used throughout this document.

1.	AASHTO – American Association of State Highway and Transportation Officials
2.	Acceptance Limits – a low and high number representing an allowable numerical range of values determined by the applicable test method.
3.	AMRL accredited – AASHTO re:Source Laboratory accredited.
4.	Annual assessment – visit by the NCDOT at least once per year to assess the laboratory with an IA sample.
5.	Batch – a representative quantity of asphalt emulsion that has an NCDOT batch number assigned to it. Note: Lot and batch have the same meaning throughout this program.
6.	Calibrate- A process that establishes the relationship (traceability) between the results of a measurement instrument, measurement system, or material measure and the corresponding

	values assigned to a reference standard.
7.	Certified – Holding appropriate documentation and officially on record as qualified to perform a specific function or practice a specified skill.
8.	Certified QC technician – Either a Level 1 or Level 2 asphalt emulsion producer competent person certified by the NCDOT.
9.	Certified sampling technician – Asphalt emulsion sampler certified by the NCDOT.
10.	Check(ing)- A specific type of inspection and/or measurement performed on equipment and materials to indicate compliance or otherwise stated criteria.
11.	COA – Certificate of Assurance is a test results report signed by the Level 2 or accredited laboratory QC Manager. Note: COA and Certificate of Compliance (COC) have the same meaning throughout this program.
12.	Comparative sample – See IA-comparative sample
13.	Directed sample – Sample taken by the producer’s certified sampling personnel when requested by a DOT employee. DOT will control when and where the sample is taken and will take immediate possession.
14.	HiCAMS – A NCDOT software used for sample tracking and test results entry. Highway Construction and Materials System.
15.	IA-comparative sampling – two or more samples taken back-to-back into separate containers for qualifying the lab technicians and equipment periodically.
16.	IAT – Independent Assessment Technician employed by NCDOT. Assesses laboratories and technicians for approval and continuing competency.
17.	Independent assessment – this is the process of evaluating the performance of the qualified sampling and testing personnel and testing equipment used to ensure that personnel are

	competent, and equipment is accurate and functioning properly.
18.	Level 1 – Basic certification for testing asphalt emulsion
19.	Level 2 – Advanced certification for overseeing Level 1 technicians and the laboratory. May also serve as the terminal manager. Serves as the backup technician for testing product in the event of Level 1 is unavailable.
20.	Lot – terminology used by some producers to describe a batch of material.
21.	MTU-Materials and Tests Unit
22.	NCDOT Asphalt Inspector – DOT employee responsible for initial terminal inspection and approval for shipping product, certifications, annual assessment of terminal’s sampling personnel, and retrieving QA samples for M&T Lab verification testing.
23.	NCDOT Certified Lab- lab inspected and approved by the NCDOT.
24.	Producer’s Lab – an AASHTO re:Source accredited or NCDOT Certified laboratory
25.	Program – NCDOT Asphalt Emulsion Quality Control/Quality Assurance Program
26.	QA – Quality Assurance –A review of a manufactured product, manufacturing process, or service after asphalt emulsion production completion to determine the degree of quality achieved.
27.	QC – Quality Control – Policies and procedures designed to maintain optimal levels of quality, accuracy, and efficiency in the production, selling and distribution of asphalt emulsions.
28.	QC Administrator – Develops Quality Control plans for producers but is not directly involved in the manufacture of product at the site.
29.	QC equipment verification – the producer’s process of verifying that the equipment is in calibration and documentation of that process.
30.	QC Manager- A competent laboratory person designated by the producer’s QC Plan who may also serve as the certified Level 2 and coordinate terminal and/or laboratory operations.

31.	Qualified- To make competent or eligible for a position or task. (a) To make competent or capable; certify. b) To make legally capable; license
32.	Random sample – a sample taken to eliminate any intentional or minimize any unintentional bias on the part of the person taking the sample.
33.	Split sample – a sample that has been divided into two or more portions representing the same material.
34.	Standardize- A process that determines whether adjustments are needed to a specific piece of equipment when its performance is compared with that of a generally accepted standard.
35.	Technician- competent laboratory sampling and/or testing person, qualified by NCDOT.
36.	Traceability – The property of a result of a measurement whereby it can be related to stated references usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties.
37.	Verification Sample – A random and independent sample taken for validation of the producer’s Quality Control’s testing and verification of the material quality

II. PROGRAM REQUIREMENTS

A. Basic Requirements

Each producer’s facility must have an approved in-house QC asphalt emulsion plan and an approved laboratory. Technicians must be certified by NCDOT Materials and Tests personnel or their representatives for sampling. The on-site laboratory, if applicable, is to be AASHTO re:Source accredited or NCDOT certified. See [Section III\(C\)](#) (Producer Laboratory Initial Certification and Annual Assessments). If the facility uses other laboratories for testing they must be AASHTO re:Source accredited in the tests in [Table 1 – Required Tests](#), and must conform to applicable sections of AASHTO R 18 (Establishing and

Implementing a Quality System for Construction Materials Testing Laboratories), henceforth designated as AASHTO R 18, for the tests in the producer's QC plan. See [Section II\(C\) \(Plant Approval Process\)](#).

Participation in the AASHTO re:Source Proficiency Sample Program (PSP) only, does not cover complete accreditation, thus the producer's laboratory still must be AASHTO re:Source accredited or NCDOT certified.

B. QC Plan

The program requires that the producer have a QC plan that meets the requirements of Section 9 of AASHTO R 26 (Standard Practice for Certifying Suppliers of Performance Graded Asphalt Binders). This is a comprehensive standard complete with guidelines and is available for purchase on the website at the following link: <https://bookstore.transportation.org/> or see [Appendix B](#). A Model Asphalt Emulsion QC plan has been referenced as a guide in [Appendix A](#). Contact the NCDOT for more information. An updated copy of the producer's current QC plan must be kept at each terminal or laboratory.

C. Plant Approval Process

The approval process requires the asphalt emulsion producer to email the state materials engineer requesting that the facility be considered for acceptance into the program. It must identify the specific products that are to be produced. The producer's QC plan must be submitted with the request for approval. A model asphalt emulsion QC plan is referenced in [Appendix A](#), which has a web link.

The NCDOT will review the producer's QC plan and, if it is approved, an on-site inspection will be scheduled. This on-site inspection will verify that the producer's QC plan has been implemented and is being followed. If either the producer's QC plan or laboratories do not meet the requirements of this program, the producer will be informed of the deficiencies in writing. Once the deficiencies have been addressed, the producer may again request approval.

The plant approval process will include taking source approval samples of each grade of emulsion the producer seeks to be approved to ship to NCDOT projects. The samples must meet NCDOT specifications. If the samples fail to meet NCDOT specifications, which can be found in [Appendix K](#), another site visit will be scheduled to take another source approval sample. When the producer seeks to be certified in another grade of emulsion after the initial plant certification, a source approval sample must be again taken for that grade.

When any change in the QC plan occurs after the initial approval, the producer shall submit written documentation specifying the change to the QC plan. Examples of such changes are, but not limited to, QC personnel, labs, lab equipment, data form changes, testing frequency, contact information, or process changes. NCDOT will review the change request for approval and respond within 10 business days.

Once the terminal is approved, it will be added to the NCDOT Approved Binder and Emulsion Suppliers List, found in [Appendix L](#).

D. Approved Laboratory

The program requires all tests associated with the testing of asphalt emulsion products listed in the producer's QC plan be conducted at an approved laboratory that is located at the terminal's location. An approved laboratory is defined as one that is NCDOT certified or one that conforms to AASHTO R 18 and is accredited by AASHTO re:Source in the procedures in Table 1 below. All equipment used by an approved lab is:

- Calibrated by qualified personnel or vendors with NIST traceable equipment/standards
- Checked, verified, and maintained per AASHTO R 18 regardless of who the approval entity is

For information on how to become an accredited laboratory contact AASHTO re:Source or visit their website at the following link: <http://aashtoreSource.org/>

Table 1: Required Tests

<u>Test Description</u>	<u>Test Method Reference</u>
Saybolt Viscosity	AASHTO T 59
Sieve	AASHTO T 59
Residue by Distillation, Oven, or Boildown	AASHTO T 59
Demulsibility	AASHTO T 59
Penetration	AASHTO T 49
Elastic Recovery	AASHTO T 301
Softening Point	AASHTO T 53
Storage Stability (24hr)	AASHTO T 59

The certification and subsequent annual IA-comparative assessments of an asphalt emulsion producer’s testing laboratory is a process by which it can be reasonably assured that the asphalt emulsion producer’s laboratory and its equipment and technicians therein can comply with ASTM, NCDOT, and AASHTO re:Source standards as it relates to required testing and sampling of asphalt emulsion products.

For laboratories that will be certified by NCDOT under this program, the asphalt producers will be required to have on-site, if applicable, the following instruments for asphalt emulsion testing calibrated

and verified to the stated procedures and checklists above and below in Table 1A. Both tables are subject to change.

Table 1A: Verifications and Checklists

<u>Equipment</u>	<u>Verification Procedure</u>	<u>Testing Procedure Checklist</u>
Balances	Appendix AJ	N/A
Demulsibility Equipment	N/A	Appendix U
Density	Appendix Z	Appendix Z
Distillation Apparatus	N/A	Appendix R
Drying Oven	Appendix AC	N/A
Ductilometer & Molds	Appendix W	Appendix W
Hot Plate	N/A	N/A
Laboratory Oven*	Appendix AC	N/A
Particle Charge Apparatus	N/A	Appendix X
Penetrometer	Appendix AG	Appendix T
Residue and Oil Distillate by Distillation	N/A	Appendix R
Saybolt Furol Viscometer	Appendix AD	Appendix O

Sieves (3-inch diameter- 850µm(No. 20))	Appendix AH	Appendix P
Softening Point Apparatus	Appendix S	Appendix S
Solubility	Appendix V	Appendix V
Thermometers	Appendix AF	N/A
Timers	Appendix AE	N/A
Water Bath	Appendix AI	N/A

* It is generally accepted that a mechanical convection oven is the only alternative to meet this specification.

Laboratory initial certification and subsequent assessments will be dependent upon keeping these instruments in faultless condition, calibrated, and verified. Detailed records of calibrations, daily equipment verifications ([Appendix AL](#)), equipment maintenance, and asset inventories ([Appendix AK](#)) shall be kept in accordance with AASHTO re:Source standards.

Laboratory certifications will be valid for a period of 60 months and shall be clearly posted in the laboratory. See [Section III\(C\) \(Producer Laboratory Initial Certification and Annual Assessments\)](#) for information on how to begin the laboratory certification process.

E. Certified Technician

The certified technician shall be known as either Level 1 or Level 2. The Level 1 shall be the person who performs the daily QC sampling, testing, and signing of test results forms of asphalt emulsion products.

The Level 1 demonstrates sampling and testing competence to the NCDOT during initial certification and

subsequent assessments. The Level 1 must also have an elementary understanding of the asphalt emulsifying or manufacturing processes, as well as understand how to properly handle asphalt emulsions before and during all applicable testing procedures.

The Level 2 shall be the person who oversees the daily operations of the producer's laboratory, may or may not supervise certified sampling technicians and the Level 1 personnel, previews the test results forms, signs test reports/COAs and any other pertinent records and documents involving the distribution and manufacturing of asphalt emulsion for use by the State of North Carolina. The Level 2 must:

- Have a competent and thorough knowledge of AASHTO, ASTM, NCDOT, and AASHTO re:Source requirements and specifications for asphalt emulsions.
- Demonstrate an advanced understanding of the science of asphalt emulsifying and manufacturing processes.
- Understand how to properly sample, handle, and test asphalt emulsions before, during, and after all applicable testing procedures.
- Demonstrate how to adjust material chemistry based on QC results.
- Know what initial certification and subsequent assessment items the NCDOT will check in a laboratory or technician certification or assessment visit. Ensure the Level 1 and laboratory is ready for this inspection.
- Be able to perform any applicable asphalt testing outlined in their QC plan in the event the Level 1 is physically unable to perform a specific test due to personal injury or personal illness.

