ALABAMA

DEPARTMENT OF TRANSPORTATION

TESTING MANUAL

Bureau of Materials and Tests

REVISED 05/14/03

GENERAL INSTRUCTIONS

This manual aids uniform sampling and testing procedures by the Alabama Department of Transportation. Compliance with these procedures ensures all materials incorporated in a project can be documented as conforming satisfactorily with specification requirements and established Department policies. Revised or additional schedules and procedures are issued periodically. They should be immediately placed in the appropriate section of this manual. Note that the primary units used in this document are English. For projects that may be administered in metric units, appropriate metric values have been included in parentheses. English and metric units are provided in a manner consistent with the intent of the specifications and may not be exact conversions.

The Sampling and Testing Program

A copy of the Department's official sampling and testing program is for reference and study by project personnel. It defines their responsibilities for acceptance of materials incorporated in the work. Many items are produced or fabricated away from the project site and, inspected and tested by other Department personnel or agencies. Thoroughly study procedure ALDOT-195 **before** allowing contractors to incorporate these items.

The Sampling and Testing Schedule

To provide a cost effective sampling and testing program, schedules contained herein were developed for major projects when materials are produced by **previously unused sources**. For materials delivered to a major project from sources consistently producing quality material, the sampling and testing frequency may be decreased on a **job-**by-**job** basis. The Materials and Tests Engineer must approve this frequency decrease. Conversely, the frequency may be **increased** for a source with a history of supplying marginal quality material.

Requirements for testing material may be waived on certain minor projects. Material must be visually inspected to ensure it is in reasonable close conformance with specifications and will do the intended job. This includes projects with very small materials quantities of a noncritical nature. Examples are certain intersection improvements, safety projects, etc. Before beginning work, the Division recommends this waiver in writing to the **Materials and Tests Engineer**. This approval would then be on file. Form BMT-16 should be completed at the time the materials are incorporated into the project to show a visual inspection of all materials was acceptable. BMT-16 accompanies the Division Materials Certificate and becomes a part of the project files.

For contracts requiring miscellaneous material items in quantities smaller than normal lots for testing purposes, quantities may be accepted by a certified test report from the manufacturer when validated by the Testing Engineer. (Examples are steel fence posts, nuts, bolts, filter fabrics, etc.). For sources consistently producing quality materials, the **Division Materials Engineer** may authorize project personnel to accept these materials following visual inspections. Project personnel will execute Form BMT-16 for materials accepted on a visual basis at the time of acceptance and incorporation into the project. State on the report the **quantity accepted** and observed physical characteristics such as dimensions where applicable, general condition, workmanship, appearance, etc.

Sampling and Testing Procedures

Generally, American Association of State Highway and Transportation Officials (AASHTO) or Alabama Department of Transportation Procedures (ALDOT) are used; occasionally, ASTM or other agencies such as FAA or Corps of Engineers procedures are required. AASHTO, ASTM, or other agency procedures are not in this manual. Project personnel may obtain these procedures from the District Engineer's Office, Division Materials Engineer, or Bureau of Materials and Tests.

ALDOT-210 is used to determine when or where a sample or test will be taken for normal lot or sublot of material. This procedure provides unbiased samples and tests. If it is apparent that failing material exists due to segregation, mishandling, or worn equipment, the contractor will be required to rework or replace the failing portion **before** taking the acceptance sample or test. All personnel engaged in sampling and testing duties should thoroughly study this procedure.

Retest Provisions

Some AASHTO, ASTM, or Alabama Department of Transportation procedures contain retest provisions. The following general policy applies for those provisions not contained in the procedure. For occasionally failing samples, two additional samples or tests (randomly selected per ALDOT-210), will be obtained for the failing lot. If the two additional tests meet the requirements, the lot may be accepted; if only one or none of the samples or tests meet the requirements, the entire lot is rejected until replaced or reworked per the Standard Specifications, Section 106. When more than two failing lots of material are sampled and tested during the same time period, all lots may be rejected without retests. In this event, the source of material and/or contractor's workmanship should be evaluated before allowing any further shipments or work to proceed.

In conclusion, project personnel are urged to thoroughly study the individual sampling and testing schedules and procedures **before beginning** any item of work. Place particular emphasis on ALDOT-195. This results in timely payments to the contractor and rapid clearance of the final Materials Certificate of Conformance (BMT-38).

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FOREWORD

Sampling and testing schedules prepared prior to job (project) construction are general guides for evaluating the quality of materials and workmanship incorporated in a highway or bridge. Accordingly, this manual contains a general frequency schedule for acceptance sampling and testing. Select lots or sites for sampling/testing under these frequencies per the random number procedure (ALDOT-210) in this manual. If test results vary significantly and/or marginal quality of materials or workmanship are noted-develop more frequent schedules of sampling and testing. Our objective is to ensure acceptance eligibility of any given lot of materials or workmanship. Materials from sources consistently producing acceptable material may require less frequent testing.

SECTION I

GENERAL INFORMATION

The Bureau of Materials and Tests of the Alabama Department of Transportation is directed by the Materials and Tests Engineer. He is responsible for evaluation of all materials functions within the Department. The Bureau is composed of the following sections: Materials, Central Testing Laboratory, and Geotechnical. Responsibilities of the Materials and Tests Engineer are further executed through Division Materials Engineers.

Division and Project Laboratories are under the general supervision of the Division Materials Engineer. Responsibilities include the quality of all acceptance sampling and testing of materials fabricated at or near the project site, i.e., soils and/or aggregate bases, Portland cement concrete, bituminous concrete mixes, etc. Duties include the review of the capabilities of all testing personnel, and their proficiency in and knowledge of the sampling and testing frequencies/procedures. He is also responsible for frequent condition checks of testing equipment used in laboratories under his supervision. When consistent failures of acceptance samples or tests occur, the Division Materials Engineer initiates an investigation. He reports his findings and actions taken or recommendations to alleviate further occurrence to the Materials and Tests Engineer. Additionally, the Division Materials Engineer directs periodic reviews of all Testing Manuals in his area for current additions or deletions.

The Central Testing Laboratory in Montgomery is directed by the Testing Engineer. Responsibilities include all chemical tests, specialty tests, standardization and uniformity of tests, and quality tests that Division or Project Laboratories are not equipped to perform. Tests are performed in accordance with Standard or Interim Standard ASTM, AASHTO, Federal Standard Specification Procedures or Alabama Department of Transportation Test Procedures.

The Materials and Tests Engineer establishes test frequencies and procedures for new products or procedures incorporated in contracts. This is accomplished for required test methods and frequencies not included in this manual.

TYPES OF SAMPLES AND TESTS

A. Quality or Informational Samples and Tests are, in general, performed on a pre-contract basis in order to determine the eligibility of a source to furnish materials or products that will consistently meet acceptance test requirements.

B. Acceptance Samples and Tests are those performed during construction for determining if contract requirements are being fulfilled.

C. Certified Acceptance Samples and Tests are performed by authorized producers shown in the Manual of Materials, Sources and Devices with Special Acceptance Requirements which contains a current list of pre-qualified producers and products.

D. Comparison and Correlation Samples and Tests are used to determine if any significant variation in results is occurring between laboratories or operators performing test(s) on a given lot or standardized sample of material.

E. Independent Assurance Samples and Tests are similar to comparison samples but may represent different lots of material than used for acceptance sampling and tests.

SECTION II

1. Acceptance and Independent Assurance Samples and Tests

a. Acceptance Samples and Tests are those samples taken and tested for determining the quality and acceptability of the materials and workmanship which have been or are being incorporated in the project. The collection of samples and proper tests (materials fabricated or produced at points away from the job site excepted) along with test reports are the responsibility of the Project Engineer (State, Municipal, County). The Project Engineer or his representative should review all test reports for accuracy and completeness regardless of whether the test was performed on the project, in the Division Laboratory, the Central Testing Laboratory, by a Certified Producer Laboratory or any other approved inspection agency. Acceptance samples and tests will be taken and performed at the proper point or stage of construction and in accordance with the scheduled frequency contained in the current Testing Manual or subsequently adopted plan for a specific project.

   Acceptance samples and tests of materials manufactured and/or fabricated away from the project site may be pre-sampled and tested before delivery to the project by Division or Central Office Materials and Tests personnel or by manufacturer's personnel when the material is from an approved source of producer certified materials. All pre-inspected materials will be marked in accordance with the required markings contained in the Testing Manual and test reports forwarded to the Project Engineer. The Project Engineer will determine the final acceptability of pre-inspected and tested materials at the time they are incorporated in the work.

b. All pre-inspected and tested materials, whether by Department or other authorized personnel, are subject to further verification or comparison tests obtained under the Independent Assurance Sampling and Testing Program.

c. Independent Assurance Samples and Tests are those samples and tests performed or observed by Department personnel who do not normally have direct responsibility for acceptance sampling and testing at the project level. These teams operate under the direct supervision of the Division Materials Engineer or Central Office Materials and Tests Certification Engineer using equipment other than that assigned to the project for acceptance sampling and testing. These tests are used for the purpose of making independent checks on reliability of the results obtained in acceptance sampling and testing. Independent Assurance samples may also be taken or observed by members of the Division or Central Office Construction Engineer's staff as well as construction engineering representatives of the Federal Highway Administration.