The Level 2 is responsible for the following:

- Notifying the NCDOT immediately if the Level 1 is unable to physically perform testing for an extended period, due to personal injury or illness.
- Laboratory oversight.
- Maintaining calibration and lab equipment.
- All required laboratory documentation includes, but is not limited to:
 - Equipment calibration records
 - Asset inventories
 - Shipping tickets
 - Test results and spreadsheets
 - QC equipment verification records
 - The terminal's QC plan
 - This NCDOT Program
- Equipment maintenance
- Authorizing of test reports
- The tracking system to determine where product is delivered

The prospective Level 1 and Level 2 technicians will be initially certified by the NCDOT at the producer's laboratory and will include an evaluation of test procedures and written test phase. Upon successful completion of both phases, the technician is then certified at either Level 1 or Level 2. If there is only one technician assigned to the laboratory, that technician shall be certified as a Level 2. Upon certification the Level 1 or 2 shall be deemed competent to perform sampling and testing on asphalt emulsions for use by the State of North Carolina.

After terminal approval, in the event a new QC technician is hired by the producer, the NCDOT shall be notified immediately. NCDOT will then issue a provisional Level 1 certification valid for a period of 45 days. The provisional certification is issued to allow the producer to train the new QC technician for 30 days and then by the 30-day mark the laboratory will notify the NCDOT to schedule an initial certification within the next 15 days. An extension of the provisional certification beyond 45 days may be granted if approved by the NCDOT. If the new QC technician performed tests, all reports issued must have the Level 1 provisional certification number in the lower tier of the report along with the Level 2 signature and certification number.

Technician certifications will be valid for a period of 60 months and shall be clearly posted in the laboratory. See [Section III\(D\) \(Producer Technician Initial Certification and Annual Assessments\)](#) for information on how to begin the technician certification process.

F. Statement of Remediation

If material not meeting specification or material that is unapproved to be supplied to NCDOT projects is shipped to NCDOT projects, the producer will immediately notify NCDOT as described in their QC plan. Pavements, seals, or other applications constructed from the material may be subject to rejection or removal in accordance with [Article 105-3 of the Standard Specifications, Conformity with Plans and](#)

[Specifications](#). The producer shall be responsible for tracking the materials to the worksite and notifying the NCDOT where the material in question was shipped along with quantities delivered.

G. Falsification of Data, Suspension, Revocation

Certifications of laboratories, samplers and/or technicians shall be suspended or revoked based on the following circumstances, separated here by categories.

1. Fraud Related

- Confirmed or found to have falsifying of test results, records and/or reports
- Tampering with samples or the sampling process
- Falsifying or submitting misleading information about a QC or QA sample
- Permitting uncertified personnel to perform any asphalt emulsion sampling and/or testing without approval of the NCDOT
- Other valid reasons deemed appropriate by NCDOT for suspension or revocation

2. Performance Related

- Incompetence
- Failure to properly label samples as required by [Section III\(A\) \(Sampling for QC\)](#)
- Failure to sample and test QC samples at intervals prescribed in the QC plan
- The producer has relieved duties of Level 1 or Level 2 technicians' and, therefore, testing is not being performed

- Failure to maintain adequate qualified staff to maintain the minimal level of sampling and testing to produce quality material
- Failure to respond within 14 days after the NCDOT contacts the producer to schedule assessment of any type
- The producer IA-comparative sample results have a pattern of not comparing to NCDOT IA – comparative sample results
- Other valid reasons deemed appropriate by NCDOT for suspension or revocation
- If the producer or NCDOT declares the terminal inactive

III. Producer's QC

The producer's QC samples are used by the producer to monitor the quality of material being produced and shipped. QC test results are used to control material quality and adjust the producer's asphalt emulsion manufacturing process and may be used for acceptance or rejection by NCDOT. Materials will be sampled in accordance with AASHTO R 66, Sampling Asphalt Materials, except that samples may be taken from a single valve near the bottom of the tank. See [Appendix E \(Sampling Procedures for Personnel\)](#) for a description of AASHTO R 66 procedure.

A. Sampling for QC

The following protocol, which is not associated with the QA verification process, will certify that the materials tested meet NCDOT specifications. In accordance with AASHTO R 66, Sampling Asphalt Materials, except that samples may be taken from a single valve near the bottom of the tank. The

producer's certified sampler will take samples in an appropriate sealed wide-mouth plastic container with lid at a frequency that is set in the producer's QC plan.

Upon acceptance into this program, the producer's technically competent sampling personnel will be initially certified on AASHTO R 66 sampling procedures by the NCDOT asphalt inspector. QC Sampler certifications will be valid for a period of 60 months and shall be clearly posted in the laboratory. A certificate and unique sampling certification number will be issued by NCDOT to the person assessed. See [Appendix E \(Sampling Procedures for Personnel\)](#) and [Appendix G \(Technician Training and Evaluation Record\)](#).

Renewal of certifications will be conducted in the same manner as the initial assessment. For suspension and/or revocation information, see [Section II\(G\) \(Falsification of Data, Suspension, Revocation\)](#).

The sample(s) are for the tests performed at the producer's designated laboratory and has a unique NCDOT batch number. QC samplers will label the samples with identifying information.

For more information on sequential batch numbers to be used for sample identification, see [Section IV \(Sample Identification and Record Keeping of All Producer Material\)](#).

B. Accessibility to Facility and Random Visits by NCDOT

Materials and work areas shall be accessible. NCDOT reserves the right to take additional random samples. Random inspections will occur anytime the producer is capable of manufacturing emulsions.

C. Producer Laboratory Initial Certification and Assessments

An asphalt emulsion laboratory initial certification and subsequent assessments shall be subject to all applicable AASHTO standards and NCDOT asphalt emulsion acceptance specifications, see [Appendix C \(NCDOT Section 1020\)](#). The assessments will be conducted at the producer's QC laboratory and

performed by NCDOT personnel. The asphalt emulsion producer's laboratory will be inspected for its capability to perform the testing procedures outlined in the asphalt emulsion producer's QC plan.

Laboratories' NCDOT certifications expire after 60 months. Additionally, if the laboratory is certified by the NCDOT, it will be required to participate in bi-annual IA-comparative testing.

1. Initial Producer Laboratory Certification

Before the NDOT certifies a laboratory, the QC manager or Level 2 technician will complete a Laboratory Data Sheet, found in [Appendix M](#). The NCDOT will verify the list of test methods outlined in the current QC plan are to be performed at the producer's designated labs.

The QC manager will then present the laboratory for initial certification. This process will include, but is not limited to, checking the overall condition of the laboratory, weighing items, measuring items, verifying temperatures, verifying timers, and other applicable sections of AASHTO R 18 deemed necessary by the NCDOT. If there is a conflict between R 18 and the NCDOT requirements, NCDOT program requirements will supersede.

The NCDOT will check for the presence and condition of the ASTM, NCDOT, and AASHTO re:Source approved/required equipment listed in Table A1 and the following lab documentation:

- Up-to-date test procedures are on file in the lab
- Records and documents regarding equipment calibration, QC equipment checking, verification and maintenance and asset inventories ([Appendix AK](#))
- The records of the producer's in-house testing and sampling procedures
- Up to date or current AASHTO, ASTM, and NCDOT testing and sampling procedures

- Evaluation of quality control procedures
- Technician training and evaluation records for technicians who will perform asphalt emulsion testing and sampling. An example form may be found in [Appendix G](#).
- Use of electronic media for backup and storage of laboratory data
- Tracking system for test results and shipping tickets for all material produced which also tracks non-compliant / deficient items
- This NCDOT Asphalt Emulsion Quality Control Quality Assurance Program
- Up to date copy of approved producer's QC plan for the facility

The NCDOT will also check that samples are taken and stored appropriately and that the laboratory conditions samples properly prior to testing.

Laboratories will be rated as either:

- Satisfactory: Meets all requirements to be NCDOT certified.
- Corrective action required: Minor deficiencies thus requiring correction immediately. If deficiencies are not corrected within 30 calendar days, status automatically becomes Unsatisfactory.
- Unsatisfactory: Major deficiencies thus requiring application to be resubmitted with a detailed account of measures taken to correct these deficiencies.

If all items comply, the NCDOT will advise the QC manager that their lab is pending approval. Within 7 working days, the NCDOT will notify the QC manager if the laboratory has been approved or not.

In the event the laboratory has not been approved, the QC manager will be provided detailed information regarding the non-compliance issues. Non-compliance issues shall be corrected within 30 days for any issue. The producer's lab will not be certified until all non-compliance issues have been corrected. The QC manager will notify the NCDOT to reschedule a time and date for a reinspection.

Upon reinspection, if all components of the lab comply with the initial certification requirements, then the NCDOT will inform the QC manager that their lab has been certified and will receive the proper documents within 7 days. Laboratory certifications are to be clearly posted in the laboratory and will be valid for a period of 60 months with IA-comparative assessments being performed bi-annually.

Provided that all non-compliance issues have been corrected, the QC manager will then contact the NCDOT for permission to ship.

2. Laboratory Re-assessment

Laboratory re-assessments shall be conducted in the event a producer's laboratory performs poorly on IA comparative testing.

The NCDOT shall contact the Level 2 or QC administrator to request a laboratory reassessment. Once contacted by the NCDOT, the responsible person shall respond within 14 days. Failure to respond accordingly will result in the revocation of the certification for the laboratory. In this case, only material certified by a secondary NCDOT certified or AASHTO re:Source accredited laboratory in accordance with the producer's QC plan will be accepted by NCDOT.

D. Producer Technician Initial Certification

The NCDOT will administer the initial certification and subsequent reassessments of technicians at the producer's NCDOT certified labs.

The technician assessments/reassessments shall be subject to applicable sections of AASHTO and NCDOT asphalt emulsion sampling and testing procedures and any other applicable procedures deemed necessary by the NCDOT. The process of certification and reassessment of technicians assures the NCDOT that the asphalt emulsion producer's personnel are initially trained and competent to perform the required sampling and testing of asphalt emulsion according to standard procedures. Technician certifications expire at 60 months. Technicians can be reassessed within the 60-month period.

You must have onsite, always, at least one NCDOT certified sampler, for test method AASHTO R-66. See [Section III \(Producer's QC\)](#). It is recommended that the Level 1 and Level 2 certified QC technician(s) also be certified as a QC sampler.

Prior to the initial certification visit, the NCDOT will contact the producer's facility and/or laboratory QC manager or Level 2 to schedule a time and date to conduct the Level 1 and Level 2 initial certifications.

The QC manager will provide the NCDOT with the following information:

- The names of the producer's technicians that need to be certified
- A list of the tests that personnel will be certified in (select from Table 2)
- A list of tests that are outsourced to accredited third party lab(s)

NOTE: The producer shall furnish all instruments, equipment, and test materials needed for the initial certifications and annual assessment inspections by NCDOT.

The NCDOT will assess and observe the Level 1 and Level 2 technicians on the required procedures that are listed in the producer's QC plan as being performed in the producer's laboratory. Table 2 (Assessed Testing Procedure Checklist) includes a comprehensive procedure checklist.

Table 2: Assessed Testing Procedure Checklist

Test Procedure	Appendix to Find Checklist
Saybolt Viscosity	Appendix O
Sieve Test	Appendix P
Residue by Evaporation (by Boildown)– Company Method	Appendix Q
Penetration	Appendix T
Residue by Oven Evaporation	Appendix AA
Elastic Recovery (for producers that furnish CRS-2P or CRS-2L)	Appendix W
Residue and Oil Distillate by Distillation	Appendix R
Demulsibility	Appendix U
Softening Point	Appendix S
Particle Charge	Appendix X
Density	Appendix Z
Settlement and Storage Stability	Appendix Y

The Level 1 shall perform each test without any direction or input from the Level 2 or any other employee. Within 7 business days of the conclusion of the initial certification, NCDOT will submit to the producer an assessment summary that includes any non-compliance items observed with either the

technician assessment or the laboratory assessment. Should the assessor's findings result in a failure to certify, the Level 2 technician will contact the NCDOT to request another certification visit. During the resolution period, the producer will only be allowed to ship if there is a certified technician to perform tests or if tests are performed by an AASHTO re:Source accredited laboratory.

If the Level 1 technician has successfully performed all operations in the initial certification, the NCDOT will then administer a written test. The Level 1 must pass the certification phase and written test (minimum of 70% correct answers on the test) to be appointed an NCDOT certified Level 1 technician.

See [Appendix N](#).

Certifications will exhibit the tests performed, a unique technician number, are valid for 60 months and shall be clearly posted in the laboratory.

E. Producer's Test Report

[Appendix F](#) lists the minimum required information to be included on an asphalt emulsion test report.