   Independent Assurance samples and tests will be taken or observed in accordance with the current schedule.

2. Comparative Testing by the Department

a. Verification of acceptance samples and tests on materials conducted by project using field laboratories and equipment will be done under a program of comparative testing of companion samples. Samples and tests taken under the Independent Assurance Sampling and Testing Program may be used for this purpose and should be companion samples or tests. Comparison of field and Central Laboratory test results will assure that the test equipment in use is in good condition and accurate, and that the test procedures are being followed correctly. This comparison is the direct responsibility of the Division Materials Engineer and will be made promptly to assure that materials and workmanship being incorporated in the project are of acceptable quality. Any substantial variations of tests results will be investigated promptly by the Division Materials and Construction Engineers or their representatives and reported. The report will be furnished to the Central Office Materials and Tests Certification Engineer and will state whether variations were caused by testing equipment, procedures used in acceptance sampling and testing, or contractor mishandling of the material, and steps taken to correct or resolve the unacceptable variation in test results.

b. When acceptance sample tests are performed in a Division Laboratory, verification and reports of comparison checks on companion or independent assurance sample test results performed by the Central Laboratory are the direct responsibility of the Division Materials Engineer and any significant variation(s) reported will be handled the same as in the preceding article.

c. When acceptance sample tests are performed by the Central Testing Laboratory or by a producer's laboratory, verification of comparison checks on companion or independent assurance sample test results will be the direct responsibility of the Materials and Tests Certification Engineer. When substantial variations of test results occur, he will initiate a prompt investigation through the responsible division head of the Central Laboratory, and include the findings and resolution of such problems in the Independent Assurance Samples and Tests report.

d. Definition of significant or substantial variation in <u>comparison</u> or <u>correlation</u> test results is as follows:

i) If the required test procedure, i.e. AASHTO, ASTM or ALDOT, has a precision statement, multi-laboratory precision requirements may be allowed; or,

ii) In the absence of such precision statement in the test procedure, results, obviously in error, or in general when differing by more than twenty-five percentage points from the mean of the test results, shall be considered a significant variation.

SECTION III

1. Materials Certification

a. All materials incorporated into the construction of a highway or bridge project with Federal Aid participation will be certified. The certificate attests that all materials used were in substantial compliance with the pertinent specification requirements of the contract except as noted on the certificate. Items that were accepted with less than normal or no test results will be listed on forms BMT-16 (Exhibit C) or BMT-38 (Exhibit B) at the end of the project showing date, material, manufacturer, quantities accepted, and any comments applicable such as dimension checks (if applicable), workmanship, and general appearance, etc. The forms should be signed by the project engineer and forwarded to the Division Materials Engineer for acceptance prior to being incorporated into the final certification report BMT-38.

b. The Materials Certificate (Exhibit A) is initiated by the Project Engineer preparing a list of quantities and the corresponding laboratory test number for such quantities of all materials incorporated in the construction of the project. This report is prepared on standard form BMT-38 (Exhibit B) and upon completion of all work is forwarded to the Central Office Materials and Tests Engineer for final preparation of the Materials Certificate which is submitted to the FHWA Division Administrator.

2. Acceptance of Small Quantities of Miscellaneous Materials on the Basis of Visual Inspection or Manufacturer Certification

The Testing Manual general instructions have provisions for acceptance of miscellaneous material items when quantities received are in lots substantially less than those used for minimum sampling and testing. When authorized by the Division Materials Engineer, the Project Engineer may accept such materials by manufacturer's certified test report, or by visual inspection if the material is from a reputable manufacturer. When accepted on a visual basis, the Project Engineer will prepare a standard miscellaneous materials test report form BMT-16 (Exhibit C) at the time the material is incorporated into the project. Form BMT-16 will list the date, material, manufacturer, quantities accepted, and any comments applicable such as dimension checks, workmanship, general appearance, etc. The test report will be included in the final materials certificate preparation report (BMT-38).