Samples are to be tested at the rate set forth in the producer's QC plan. Test results are to be submitted to the NCDOT by means described in [Section IV\(B\) \(Retention and Reporting of Data\)](#). No information on a test report shall contain whiteout used to obscure original information nor shall pencil be used anywhere on the report. If corrections are needed, unused information should be lined out with only one line and then initialed. If a corrected report is sent out after the original report, it shall have the words "Corrected Report" clearly written or ink stamped on it.

The Level 2 technician must certify the COA's before product is shipped.

F. Consequences of Falsification of Test Results

No payment will be made for the quantity represented by the falsified test(s) results or documentation.

In addition, state and/or federal authorities may also pursue legal action.

See also [Section II\(G\) \(Falsification of Data, Revocation, Suspension\)](#).

G. Notification of Product Failure

This subject is addressed in Section 2.1 of any producer's QC plan on file at NCDOT and [Section VI.A.1](#) of this program.

H. Standard Specifications

The producer is to perform all sampling and testing in accordance with AASHTO, ASTM current specifications, and procedures referenced in the latest edition of the NCDOT Standard Specifications for Roads and Structures.

IV. Sample Identification and Record Keeping for All Producer Material

Each asphalt emulsion terminal that furnishes product to the state will be assigned a two-digit identification number. The producer shall properly label samples and record test data accurately. Producer's material will be identified with the sequential batch numbers. The first two digits of which will be the terminal ID. Skipping batch numbers when identifying material to be certified by the producer will not be permitted as this will create confusion in this process.

For retained samples, the batch number prefix shall contain an "R". For example, QC- becomes QR-. The word, retain, should be entered into the remarks/comment field to ensure there is no confusion.

Product resampled by the sampling personnel shall have an "R" designation on the end.

For example, if a terminal has the terminal ID AT01 the first batch ID will be 0100001. The first QC sample taken from batch 0100001 will be QC-0100001 and the resample would be QC-0100001R. Any retain would be QR-0100001. Product sampled for IA-comparative shall begin with IA, for example, IA-0100001.

A. Bill of Lading Requirements

An example bill of lading must be included with the QC plan. Furnish 2 copies with each shipment. Ensure both copies accompany the shipment and are delivered to the engineer or their representative at the destination. The bill of lading must contain all necessary information to identify the material and meet the requirements of the state's Department of Agriculture and Consumer Services that the asphalt terminal is located in. All bills of lading are required to have NCDOT sequential batch numbers. [Appendix H](#) must be accompanied with every BOL. If the information found on Appendix H is included in the BOL, the producer does not have to attach this document to every shipment.

The NCDOT may request copies of BOLs be provided the NCDOT Materials and Tests Unit at any time to aid in tracking material.

B. Retention and Reporting of Data

QC producer test data, Certificate of Analysis (COA) and/or Certificate of Compliance (COC) test documentation, tracking documents, bills of lading and special attachments, and loading affidavits are to be retained by the producer permanently. This documentation will be made available for review to the NCDOT and Federal Highway Administration (FHWA) upon request.

Quality control COA's or COC's and/or QC test reports shall include the items in [Appendix F](#) , including the NCDOT batch number identification, and shall be emailed at the time of testing completion to AsphaltQCQA@ncdot.gov.

Submission of certified test data to the NCDOT shall also be done by populating the Excel spreadsheet shown in [Appendix M](#). No header changes to the spreadsheet are permitted. The spreadsheet must be emailed at least every month of the year unless no product was shipped to NCDOT projects, and no product was assigned an NCDOT batch ID. If no product was shipped and no product was assigned a batch ID, please write an email saying so.

In addition to QC data, test data for all passing compatibility tests performed for micro surfacing or slurry seal mix designs must be emailed to the NCDOT from the lab that performed the testing.

Email this data to AsphaltQCQA@ncdot.gov by the 15th of the following month. No signature is required on this spreadsheet, but the data will be cross-checked with the certified test report data received from producers.

V. Quality Assurance (QA) Verification Sample Testing

The following protocol, which is not associated with the producer's QC process, will verify material quality, and validate the producer's test results which may or may not be used for acceptance or rejection. The QA verification samples taken by the NCDOT asphalt inspector, NCDOT construction and maintenance personnel, or other qualified individuals are used by the NCDOT to verify the quality of and validate QC testing of material being produced and shipped.

QA samples are to be taken at a frequency of at least one sample per 100,000 gallons of emulsion shipped for each terminal.

A. Verification Sampling by QA Personnel

In accordance with AASHTO R 66, Sampling Asphalt Materials, except that samples may be taken from a single valve near the bottom of the tank, the NCDOT asphalt inspector shall take verification samples, random and independent of QC samples, of asphalt emulsion at the rate of at least one one-gallon wide mouth plastic container with lid, for each grade per tank per batch number available when they perform a site visit.

NCDOT will affix a label to each container itself, not on the lid, to identify the material. An example of the label is in [Appendix D](#).

The samples are for NCDOT and have the same batch number as the most current QC sample taken from that batch by the producer. Upon return to the laboratory, the NCDOT asphalt inspector will record the sample information on a HiCAMS sample card and assign the HiCAMS number. The QA verification sample will be tested by the NCDOT in accordance with methods in [Section II\(D\) \(Approved Laboratory\)](#), (Table 1- Required Tests).

1. Field Verification Sampling by NCDOT Construction and Maintenance Personnel

NCDOT QA project personnel, certified in sampling procedures by the NCDOT, can take samples at project sites from producer's asphalt emulsion tankers, storage tankers, and distributor tanks using the appropriate sampling procedures set forth in [Appendix E](#).

QA project personnel will affix a label to each container surface, not on the lid, to identify the material. An example of the label is in [Appendix D](#).

These QA sample(s) for NCDOT have the same batch number as the bill of lading indicates. Upon return to the laboratory the NCDOT personnel will record the sample information on a HiCAMS

sample card and assign the HiCAMS number. The field QA verification sample will be tested by the NCDOT in accordance with methods in [Section II \(D\) \(Approved Laboratory\)](#), (Table 1-Required Tests). Other tests can be tested by the NCDOT upon request.

B. Accessibility to Facility

Materials and work areas shall be accessible. The NCDOT reserves the right to take additional samples. Random inspections will occur during normal business hours or when producing or shipping material for the NCDOT.

VI. QC Sample and QA Verification Sample Results Evaluation

A. Corrective Action and Investigation by the Producer and NCDOT on QC and QA Verification Samples

1. QC Sample Test(s) Fail Specifications by Any of the Producer's Labs

For a QC sample tested by any of the producer's accredited and/or certified testing facilities, where the sample does not meet specifications, once it has been determined that proper sampling and testing procedures were used, the producer will stop shipment and immediately notify the NCDOT.

The producer will conduct a formal investigation and take corrective action. The corrective action taken will be documented by the producer and all findings, which include test reports with comments, will be sent to the NCDOT immediately via email to AsphaltQCQA@ncdot.gov.

Once the investigation concludes and any corrective action implemented, normal sampling and testing procedures are resumed at the discretion and approval of the NCDOT. QC sampling may be increased per the direction of the NCDOT.

2. QA Sample Test(s) Fail Specifications by the NCDOT Laboratory

For a sample that does not meet specifications when tested by the NCDOT MTU Laboratory, once it has been determined that proper sampling and testing procedures were used, the NCDOT will immediately notify the asphalt terminal personnel and instruct them to stop further shipment of that batch number to NCDOT projects. The producer and NCDOT will agree on the corrective action taken before shipment of the grade in question can resume. The NCDOT will collect samples of the corrected material.

Succeeding batch numbers shall be tested by the producer’s lab in accordance with the producer’s QC plan. QC and QA sampling may be increased per the direction of the NCDOT.

3. Consequences of Providing Failing Material to NCDOT

If the material fails to meet AASHTO specifications for any test performed, the material is not acceptable and will be subject to [Section II \(F\) \(Statement of Remediation\)](#) of this written program.

VII. Independent Assurance (IA) – Comparative

For each producer over the IA-comparative sampling interval of at least twice per year, the producer’s IA test result(s) data set and the corresponding NCDOT IA test result(s) data sets are compared to the reproducibility limits statements in Table 4.

A. Table 4 – Asphalt Emulsion Reproducibility Limits – (IA only)

Test Parameter	** Asphalt Emulsion Grade Reproducibility Limits	Test Method Reference
Saybolt Viscosity @77F	15 % of the mean	AASHTO T 59
Saybolt Viscosity @122F	21 % of the mean	AASHTO T 59

Sieve	For values 0.00 to 0.10 – 0.08% (weight)	AASHTO T 59
Residue by Oven Evaporation	0.8% (weight)	AASHTO T 59
Residue and Oil Distillate by Distillation	2.0 % (weight) – Residue 0.7% - Oil	AASHTO T 59
Demulsibility	30% of the mean	AASHTO T 59
Penetration	Acceptable range: $d_{2s} = (0.02 * \text{average} + 1.8) * 2.83$	AASHTO T 49
Elastic Recovery	5.06 %	AASHTO T 301
Softening Point	5.15°C (Distilled Water)	AASHTO T 53

**** Note: Reproducibility limits subject to change.**

B. Comparative Sampling for IA

The IA comparative sampling protocol assesses the certified sampling personnel, testing personnel, and testing equipment. The IAT and Level 2 will coordinate when IA samples will be collected. The IAT will be on-site before sampling commences.

The sampling technician is to take samples for the NCDOT certified labs that they use for certifying asphalt emulsion. The QC sampler will take random IA samples of asphalt emulsion at the rate of at least two one-gallon wide-mouth plastic container, at least twice each year at the request of the NCDOT IAT. The IA sample will be a typical asphalt emulsion grade produced or supplied. IA samples are to be taken at the same time (back-to-back) and do not need to be physically split from a bulk container.

More than one “A” sample may be taken by the QC sampler depending on the number of laboratories being assessed. Samples designated with an “A” are always the producer’s samples. Each of the producer’s NCDOT certified labs receive an “A” sample. The sequence “A1, A2, A3, ...” will be used. For

example, if there are five labs used by a producer, there needs to be six samples taken (five for the producer's use, one for NCDOT). The NCDOT will receive the "B" sample.

The IA samples taken by the sampler are to be identified with the following information on the sample container. The sampler will furnish and affix a label to each container surface, not on the lid, with the following information to identify the material. [Appendix D](#) has NCDOT label information that can be used as a reference.

ASPHALT EMULSION LABEL:

1. Sampled By (Print): _____
 2. Date / Time Produced __/__/____ __: __ am/pm
 3. Date / Time Taken __/__/____: __ am/pm
 4. NCDOT Batch #IA- _____
 5. Facility: AT- _____
 6. Tank/Car#: _____
 7. Emulsion Grade: _____
 8. Rep. Qty.: _____
 9. ID: _____ *** (A, A1, A2...Ax=Prod/Supp, B=DOT)
- Sampler's Signature: _____

Sample "B" will be transported by the IAT to the NCDOT laboratory. Prior to departing from the terminal, the IAT will inform the Level 2 as to which tests will be performed on the "A" sample(s) as well as when to commence testing of the "A" sample(s). The "B" sample will be tested by the NCDOT laboratory at the same time (same day) as the "A" sample(s). The date and time of testing commencement shall be documented on the test report or in the report comments.

C. IA – Comparative Sample Test Results Evaluation

For the batch of a grade tested by the producer over the inspection interval, the set of IA results are compared to the corresponding NCDOT IA sample to reproducibility statements in [Table 4](#). If producer IA test result data sets a trend of not comparing to NCDOT IA test result data, technician certification may be suspended or revoked. See [Section II \(G\) \(Falsification of Data, Suspension, Revocation\)](#).

D. Corrective Action and Investigation by the Producer and NCDOT on IA – Comparative Samples

1. Deviation from Reproducibility Requirement of [Section VII\(A\) \(Table 4 – Asphalt Emulsion Reproducibility Limits – IA only\)](#)

See [Appendix AB \(Flowchart for Section VII \(D\) \(1\)\)](#) to use as a reference in this section.

For deviations from the reproducibility statements [in Section VII \(A\) Table 4 – Asphalt Emulsion Reproducibility Limits – IA only](#), the IAT will notify the Level 2 and other designated representatives.

IA comparative samples will be retaken, and all concerned labs will repeat testing. The NCDOT will observe the Level 1 or Level 2 perform the repeat test(s). Then if the results of the repeat test are in range of method reproducibility limits, they are reported by the NCDOT.

If the reproducibility is not acceptable after the repeat round of resampling and retesting, all labs will review the results and an investigation by the producer and NCDOT will be made to determine the cause of the discrepancy.

If the cause is determined to be improper sampling, testing procedures, testing equipment, or handling of the material by the producer's accredited and/or certified testing facilities, the NCDOT will issue the appropriate non-compliance statement to the producer.

Then the producer will notify their responsible approved individual and will take corrective action.

The corrective action and all related items will be documented by the producer and sent to the NCDOT for review.

If the problem is not corrected the producer's technician and/or laboratory certification will be suspended or revoked. If revoked, the producer needs to reapply for certification as noted in [Section II \(Program Requirements\)](#). It shall be determined who will perform testing for the producer while recertification is in process.

If the producer's technician or laboratory does not pass recertification, the technician and/or laboratory will be taken offline indefinitely and must use an alternate NCDOT certified or AASHTO re:Source accredited laboratory to certify the materials shipped.

If the cause is determined to be in the NCDOT's sampling and testing equipment, the NCDOT will take corrective action. Once the investigation concludes and any corrective action implemented, normal testing and sampling procedures are resumed.

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Appendix A: Example Model Asphalt Emulsion Quality Control Plan

See the website for the latest updates:

<https://connect.ncdot.gov/resources/Materials/MaterialsResources/Asphalt%20Emulsion%20QC%20Model%20Plan.pdf>

Appendix B: AASHTO R 26-01, Certifying Suppliers of Performance Graded Binders.

This method is available for purchase on the website: <https://bookstore.transportation.org/>

Appendix C: NCDOT Section 1020

See the website for the latest updates:

<https://connect.ncdot.gov/resources/Specifications/Pages/Specifications-and-Special-Provisions.aspx>

Note: Click on the latest Specification Book

APPENDIX D: Example Label for Sample Identification

The displayed file in this Appendix is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory.



ASPHALT EMULSION LABEL:

SAMPLED BY (PRINT): _____
DATE/TIME PRODUCED __/__/____ __:__am/pm
DATE/TIME TAKEN __/__/____ __:__am/pm
NCDOT BATCH# QA-_____ (Add "R" to end if resampled)_
(Or change batch prefix to contain an "R" if it is a retained sample)
FACILITY: AT- _____
TK/CAR#: _____
EMULSION GRADE: _____ REP. QTY. _____
ID: _____ (A=Prod/Supp, B=DOT)
EMULSION HiCAMS # _____
SAMPLER's Signature: _____

Appendix E: Sampling Procedures for Personnel

To reduce the number of variables that affect the correlation between QC samples and QA verification samples and IA comparative samples, it is important that all samples be obtained following the same procedures outlined in the *Standard Specifications*, and as outlined in this program.

All QC, QA, IA, and QR asphalt emulsion samples are to be taken by AASHTO R 66, Sampling Asphalt Materials, except that samples may be taken from a single valve near the bottom of the tank. This R 66 method is available for purchase on the website by following the link to the bookstore, <https://bookstore.transportation.org/>. The modification by NCDOT concerning single sample valves near the ground is to accommodate all existing producers to alleviate expensive modifications to tanks.

Each producer will describe in detail the sampling and testing procedures used at the facility in the producer's QC plan including the qualifications of sampling and testing personnel.

Samples taken by NCDOT QA personnel during facility visits will be taken in the same manner as the QC or IA samples taken at the plant.

Appendix F: QC and QA Verification Test Report Forms

Each producer will submit copies to NCDOT of all final QC test report forms, COA's, and COC's used with the producer's QC plan or with this program. COA's or COC's shall contain at a minimum the following information:

- A. Certifying statement with signature on the test report and COC/COA. This statement must read as follows: "By providing this data under my signature, I attest to the accuracy and validity of the data contained on this form and certify that no deliberate misrepresentation of data or manipulation of samples, in any manner, has occurred."
- B. Name and address of the testing laboratory.
- C. The facility or terminal who owns the sample.
- D. Unique report identification number and/or title and the date issued.
- E. Identification of the NCDOT batch number.
- F. Description, identification, and condition of the test sample.
- G. Date and time the sample was taken.
- H. Quantity in gallons/liters represented by the sample/test results.
- I. Sampled by name.
- J. Tank or car number.
- K. Grade of asphalt that is being tested.

- L. Date of receipt of the test sample in laboratory.
- M. Date(s) of test completion.
- N. Identification of the standard test method used and a notation of all known deviations from the test method.
- O. Test results and other pertinent data required by the standard test method.
- P. Identification of any test results obtained by a subcontractor and the name of the subcontractor.
- Q. Name of the person(s) accepting technical responsibility for the test report and NCDOT Technician Certification number for testing.
- R. Technician's name and NCDOT Technician Certification number for testing.
- S. Signatures of both Q and R.

APPENDIX H: Bill of Lading NCDOT Supplier and Transporter Certifications Standard

Attachment

The displayed file in this Appendix may not be current and is meant to be a reference. Contact the NCDOT Materials and Tests Unit with any questions about this document. If the information found on this document is included in the BOL, the producer does not have to attach this document to every shipment.

Attachment #1: (ATTACH TO EACH SHIPPING TICKET TO N. CAROLINA)

Asphalt Materials Bill of Lading Supplier's and Transporter's Certification for North Carolina per Section 1020.

Supplier: SUPPLIER NAME< CITY< STATE< TERMINAL ID

Terminal: ADDRESS
CITY< STATE< ZIP

Date: _____

Bill of Lading #: _____

NCDOT Project# _____ PO# _____

NCDOT Supplier's Certification:

This is to certify that this shipment of _____ gallons/liters or tons/metric tons of _____ grade asphalt including __0_ gallons/liters of _____ NA___ anti-strip meets all requirements of NC Department of Transportation specifications.

Signed: _____

Authorized Representative of Supplier

Extracted from Section 1020: "When no anti-strip additive is included with the load, the supplier shall indicate zero (0) in the gallons field and "NA" in the anti-strip field on the above certification."

NCDOT Transporter's Certification:

This is to certify that this transport tank was clean and free from contaminating materials when loaded. The material transported on the previous load in this tanker was _____
_____.

Signed: _____

Authorized Representative of Transporter

APPENDIX I: Federal Highway Administration Poster

The most recent version of the FHWA poster can be found here labeled “NOTICE Federal-Aid Project” Poster:

<https://connect.ncdot.gov/business/Ethics%20Documents/Required%20Posters.pdf>

This document must be displayed on site in the asphalt terminal office and/or Producer’s laboratory if product is furnished to NCDOT.

APPENDIX J: Spreadsheet for Asphalt Emulsion Test Data for Submitting to NCDOT

The Excel spreadsheet template is sent with an initial document package to all asphalt emulsion producer's quality control administrators for distribution. The information in the displayed template is subject to change. For an Excel copy, contact the asphalt quality engineer.

Sample Date/ Time	Test Completed Date	ID No.:	Test Comment	Sample Status	Material Description	Type/ Item/ Grade:	Sampled By	Sample From	Sample Location Details	Facility Name	Producer Name	Stability:	Saybolt Viscosity [sec]:	Saybolt Temperature [F]:	Residue by hot plate/ MAB [%]
4/27/2006 0:00	5/1/2006	QC-26xxxxx		Meets Specs	Emulsified Asphalt	CRS-2P	Jane Doe	Tank	10	Anytown, NC (#XX)	Emulsions company	ok	235	122	67.0

Residue by Evap. [%]:	Residue by Distillation [%]:	Sieve [%]:	Demulsibility [%]:	Residue Penetration[1/100cm]:	Elastic Recovery [%]:	Specific Gravity:	Solubility [%]:	Softening Point [F]:	Bath Liquid - Ring & Ball:	Reported By:	Tested By
67.0	67.3	0.012	96	100	58	8.45	99.96	112	water	Jane Doe	John Q. Doe

Note: Spreadsheets will be submitted by email in Excel .xls, .xlsx, or .xlsm format, to the QC Administrator of each producer for distribution. Header descriptions subject to change by NCDOT

APPENDIX K: Emulsion Specifications

The current version of the NCDOT Emulsion Specifications can be found here:

<https://connect.ncdot.gov/resources/Materials/MaterialsResources/Emulsified%20Asphalt%20Test%20Specifications.pdf>

APPENDIX L: NCDOT Approved Binder and Emulsion Suppliers and Products

The current version of the NCDOT Approved Suppliers and Products can be found here:

<https://connect.ncdot.gov/resources/Materials/MaterialsResources/Asphalt%20Products%20for%20NC.pdf>

APPENDIX M: Laboratory Data Sheet

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory.

Laboratory Data Sheet

NCDOT QC/QA Laboratory Certification Program- MT FORM 551

For initial certification and subsequent assessments this document must be completed, signed, and returned to the following address.

NCDOT Materials & Tests Unit
 Asphalt Laboratory
 1801 Blue Ridge Road
 Raleigh, NC 27607
 ATTN: Independent Assurance Technician
 Tel : (919) 329-4060

LABORATORY INFORMATION

Name of Company	
NCDOT Facility #	AT-
Name of testing facility	

Facility Physical Address	
City, State and Zip Code:	
Driving Directions (cross street)	

Facility Mailing Address of Laboratory (If different from above)	
City, State, Zip Code:	

Facility Contact:			
Title			
Telephone Number		(fax)	(Cell)
E-mail address			

Personnel Responsible for Quality

Level 2 Technician (Lab Supervisor / Manager)

Name: _____
Title: _____
Phone Number: () _____
Number of years' experience in testing Asphalt Emulsion: _____

Level 1 Technician

Name: _____
Title: _____
Phone Number: () _____
Number of years' experience in testing Asphalt Emulsion: _____

Level 1 Technician

Name: _____
Title: _____
Phone Number: () _____
Number of years' experience in testing Asphalt Emulsion: _____

Asphalt Emulsion Sampler

Name: _____
Title: _____
Phone Number: () _____
Number of years' experience in sampling Asphalt Emulsion: _____

Attach additional sheets if necessary.

I do hereby state that all information submitted and documented on this form is complete and accurate and acknowledge that any falsified or misleading information is subject to denial or revocation of certification. Please sign below.

Laboratory Supervisor: _____ **Date:** _____

APPENDIX N: Level 1 / Level 2 Technician Exam Information

Copies of the Exams are not available.

For confidentiality purposes the actual test cannot be displayed. The test will consist of series of questions based on AASHTO and ASTM asphalt emulsion testing procedures, as well as NCDOT asphalt emulsion specifications. The content may include questions regarding testing method, procedures, and information on the following.

- Sieve
- Unit conversion
- Saybolt Furol Viscosity
- Demulsibility
- Penetration
- Residue by Evaporation (all methods)
- Elastic Recovery
- Solubility
- Density
- Settlement and Storage
- Softening Point

APPENDIX O: Saybolt Viscosity Checklist

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060. This Checklist is not meant to be used as actual procedure, it is meant to be used to document and evaluate the technician administering the procedure

Furol Viscosity Procedure Checklist
MT Form 552

Viscosity Tubes

	1	2	3	4	5	6	7	8
Calibration Factor								
Month and Year of calibration								
Calibrated within last 3 years								
Tube has furol tip								
Inner surface smooth and clean								

Testing Bath

- (a) Maker _____
- (b) Viscometer and bath in draft free location
- (c) Bath must be capable of being filled to at least 6mm above overflow rim of viscometer.

- (d) Bath has stirrer
- (e) Control capable of regulating the temperature of the bath so that the digital display does not fluctuate by more than $\pm 0.05^\circ\text{F}$

Thermometers

- (a) ASTM 17F or 17C for tests at 77°F (25°C)
- (b) ASTM 19F or 19C for tests at 122°F (50°C).....

Water Bath

Water bath at 77°F (25°C) capable of maintaining temperature within range of $77.0 \pm 0.2^\circ\text{F}$ _____
 ($25.00 \pm 0.10^\circ\text{C}$)

COMMENTS:

Saybolt Furol Viscosity Procedure Checklist

(a) Timing Device(s)

No.	Manufacturer	Type			1/10 sec. graduations?	Accurate to 0.1% in 60 min.? (3.6 seconds in 60min.)
		Electric	Spring	Quartz		
1						
2						
3						

- (b) Withdrawal device?..... _____
- (c) Thermometer support? _____
- (d) Proper receiving flasks? _____
- (e) 850- μ m (No. 20) sieve or a 20-mesh strainer of wire cloth? _____
- (f) 4 oz bottle with stopper for tests at 77°F (25°C)? _____
- (g) 400-ml beaker for tests at 122°F (50°C)? _____
- (h) Water bath for tests at 122°F (50°C): capable of 160 \pm 5°F(71 \pm 3°C) _____

COMMENTS:

Procedure for tests at 77°F (25°C)

- _____ 1. Viscometer bath thermostat adjusted to maintain the bath at a temperature of 77.0 \pm 0.2°F?
- _____ 2. Sample thoroughly stirred without incorporating air bubbles?
- _____ 3. 100 to 110 ml of sample poured into 40 oz (118ml) bottle?
- _____ 4. Closed bottle place for 30 minutes in water and maintained at 77.0 \pm 0.2°F
- _____ 5. Bottle slowly inverted several times to mix sample?
- _____ 6. Sample poured into viscometer through No. 20 (850- μ m) sieve?
 - (a) Small portion allowed to flow through outlet to waste?
 - (b) Tube corked and viscometer filled until liquid begins to overflow the overflow rim
- _____ 7. Viscosity determined without any further disturbance of sample (without clearing gallery or stirring)?
 - (a) Cork snapped from the tube and timer started at the same instant
 - (b) Flask located so stream just touches neck of flask.
 - (c) Timer stopped when bottom of meniscus reaches graduation mark.

Procedure for tests at 122 °F (50 °C)

- _____ 1. Heat the emulsion sample in the original container to $122^{\circ} \pm 5^{\circ}\text{F}$ in a $160 \pm 5^{\circ}\text{F}$ water bath or oven?
- _____ 2. Clean, dry viscometer corked.
- _____ 3. Sample thoroughly stirred without incorporating bubbles.
- _____ 4. Approximately 100ml of sample poured into 400ml beaker?
- _____ 5. Beaker placed in water bath at $160 \pm 5^{\circ}\text{F}$
- _____ 6. Sample heated in water bath until temperature between 124.5 and 140°F is achieved?
- _____ 7. Sample poured into viscometer through No. 20 (850- μm) strainer?
- _____ 8. Level of sample above overflow rim of viscometer?
- _____ 9. Sample stirred at or about 60rpm with thermometer avoiding bubbles?
- _____ 10. Temperature of emulsion adjusted until it remains constant for one minute at $122.0 \pm 0.1^{\circ}\text{F}$?
- _____ 11. Temperature of viscosity bath within $\pm 0.35^{\circ}\text{F}$ of sample temperature
- _____ 12. Thereafter, thermometer withdrawn from viscometer and excess emulsion quickly removed from the gallery?
- _____ 13. Cork snapped from tube and timer started at same instant?
 - (a) Cork dry?
 - (b) Flask located so stream just touches neck of flask.
 - (c) Timer stopped when bottom of meniscus reaches grad. mark?

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX P: SIEVE CHECKLIST

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060. This Checklist is not meant to be used as actual procedure, it is meant to be used to document and evaluate the technician administering the procedure.

Sieve Procedure Checklist
MT Form 554

Apparatus

1. _____ A 3 in. diameter, 850- μ m (No. 20) sieve.
2. _____ Pan: shallow metal container to fit bottom of sieve.
3. _____ Solution of 2% sodium oleate in distilled water for anionic emulsions.
4. _____ Distilled water for cationic emulsions.
5. _____ Container suitable for 500g to 1000g of emulsion
6. _____ Oven: capable of being maintained at 220°F (105°C).
7. _____ Desiccator
8. _____ Class G5 balance available for weighing emulsion
Class G2 Balance available for weighing the sieve and residue.

Procedure

1. Test Temperature
 - a). _____ Test temperature is room temperature for samples whose viscosity is 100s or less when tested at 77°F (25°C).
 - b). _____ Test temperature is at $122 \pm 5^\circ\text{F}$ ($50 \pm 3^\circ\text{C}$) for samples whose viscosity is greater than 100 s or whose viscosity is specified at 122°F (50°C)
2. _____ Sample stirred to achieve homogeneity
3. _____ Weight of 850- μ m (No. 20) sieve and pan determined
4. _____ Sieve wetted with appropriate fluid
 - _____ with 2% sodium oleate for anionic emulsions
 - _____ with distilled water for cationic emulsions
5. _____ 1 kg (1000g) of emulsion weighed in suitable container
6. _____ Sample poured through sieve
7. _____ Container and residue on sieve washed with appropriate liquid
8. _____ Pan placed under sieve
9. _____ Pan and sieve heated for 2 hr. in 220°F (105°C) drying oven
10. _____ Pan and sieve cooled in desiccator
11. _____ Sieve, pan, and residue weighed
12. _____ Percentage sample retained on sieve calculated

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX Q: RESIDUE BY HOT PLATE CHECKLIST

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Residue by Evaporation via Hot Plate Procedure Checklist
MT Form 555

Apparatus

- Beaker(s), glass or metal 500 ml capacity
- Glass rod(s) with polished ends.
- Laboratory type hotplate

Procedure

- Beaker and rod weighted to 0.1 g
- 100.0 to 110 grams of emulsion added to beaker while still on the balance and weight recorded
- 3. Beaker containing rod and sample placed on hot plate and maintained at medium temperature
- As sample begins to boil, sample continuously stirred with glass rod.
- After it appears that the water is removed from the sample, heating continued for another 5 to 15 minutes.
- Sample not allowed to burn/smoke excessively
- Sample removed from hot plate and weighed to nearest 0.1 grams

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX R: RESIDUE BY DISTILLATION CHECKLIST

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Residue by Distillation Procedure Checklist
MT Form 556

Apparatus

1. Still and Burner Assembly
 - a) Still made of aluminum alloy
 Approximately 240 mm by 95mm I.D.
 - b) Still head made of aluminum alloy
 One 1-inch hole for connecting tube
 Two 0.5-inch holes for thermometers
 - c) Clamp for still head acceptable.
 - d) Seal for still
 - e) Burner for still: approx 4.75 in. I.D. ring burner with ports on inner periphery and Spacers.

2. Connecting Apparatus
 - a) Glass connecting tube approx. 12 mm O.D.
 - b) Bunsen burner for connecting tube
 - c) Metal flame shield
 - d) Suitable adapter between condenser and graduate

3. Condenser
 - a) one of the following
 - 1) West or Liebig type glass condenser
 - 2) Metal-jacketed condenser
 - b) Adapter to accommodate cork connection

4. Receiver
 - a) 100 ml graduated cylinder
 - b) Graduated intervals of 1.0 ml

5. Thermometers
 - a) Two ASTM 7C or 7F thermometers
 - b) Corks for thermometers

Procedure

1. Still (with lid; clamp, thermometers; and gasket, if used) weighed
2. 200.0 \pm 0.1 g of sample weighed in still assembly
3. One thermometer positioned approximately 0.25 in. from bottom of still
4. Another thermometer positioned approximately 6.5 in. from bottom of still
5. Ring burner placed around still about 6 in. from bottom
6. Ring burner lit (time: _____)
7. Connecting tube heated by Bunsen burner to prevent condensation.
8. Ring burner moved to bottom of still when lower thermometer is readable (420°F)
9. Temperature of (lower thermometer) increased to 500 \pm 10°F (260 \pm 5°C)
10. Temperature maintained at 500 \pm 10°F (260 \pm 5°C) for 15 minutes.
11. Ring burner shut off (time: _____)
12. Elapsed time, steps 6 to 11: 60 \pm 15 minutes
13. Hot still assembly containing residue immediately weighed to 0.1 g.
14. Thermal buoyancy correction of 1.5 added to above gross weight.

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX S: SOFTENING POINT CHECKLIST

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060. This Checklist is not meant to be used as actual procedure, it is meant to be used to document and evaluate the technician administering the procedure.

Softening Point Procedure Checklist
MT Form 557

1. Rings (at least two)	1	2	3	4	5	6	7	8
O.D. At top of shoulder 22.7 – 23.3 mm								
I.D. at top of shoulder 19.5 – 20.1 mm								
O.D. at bottom of ring 18.5 – 19.1 mm								
I.D. at bottom of ring 15.6 – 16.2 mm								
Total Height 6.0 - 6.8 mm								
2. Steel balls (at least 2)	1	2	3	4	5	6	7	8
Diameter: 9.5 mm								
Weight: 3.45 – 3.55 g								

3. Ball centering guides

_____ Two brass guides

4. Bath

_____ Glass vessel, minimum inside diameter of 85 mm and not less than _____ 120 mm in depth (800-ml beaker fits requirement)

5. Thermometer

- a) _____ One of the following thermometers available
ASTM 16C or 16F ASTM 15C or 15F (AASHTO only: ASTM 113C or 113F)
- b) _____ Thermometer positioned so bottom of bulb is level with the bottom of rings and within 13 mm of the rings but not touching them.
- c) _____ Thermometer can be read after 3 min. with bulb at bottom of rings.
- d) _____ AASHTO Only: an electronic temperature-measuring device may be used if it exhibits the same temperature response as the mercury thermometer.

6. Ring Holder

- a) _____ Holder accommodates two rings only in a horizontal position
- b) _____ Bottom of rings 25 mm above upper surface of bottom plate.
- c) _____ Lower surface of bottom plate 16 ± 3 mm above bottom of bath.

7. Bath liquids

- a) Freshly boiled distilled water for tests between 30 and 80°C.
- b) USP Glycerin for tests between 80 and 157°C
- c) Ethylene glycol for tests between 30 and 110°C
_____ Boiling point between 193 and 204°C

8. Miscellaneous

- a) _____ Release agent available.
- b) _____ Base plate, brass and approx. 50 by 75 mm
- c) _____ Forceps/Extra-large tweezers.
- d) _____ Knife or spatula
- e) _____ Gas burner

Comments:

Procedure

1. _____ Sample heated not more than 2 hours and not more than 110°C (200°F) above softening point.
2. _____ Pouring plate coated with release agent
3. _____ Brass rings heated to approximate pouring temperature
4. _____ Enough sample poured into two rings to provide excess when cool

5. _____ Elapsed cooling time at least 30 minutes
6. _____ If samples are at room temperature, cooling done at minimum of 10°C (18°F) below expected softening point.
7. _____ Knife warmed.
8. _____ Excess material cut off level
9. _____ One of the following bath liquids and thermometers.
 - a) _____ Freshly boiled distilled water for softening points between 30 and 80°C using ASTM 15C/15F thermometer.
 - b) _____ USP Glycerin for softening pts. between 80 and 157°C
10. _____ Apparatus assembled with rings, thermometer and ball centering guides in position.
11. _____ Bath filled to depth of 102 to 108 mm
12. _____ Balls adjusted to bath temperature before use
13. _____ Bath maintained at the proper starting temperature for 15 minutes
 - a) Ethylene glycol and freshly boiled dist. water: $5 \pm 1^\circ\text{C}$ ($41 \pm 2^\circ\text{F}$)
 - b) USP Glycerin: $30 \pm 1^\circ\text{C}$ ($86 \pm 2^\circ\text{F}$)
14. _____ Care taken to avoid contamination of bath liquid
15. _____ Ball placed in each ball centering guide with forceps
16. _____ Heat applied from below avoiding drafts
17. _____ After 3 minutes, is rate of temperature rise controlled to $5.0 \pm 0.05^\circ\text{C}$ ($9.0 \pm 1.0^\circ\text{F}$) per minute
18. _____ Temperature shown by thermometer at instant sample surrounding ball touches bottom plate recorded for each ring and ball.
19. _____ Total elapsed time from preparation to completion of testing for all asphalt specimens not more than 6 hours.
20. _____ Total elapsed time from pouring of specimen to completion of testing for all asphalt specimens not more than 240 minutes (4 hours)
21. _____ If softening point temperatures differ by more than 1°C (2°F), is test repeated.

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX T: PENETRATION CHECKLIST

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Penetration Procedure Checklist
MT Form 558

Apparatus

1. Penetrometer

	1	2	3	4
Maker				
Serial No. (or ID No.)				
Dial accurate to 0.1 mm				
Spindle readily detached				
Mass of spindle 47.45 – 47.55g				
Mass of 50 g wt. 49.95 – 50.05g				
Mass of 100g wt. 99.95 – 100.05 g				
Needle moves vertically, Base flat				
Equipped with leveling indicator				
Level indicator verified at least annually with a hand-held level				

2. Penetrometer Needles

	1	2	3	4	5
Needle No.					
Mass of needle: 2.45 – 2.55 g					
Needle Dia: 1.00 – 1.02 mm					
Ferrule Dia: 3.15 – 3.25 mm					
Ferrule length: 37 – 39 mm					
Needle straight					
Surface finish OK					
End symmetrically tapered and good condition					

3. Sample Container

- (a) _____ Metal or glass cylindrical, flat bottom container of essentially the following dimensions.
 (1) _____ For penetrations less below 200, 55 mm in dia. and 35 mm deep.
 (2) _____ For penetrations between 200 & 350, 55-75 mm in dia. and 45-70 mm deep.

4. Water Bath

- (a) _____ Capable of being maintained at a temperature varying not more than 0.1°C (0.2°F) from test temperature.
 (b) _____ At least 10 liters of water in bath
 _____ Perforated shelf at least 100 mm below surface of water and at least 50 mm from bottom of bath
 (c) _____ Water in bath clean

5. Thermometer for water bath

- (a) _____ Any thermometer or thermometric device with 0.1°C (0.2°F) subdivisions
 (b) _____ Thermometer used calibrated.
 (c) _____ Thermometer immersed to level of shelf.

6. Transfer Dish for Container (for penetrations made outside of bath)

- (a) _____ Capacity of at least 350 ml

- (b) _____ Sufficient depth for water to cover sample container
- (c) _____ Means of preventing rocking of container provided.

7. Timing Device

- (a) _____ Electric timer, stopwatch or another device graduated to 0.1 s or less and accurate to ± 0.1 s for 60 s interval.
- (b) _____ Automatic timing device on Penetrometer.

8. Light source

- (a) _____ Facility for illuminating surface of specimen.

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

Procedure Sample Preparation

- _____ Sample heated to not more than 90°C above expected softening point for asphalt
- _____ Sample stirred
- _____ Sample heated for the minimum time necessary to make sample sufficiently fluid.

1. _____ Sample poured into container (time: _____)
2. _____ Sample depth at least 10 mm greater than 120% of the depth of expected penetration
3. _____ If the sample is less than 65 mm in diameter and the expected penetration is more than 200, 3 separate samples poured for each variation in test conditions.
4. _____ Container loosely covered
5. _____ Proper container used
6. _____ Sample allowed to cool to for appropriate time.
7. _____ Sample and transfer dish place in water bath for appropriate time.
8. _____ Test run at 25°C with a test load of 100 g and a time of 5 s.
9. _____ Water in transfer dish covers entire sample.
10. _____ Needle cleaned with toluene or other solvent, dried with clean cloth and inserted into penetrometer.
11. _____ Levelness of apparatus ensured using the level indicator.
12. _____ Needle with weight adjusted to make contact with sample surface.
13. _____ Dial reading noted or adjusted to zero.
14. _____ Needle quickly released for 5.0 ± 0.1 s and dial adjusted to measure penetration.
15. _____ Penetration ignored if any container movement noted.
16. _____ Pens. at least 1 cm (10 mm) from side and bottom of container and each other.
17. _____ If transfer dish is used, dish with sample returned to bath after each penetration.

18. _____ If pen. over 200, needles left in sample until completion of test.
19. _____ When 1 needle is used, cleaned with solvent-moistened cloth after each pen. and then wiped with a clean dry cloth.
20. _____ Three penetrations made
21. _____ If container is less than 65 mm in diameter and the expected penetration is less than 200, one penetration in each of the 3 separate containers prepared.
22. _____ Average of at least 3 penetrations whose value do not differ by more than the amount shown below.

Penetration	0 – 49	50 – 149	150 – 249	250 - 500
Max. Difference	2	4	12	20

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX U: DEMULSIBILITY CHECKLIST

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Demulsibility Procedure Checklist
MT Form 559

Apparatus

1. _____ One piece of No. 14 wire cloth, unframed approximately 5 in.
2. _____ Metal beaker with 600 ml capacity
3. _____ Metal rod: approximately 7.9 mm long and 3.2 mm in diameter, with rounded ends
4. _____ A 50 ml glass burette graduated in 0.1 ml intervals.
5. _____ Demulsifying solutions for anionic emulsions:
 - (a) _____ CaCl_2 solution (1.11 g/L), prepared with water or
 - (b) _____ CaCl_2 solution (5.55 g/L) prepared with water.
6. _____ Demulsifying solution for cationic emulsions
 - (a) _____ Dioctyl sodium sulfosuccinate sol. (8 g/L), in water.
7. _____ Class G2 balance available
8. _____ Oven capable of maintaining $163 \pm 3^\circ\text{C}$ ($325 \pm 5^\circ\text{F}$).

Procedure

1. _____ Percent residue by distillation determined.
2. _____ Metal beaker, rod, and wire cloth weighed.
3. _____ 100.0 ± 0.1 g of sample weighed into beaker.
4. _____ Weighed to nearest 0.1 g.
5. _____ Weighed sample and reagent brought to $77 \pm 1.0^\circ\text{F}$ ($25.0 \pm 0.5^\circ\text{C}$)
6. _____ Reagent added from burette over 2-minute period (± 10 s).
7. _____ Contents of beaker stirred continuously and vigorously during addition of reagent.
8. _____ Lumps kneaded against side of beaker.
9. _____ Kneading continued for 2 minutes after addition of reagent.
10. _____ Mixture decanted onto wire cloth.
11. _____ Beaker and rod rinsed over wire cloth with distilled water.
12. _____ Lumps kneaded, and beaker, rod, and wire cloth rinsed until water runs clear.
13. _____ Wire cloth enclosing asphalt placed in beaker with rod.
14. _____ Assemblies placed in 325°F (163°C) oven.
15. _____ Samples dried to constant weight (change between 2 successive weighing < 0.1 g).

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX V: SOLUBILITY CHECKLIST

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Solubility Procedure Checklist

MT Form 560

Apparatus

1. Gooch Crucibles
 - (a) _____ Glazed inside and outside, except on outside bottom surface
 - (b) _____ Approx. dimensions of 44 mm at top, diameter of 36 mm at bottom and depth of 24 to 28 mm
2. Filtration Assembly
 - (a) _____ Filter flask: heavy wall with side tube, capacity of 250 ml or larger.
3. Suction Assembly
 - (a) _____ Appears to be satisfactory in all respects.
4. Glass Fiber Pads
 - (a) _____ Diameter of 32, 35 or 37 mm.
5. Solvent
 - (a) _____ Trichloroethylene, technical grade, type 1 (or reagent grade) or 1,1,1-trichloroethane, technical grade.
6. Desiccator
 - (a) _____ Appears to be satisfactory and is charged with effective desiccant.
7. Drying Oven
 - (a) _____ Capable of maintaining temperature at $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$).
8. Miscellaneous Items
 - (a) _____ Suitable container for weighing and dissolving sample.
 - (b) _____ Class A balance (readable to 0.0001 g) available
 - (c) _____ Policeman (optional)

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

Procedure

1. Preparation of Gooch crucible
 - (a) _____ Filtering apparatus assembled
 - (b) _____ Crucible placed in filter tube.
 - (c) _____ New glass fiber pad placed in crucible.
 - (d) _____ Pad wetted with solvent and seated firmly with light suction.
 - (e) _____ Crucible & contents dried at $110 \pm 5^\circ\text{C}$ for at least 20 minutes
 - (f) _____ Crucible & contents cooled in a desiccator for at least 20 min. and then weighed to nearest .0001 g.

- (g) _____ Drying and cooling procedure repeated until constant mass (± 0.0003 g) is obtained.
- (h) _____ Crucible stored in desiccator until used.

2. Procedure

- (a) _____ If sample is not fluid, sample heated with care to prevent local overheating, stirred occasionally and the entrapment of air avoided.
- (b) _____ Approx. 2 g of sample placed in tared (nearest 0.001 g) container
- (c) _____ Container with sample allowed to cool and then weighed to nearest 1 mg.
- (d) _____ 100 ml of solvent added to container, flask stoppered, and then container agitated as necessary until the sample is dissolved.
- (e) _____ Lumps gone? Container sides free of undissolved sample.
- (f) _____ Container stoppered and set aside for at least 15 min.
- (g) _____ Crucible put in filter tube and filter wetted.
- (h) _____ Asphalt solution decanted through filter with light suction
- (i) If insoluble matter is visible.
 - 1) _____ Retained in container until solution has drained through filter.
 - 2) _____ Container washed with solvent and insoluble matter transferred to crucible.
 - 3) _____ Container and policeman (if used) rinsed.
 - 4) _____ Insoluble matter washed until the filtrate is substantially colorless.
 - 5) _____ Strong suction applied to remove remaining solvent.
- (j) _____ Crucible removed and bottom washed free of dissolved matter.
- (k) _____ placed in oven at $110 \pm 5^\circ\text{C}$ for at least 20 min.
- (l) _____ Cooled in desiccator for at least 20 min. and then weighed to nearest 0.0001 g.
- (m) _____ Steps (k) and (l) repeated until constant mass of ± 0.0003 g obtained.
- (n) _____ Percent insoluble reported to nearest 0.1%

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX W: ELASTIC RECOVERY CHECKLIST

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Elastic Recovery Procedure Checklist
MT Form 561

Apparatus

1. (a) Molds

	1	2	3	4	5	6	7	8
Design conforms to fig 1 AASHTO T 301								
Thickness: 9.9 – 10.1 mm								
Width at midpoint: 9.9 – 10.1 mm								
Brass								

(b) Mold Plates

	1	2	3	4	5	6	7	8
Non-absorbent								
Brass								
Flat and level								

2. Ductilometer

- (a) Maker: _____
- (b) Serial No. (or ID No.): _____
- (c) _____ Space for at least 25 mm of water above and below sample at start of test.
- (d) _____ Machine capable of maintaining specified speed within 5%
- (e) _____ Machine functions without undue vibrations
- (f) _____ Capable of maintaining temperature within 0.1°C of 10°C
- (g) _____ Water free from oil and slime

3. Thermometer

- (a) _____ ASTM 63C or 63F/9C or 9F
- (b) _____ Thermometer calibrated.

4. Miscellaneous Equipment

- (a) _____ Straight-edged trimmer at least 1.5 in. wide
- (b) _____ Glass or metal beakers with 1000 ml capacity
- (c) _____ Glass rod(s)
- (d) _____ Oven capable of maintaining 163°C ± 3°C (325°F ± 5°F)

COMMENTS:

Procedure**Preparation** (residue by evaporation via oven)

1. _____ Assemble beaker(s) with rod and weigh to nearest 0.1 g
2. _____ Pour $50.0 \pm .1$ g of asphalt emulsion into beaker and weigh to nearest 0.1 g.
3. _____ Beakers placed in oven for period of 3 hours
4. _____ Mold assembled on plate prepared with release agent
5. _____ Interior surface of mold side pieces treated with release agent
6. _____ Samples stirred after 2 hours
7. _____ Beakers removed after subsequent 1 hr. and weighed to nearest 0.1 g.
8. _____ Mold filled by pouring a thin stream back and forth from end to end.
9. _____ Mold filled until more than level full.
10. _____ Disarrangement of mold parts avoided during filling
11. _____ Sample, mold and plate cooled at room temperature
12. _____ Cooling time 30 – 40 minutes
13. _____ Molds placed in water bath for 30 minutes
Water within 0.1°C of test temperature
14. _____ Base plate and filled molds removed from bath and excess trimmed with hot trimmer.
15. _____ Material not pulled away from base plate and mold pieces during trimming.
16. _____ Filled molds and base plate placed back in bath and conditioned for 85 – 95 minutes.
17. _____ Mold taken off plate and side pieces removed

Testing

18. _____ Briquette place on testing platform.
19. _____ Water in bath sufficient to cover briquette
20. _____ Water in Ductilometer within 0.5°C of testing temperature
21. _____ Specimen elongated to 20 cm over 5-cm/min rate.
22. _____ Specimen allowed to rest for period of 5 minutes.
23. _____ Specimen cut at mid-point
24. _____ Specimen allowed to recover for period of 60 minutes
25. _____ Ductilometer drive mechanism is pushed back and ends of severed ends meet
26. _____ Record measurement.

COMMENTS:

APPENDIX X: PARTICLE CHARGE CHECKLIST

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Particle Charge Procedure Checklist
MT Form 562

Apparatus

1. _____ 12-V dc current source, milliammeter, and current control device
2. _____ Electrodes: two 1x4-in. stainless steel plates.
3. _____ Held rigidly parallel, ½ in. apart
4. _____ 250 ml capacity beaker.
5. _____ Insulator (polytetrafluoroethylene resin square rod, virgin electrical grade, ½ in. thick, or an insulator made from other suitable material)
6. _____ Glass rod, 4 in. long and 3 in. thick or other device capable of insulating and suspending the electrode assembly in emulsion.
7. _____ Apparatus capable of manual height adjustment to insulate and suspend electrode assembly (optional)
8. _____ Water bath at temperature of $160 \pm 5^\circ\text{F}$ ($71 \pm 3^\circ\text{C}$)
9. _____ ASTM 19F or 19C thermometer
10. _____ Suitable timing device.

COMMENTS:

Procedure

1. _____ Heat the emulsion to $122 \pm 5^\circ\text{F}$ in a $160 \pm 5^\circ\text{F}$ water bath
2. _____ Pour emulsion into 250 ml beaker – insert glass rod between the insulator. Lie ends of glass rod on the two opposite edges of beaker. (An apparatus capable of manual height adjustment to insulate and suspend electrode assemble may be used)
3. _____ Sufficient emulsion pours into beaker to allow electrodes to be immersed 1 in.
4. _____ New electrodes and electrodes to be reused cleaned by washing with distilled water, suitable asphalt solvent, and then distilled water.
5. _____ Clean dry electrodes connected to current source and inserted approximately 1 in. into emulsion.
6. _____ Current adjusted to at least 8 mA and timing started.
7. _____ After 30 minutes or at 2 mA, whichever occurs first, electrodes disconnected and gently washed with a smooth, thin stream of distilled water.
8. _____ Electrodes examined for deposit of asphalt.
9. _____ Determined polarity reported.

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX Y: SETTLEMENT & STORAGE STABILITY CHECKLIST

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**Settlement and Storage Stability
Procedure Checklist
MT Form 563**

Apparatus

1. _____ Two 500 ml glass cylinders.
 - (a) _____ 50 mm \pm 5 mm O.D.
 - (b) _____ 5 ml graduations. (AASHTO only)
 - (c) _____ Cork or glass stoppers
2. _____ A 60 ml glass tube pipette [ASTM: 50ml glass tube pipette] (of optional form) {not necessary if cylinders with side arms are used}
3. _____ Four [ASTM: only two required] 1000 ml glass or metal beakers or containers of similar dimensions.
4. _____ Four [ASTM: only two required] glass rods: 7 in. long x $\frac{1}{4}$ in. diameter.
5. _____ Stir rods, glass or stainless steel, with rounded ends.
6. _____ Oven: capable of being maintained at $325 \pm 5^\circ\text{F}$
7. _____ Class G2 balance available.

Procedure

1. _____ Sample brought to room temperature (storage stability: 70 to 80°F)
2. _____ 500 ml representative sample placed in each of 2 cylinders
3. _____ Cylinders sealed airtight.
4. _____ Cylinder(s) allowed standing undisturbed at lab temperature (storage stability: 70 to 80°F).
 - (a) _____ 24 hours of storage stability
 - (b) _____ 5 days for settlement
5. _____ Approx. top 55 ml of emulsion pipetted or siphoned from each cylinder (or drained if using cylinders with side arms) without disturbing remainder.
6. _____ Each 55 ml portion thoroughly mixed.
7. _____ 50.0 \pm 0.1 g of each sample weighed into a separate beaker or container that has been previously weighed with a glass rod.
8. _____ Content of each beaker or container evaporated by procedure specified under residue by evaporation and percent residue calculated. (A = top)
9. _____ Approximately next 390 ml siphoned (or drained) from each cylinder.
10. _____ Emulsion remaining in each cylinder thoroughly mixed and 50.0 \pm 0.1 g weighed into a separate beaker that has been previously weighed with a glass rod.
11. _____ Content of each beaker or container evaporated by procedure specified under Residue by Evaporation and percent residue calculated. (B = bottom)
12. _____ Storage stability or settlement for the cylinder calculated as follows:
Storage Stability, %(24hrs) = B - A
Settlement, % (5 days) = B - A
13. _____ Report the storage stability as the average of the two individual cylinders results.

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX Z: DENSITY OF EMULSIFIED ASPHALT CHECKLIST

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060. This Checklist is not meant to be used as actual procedure, it is meant to be used to document and evaluate the technician administering the procedure.

**Density of Emulsified Asphalt
Procedure checklist
MT From 564**

Apparatus

1. _____ Density cup, stainless steel measure of known standard volume (83.2 ml)
2. _____ Balance, capable of being read to nearest 0.01 g.
3. _____ Water bath, constant temperature maintained at $25 \pm 0.5^{\circ}\text{C}$

COMMENTS:

Procedure

Preparation

1. _____ Stir emulsion to achieve homogeneity
2. _____ Heat emulsions whose viscosity testing requirement is 50°C in original container to $50 \pm 3^{\circ}\text{C}$.
3. _____ After sample reaches $50 \pm 3^{\circ}\text{C}$ stir the sample.
4. _____ Heat emulsions whose viscosity testing requirement is 25°C in the original container to $25 \pm 3^{\circ}\text{C}$.

Procedure

1. _____ Stir the emulsion and place in a constant-temperature water bath maintained at $25 \pm 0.5^{\circ}\text{C}$ for approximately 1 hour.
2. _____ Place the measure and its cap on the balance, tare, and zero the balance.
3. _____ Emulsion sample removed from the bath, stirred and trapping air in the sample avoided. (If necessary, strain through $850\mu\text{m}$ sieve to remove any skin or film)
4. _____ Measure brought to approx. 25°C and poured into the measure, filling it completely.
5. _____ Cap placed into the measure and removed with clean dry rag or paper with excess asphalt oozing through the orifice in the cap.
6. _____ Cap is placed on tightly and measure cleaned carefully, weighed and tared on balance to nearest 0.01 g and recorded.

COMMENTS:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX AA: RESIDUE BY EVAPORATION via OVEN CHECKLIST

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060. This Checklist is not meant to be used as actual procedure, it is meant to be used to document and evaluate the technician administering the procedure.

**Residue by Evaporation via Oven
Procedure Checklist
NCDOT Modified Method
MT Form 565**

Apparatus

- (a) _____ Glass or metal beakers with 100 ml capacity
- (b) _____ Glass rod(s)
- (c) _____ Oven capable of maintaining $163^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($325^{\circ}\text{F} \pm 5^{\circ}\text{F}$)

Comments:

Procedure

1. _____ Assemble beaker(s) with rod and weigh to nearest 0.1 g
2. _____ Pour 50.0 ± 0.1 g of asphalt emulsion into beaker and weigh to nearest 0.1 g.
3. _____ Beakers placed in oven for period of 3 hours
4. _____ Samples stirred after 2 hours
5. _____ Beakers removed after subsequent 1 hour stirred and weighed to nearest 0.1 g.
6. _____ Percent residue calculated and recorded.

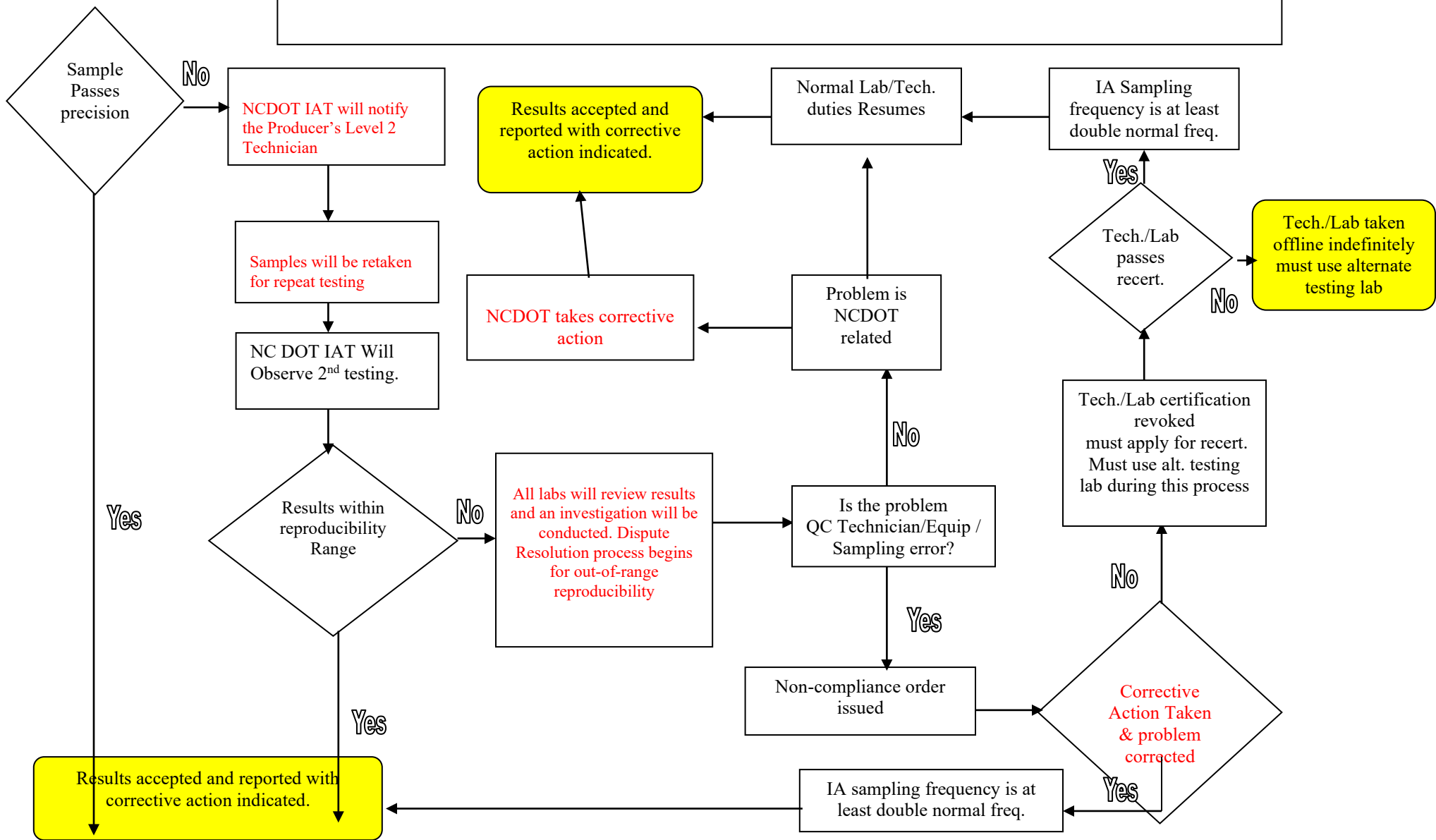
Comments:

Terminal Lab: _____ Technician: _____ Date: _____

APPENDIX AB: FLOWCHART FOR SECTION VII(D)(1)

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

APPENDIX AB: FLOWCHART FOR SECTION VII(D)(1) Deviation from Reproducibility Requirement of Table 4



APPENDIX AC: VERIFICATION OF OVENS

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

Verification of Ovens
MT Form 568

Equipment Verification Procedure:

1. Note the required operating temperature of oven.
2. Open the door of the oven and place an unexpired certified oven type thermometer inside the oven.
3. Leave the certified thermometer in the oven for approximately 30 minutes.
4. Slowly open the oven door to verify and record the temperature of the thermometer inside the oven.
5. If the temperature is in compliance proceed to step 6. If temperature is out of compliance make the necessary adjustments with thermostat or control knob and allow the temperature to stabilize for another 30 minutes. Repeat this step until required temperature measured by the certified thermometer is reached.
6. Record the reading of the thermometer inside the oven and the reading of the digital thermometer on the Oven Calibration Chart.

COMMENTS:

**VERIFICATION
CHART**

OVENS

MUST BE VERIFIED EVERY 4 MONTHS

PROCEDURE MT-568

OVEN NO. _____

CHECKED AGAINST NIST CALIBRATED THERMOMETER NO. _____ TYPE _____

OVEN LOCATION : _____

DATE	CHECKED BY	CALIBRATED THERMOMETER READING	DIGITAL READING

By providing this data under my signature, I attest to the accuracy and validity of the information and data contained on this form and certify that no deliberate misrepresentation of data or information, in any manner, has occurred.

Signature: _____ Date: _____

APPENDIX AD: Verification of Saybolt Viscometer

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

Verification of Saybolt Viscometer
MT Form 569

MT-569 Verification Procedure (Every 36 Months):

1. Check tubes to be sure they are clean and, there is no blockage in the orifices.
2. Check bath temperature to be sure it is in the limits as prescribed for the test.
3. With a stopwatch, measure the efflux time of viscosity oil standard.
4. Use Standard No. S600 and record the efflux time at 122-degree F. (The standard should have a minimum efflux time of 90 seconds).
5. If the efflux time differs from the certified value by more 0.2 percent , a correction factor must be calculated.
6. Record the correction factor for each tube and post in the vicinity of the Saybolt Viscometer.
7. Tubes requiring correction factors greater than one percent shall not be used for referee testing.
8. Record the following information upon each calibration:
9. Date
10. Type of calibration fluid.
11. Number and expiration date of calibration fluid.
12. Efflux time for each tube.
13. Certified value of calibration fluid.
14. Calculated correction factor for each tube.

VERIFICATION CHART

SAYBOLT VISCOMETER

PROCEDURE MT-569

MUST BE DONE EVERY 36 MONTHS

VISCOMETER NO. _____ - TUBES _____ THRU _____
 STANDARD FLUID NO. _____; LOT NO. _____ EXPIRATION _____
 TIMER NO. _____

TUBE NO.	50C EFFLUX TIME	50C VISC. STD.	% ERROR	CALIBRATION FACTOR

VISCOMETER NO. _____ - TUBES _____ THRU _____
 STANDARD FLUID NO. _____; LOT NO. _____ EXPIRATION _____
 TIMER NO. _____

TUBE NO.	50C EFFLUX TIME	50C VISC. STD.	% ERROR	CALIBRATION FACTOR

CALIBRATION PERFORMED BY _____
 DATE _____

COMMENTS:

By providing this data under my signature, I attest to the accuracy and validity of the information and data contained on this form and certify that no deliberate misrepresentation of data or information, in any manner, has occurred.

Signature: _____ Date: _____

APPENDIX AE: Verification of Timers

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

**Verification of Timers
MT Form 570**

MT-570 Equipment Verification Procedure:

1. Start and stop timer to be sure it is in working order and that the battery is not dead.
2. Verify that timer has been re-set to zero.
3. Using a non-expired certified timer, check all timers used in the lab against the certified timer as follows:
 - a) Check each timer a minimum of fifteen minutes and calculate its accuracy (measure against certified thermometer).
 - b) Timers not accurate to at least 0.05 percent are discarded.
 - c) Record results for each timer on form MT form 570a.

VERIFICATION
CHART

DATE _____

TIMERS

CHECKED BY _____

PROCEDURE MT-570
MUST BE DONE EVERY 6 MONTHS

CHECKED AGAINST CALIBRATED TIMER NO. _____

DO ALL TIMERS HAVE 1/10 SECOND GRADUATIONS? _____

Reading after 15 minutes must be accurate to 0.45 seconds

Manufacturer	Timer Serial Number & Expiration Date		Reading of Cert. Timer	Reading of Measured Timer

By providing this data under my signature, I attest to the accuracy and validity of the information and data contained on this form and certify that no deliberate misrepresentation of data or information, in any manner, has occurred.

Signature: _____ Date: _____

APPENDIX AF: Verification of Thermometers

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

Verification of Thermometers
MT Form 571

MT-571 Verification Procedure

1. Visually check to be sure thermometer reads the pre-set temperature of the oven or bath.
2. Check thermometers for cracks and mercury separation.
3. Discard faulty thermometers.
4. Record temperature and dates on form MT Form 571a.
5. Check ice point on thermometers that are so constructed in ice slurry.
6. Record thermometer number and ASTM type.
7. Condition both the thermometer being checked and a certified thermometer in a bath at the appropriate temperature for at least one hour.
8. Record the reading on the thermometer being checked and establish a calibration factor if necessary.
9. Discard thermometers outside the allowable limits.
10. Enter information in the thermometer calibration worksheet showing thermometer numbers, date, and calibration factors.

THERMOMETER VERIFICATION

MT Form 571a

Thermometer must be Verified every 6 months

Check in a liquid medium against a certified, calibrated thermometer.

Thermometer Type: _____	Operating Range _____
Type of test Used for: _____	
Verified against NIST Certified thermometer, Number: _____ Type: _____	
Date: _____	Verified by: _____

Thermometer number being Verified _____
Reading of tested thermometer _____
Reading of Certified thermometer _____

Thermometer number being Verified _____
Reading of tested thermometer _____
Reading of Certified thermometer _____

Thermometer number being Verified _____
Reading of tested thermometer _____
Reading of Certified thermometer _____

Thermometer number being Verified _____
Reading of tested thermometer _____
Reading of Certified thermometer _____

By providing this data under my signature, I attest to the accuracy and validity of the information and data contained on this form and certify that no deliberate misrepresentation of data or information, in any manner, has occurred.

Signature: _____ Date: _____

APPENDIX AG: Verification of Penetrometer

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

Verification of Penetration Apparatus
MT Form 572

MT-572 Verification Procedure (Every 6 Months):

1. Check spindle to be sure it moves freely up and down when released.
2. Visually inspect needle for straightness and burrs.
3. Check level of apparatus.
4. Verify scale is set so that the hand that reads the penetration is on zero.

Needle, Spindle, and Weight Calibration

1. Check condition of needle with jig that checks for straightness.
2. Check and record the weight of needle.
3. Check and record the weight of spindle.
4. Record the total weight of spindle and needle.
5. Weigh and record weight of 50.0-gram weight.
6. Use a Certified timer to check the timer used for penetration.
 - a) If a stopwatch is utilized check for 60 seconds.
 - b) If the penetrometer has an automatic timer verify the five second interval.

Penetrometer Measurement Calibration using Calibration Block

1. Place a brass plate on top of a glass transfer dish.
2. Place the calibration block on the brass plate at one of the numbered calibration points.
3. Without the needle inserted in the spindle unit, lower the spindle carefully down to the block so there is a snug fit. (The penetrometer may need to be raised and lowered to obtain the snug fit.)
4. Press the gauge plunger of the penetrometer and record the measurement. Do not reset the penetrometer scale to zero.
5. Slide the calibration block out from between the spindle and brass plate assembly. (There should be a slight pull necessary for this step.)
6. Carefully lower the spindle to the brass plate.
7. Press the gauge plunger of the penetrometer and record the measurement.
8. Subtract measurement two from measurement 1. (The difference should be the number the spindle was positioned over.)
9. Reset the scale by gently pushing the spindle up vertically. Ensure that the spindle is only pushed to the zero mark.
10. Repeat the process for the three calibration points (33.5 mm, 127.3 mm, and 192.5 mm) on the calibration block.

Verification of Penetration Needles
MT Form 572a

Penetration Needle Log

Date	Needle Serial #	Condition	Remarks	Initial

By providing this data under my signature, I attest to the accuracy and validity of the information and data contained on this form and certify that no deliberate misrepresentation of data or information, in any manner, has occurred.

Signature:_____ Date:_____

**VERIFICATION
PENETRATION APPARATUS**

Penetrometer

Maker:

Serial No.

**MUST BE CHECKED EVERY 6 MONTHS
PROCEDURE 572b**

CHECK WEIGHTS ON A CERTIFIED ANALYTICAL BALANCE & TIMER AGAINST A CERTIFIED STOPWATCH
BALANCE ID _____ CERTIFIED TIMER NO. _____

DATE CHECKED									
CHECKED BY									
CONDITION OF NEEDLE & NEEDLE NUMBER									
WEIGHT OF NEEDLE 2.45 TO 2.55 G									
SPINDLE WEIGHT 47.45 TO 47.55									
WT. OF NEEDLE & SPINDLE 49.9 TO 50.1									
WT. OF 50 G WEIGHT 49.95 TO 50.05									
TIMER - WITHIN 5 SEC. OR WITHIN + 0.1 S IN 60 SEC									
TIMER NO.									

MEASUREMENT CALIBRATION

CHECK EVERY 6 MONTHS AGAINST CALIBRATED BLOCK

CALIBRATION BLOCK: 127.3 MM 33.5 MM 192.5 MM

DATE CALIBRATED									
VERIFIED BY									
READING OF 192.5 MM BLOCK									
READING OF 127.3 MM BLOCK									
READING OF 33.5 MM BLOCK									

By providing this data under my signature, I attest to the accuracy and validity of the information and data contained on this form and certify that no deliberate misrepresentation of data or information, in any manner, has occurred.

Signature: _____ Date: _____

APPENDIX AH: Verification of Sieves

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

Verification & Calibration of Sieve
MT Form 573

MT-573 Verification & Calibration Procedure

1. Visually check sieves for physical defects such as broken wire, slits, or sags.
2. Discard faulty sieves.
3. Purchase all sieves to meet requirements of AASHTO M 92.
4. Visually inspect sieves for physical defects when put into service.

APPENDIX AI: Verification of Baths

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

Verification of Baths

MT Form 575

MT-575 Equipment Verification Procedure:

1. Note the required operating temperature of bath.
2. Ensure that the bath medium is of the appropriate type for a specific test.
3. Check the level of bath and fill to appropriate level with appropriate bath medium.
4. Observe and verify the temperature of the bath with a certified thermometer
5. If temperature is out of compliance adjust with thermostat or control knob until required temperature is reached.

APPENDIX AJ: Verification of Balances

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

Verification of Balances

MT Form 578

1. Have balance cleaned, serviced, and calibrated annually by trained service personnel to comply with AASHTO M 231.
2. Check to be sure that the balance is level.
3. Check zero and zero balance if needed.
4. Place calibrated weight on balance and check to see if balance is weighing correctly.
5. Record weight check in the verification form at the time interval indicated.
6. If at any time during the daily checks (Appendix AQ) the balance is found to be off and cannot be adjusted, call in trained service person for repair.

VERIFICATION

BALANCES

ANALYTICAL BALANCES MUST BE VERIFIED EVERY 4 MONTHS

GENERAL PURPOSE BALANCES MUST BE VERIFIED EVERY 12 MONTHS

CALIBRATED WEIGHT: 100 grams, Serial No. _____

Balance Location: _____

Balance Number: _____

DATE	CERTIFIED WEIGHT	BALANCE READING	CHECKED BY

By providing this data under my signature, I attest to the accuracy and validity of the information and data contained on this form and certify that no deliberate misrepresentation of data or information, in any manner, has occurred.

Signature: _____ Date: _____

APPENDIX AK: Asset Inventory Example

The displayed file in this Appendix may not be current and is meant to be a reference for display purposes. The header descriptions are in a column so the table will fit the page.

For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

<i>ASSET</i>	<i>INVENTORY</i>	<i>EXAMPLE</i>
INTERNAL #	143014	None
LOCAL ROOM	Chem	Chem
DATA ENTERED FOR	NCDOT	NCDOT
ROOM NO.	Trailer	127E-F
NAME	John Doe	John Doe
TYPE OF ASSET	Gravity Oven	Balance
DATE RECEIVED	11/13/1998	6/5/2003
DATE PUT INTO SERVICE	11/13/1998	6/6/2003
CONDITION RECEIVED	N/A	New
MANUFACTURER	Blue M	Denver
MODEL #	RS18A2GOP	XL-6100
SERIAL #	RS537	0075828
LOC CALIB RESULTS (EXACT LOCALE)	Trailer	Office
VERIF. FREQ.	Day/Use	Day/Use
VERIF.PROC.	MT-568	MT-578
VERIF RESP. PERSON	Tech.	Tech
LOC OF VERIF RESULTS (EXACT LOCALE)	Trailer	127E-F
Calib. Due	1/24/2009	1/24/2010
REMARKS	EXAMPLE	EXAMPLE

APPENDIX AL: Daily Equipment Check Log

The displayed file in this Appendix may not be current and is meant to be a reference. For the latest updated copy contact the NCDOT MTU Asphalt Laboratory at 919-329-4060.

EQUIPMENT CHECK LOG

INITIALS _____
 FOR WEEK ENDING _____

Certified Wt.= _____
 Serial# _____

<i>DAY</i>	<i>TEMP.PENETRATION BATH</i>	<i>TEMP.SAYBOLT VISCOSITY</i>	<i>TEMP. OVEN</i>	<i>BALANCE</i>
			Serial Number	Serial Number
MONDAY		1.		
		2.		
		Notes:		
TUESDAY		1.		
		2.		
		Notes:		
WEDNESDAY		1.		
		2.		
		Notes:		
THURSDAY		1.		
		2.		
		Notes:		
FRIDAY		1.		
		2.		
		Notes:		

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LAST PAGE OF PROGRAM.