SECTION IV

1. National Reference Laboratory Inspections

a. The Alabama Department of Transportation Central Laboratory regularly participates in laboratory inspections and testing of comparative samples conducted by AMRL and CCRL. These reference laboratories have been authorized to furnish copies of their inspection and comparative test results to both FHWA Division and Regional Administrators. Laboratory test equipment and standard test procedures are reviewed for tests on soil, aggregate, liquid bituminous materials and bituminous mixtures by AMRL, and by CCRL for cement, concrete and reinforcing steel standard tests. Any discrepancies noted in such reports are resolved by equipment replacement or thorough study of test procedures. Also, the Central Laboratory is accredited by AASHTO in many areas under AASHTO R 18, Establishing and Implementing a Quality System for Construction Materials Testing Laboratories.

b. Due to the expense involved, the Department does not provide for AMRL or CCRL inspection tours and comparative tests for its Division Laboratories. The Department's Central Laboratory has conducted a comparative testing program for soils and bituminous mixtures with the Division Laboratories for several years. An annual inspection tour by Central Laboratory teams of Division and producer laboratory equipment and procedures similar to AMRL and CCRL inspections has been adopted by the Department. A check list type of report showing discrepancies in equipment and procedures is forwarded to the Materials and Tests Engineer, Testing Engineer, Division Engineer, and Division Materials Engineer. A copy of this report will be forwarded to the FHWA Division Administrator on a regular basis if requested. After action has been taken to correct all discrepancies shown on the check list, the Division Materials Engineer will be responsible for writing a letter to the Materials and Tests Engineer explaining this corrective action. The distribution of this letter will be the same as the check list. All equipment found in substantial compliance will be tagged and the tag number recorded on the inspection report.

c. Regular inspections of Division and project laboratory equipment and test procedures are the responsibility of the Division Materials Engineer. A written report of any discrepancies noted and actions taken are to be forwarded to the Central Office Materials and Tests Engineer.

SECTION V

Certification of Materials and Tests

Division Administrator	or	Office Engineer
Federal Highway Administration		Alabama Department of Transportation
500 Eastern Blvd., Suite 200		1409 Coliseum Boulevard
Montgomery, Alabama 36117-2018		Montgomery, Alabama 36110

Re:

Dear Sir:

This is to certify that the results of the tests used in the acceptance program indicate that the material incorporated in the construction work, and the construction operations controlled by sampling and testing, were in conformity with the approved plans and specifications. All independent assurance samples and tests are within the tolerance limits of the samples and tests that are used in the acceptance program. Both the IAS&T **Record Check** (Accepted 00/00/00) and the BMT-38 Materials Certification are now complete.

Yours very truly,

Materials & Tests Engineer

cc: Office Engineer (if addressed to FHWA)
Construction Engineer
County Transportation Engineer (if applicable)
Division Engineer
File (2)

EXHIBIT A

BMT-38

See BMT-38

EXHIBIT B

BMT-16

See BMT-16

EXHIBIT C

NUMERICAL INDEX OF ACCEPTANCE SAMPLING AND TESTING SCHEDULE

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Section-215	Excavation for Bridges
Section-217	Special Protection for Rock Slopes
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Section-224	Treatment of Limesinks
Section-230	Roadbed Processing
Section-231	Stabilized Roadbed
Section-232	Lime Stabilized Roadbed
Section-301	Soil, Soil Aggregates and Aggregate Base and Subbase
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Section-703	Traffic Control Markings and Legends
Section-705	Pavement Markers

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Excavation Embankment Construction	Underwater Embankment Material	Size Check (Visual)	Daily	Check at source before delivery to roadway See ALDOT-249	1 – Transporting vehicle load			Consult Division Materials Engineer for approved sources located within ROW. Record results of daily checks in project diary. Report total quantity accepted for project on Form BMT-16
	Underwater Backfill from Approved Sources	*Soil Analysis *No test required if rocky material is used in lieu of A-1, A-2 or A-3 material	One (1) per each 2600 yd^3 (2000 m^3) or 4000 English tons (3500 metric tons) or fraction thereof	Source should be thoroughly sampled, tested and areas or stockpiles approved before delivery to project	25 lb (12 kg)	ALDOT-105	AASHTO T-88 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90 AASHTO M-145	Use worksheet forms BMT-17 and BMT-30. Report on form BMT-5
	Unclassified Excavation Material from Approved Cuts or Borrow pits. See Soils Profile or Consult Division Materials Engineer	Moisture Density Standard	Each apparent soil change	A sufficient number of tests should be performed prior to beginning operations to identify any significant strata changes	25 lbs (12 kg)	ALDOT-105	AASSHTO T-99 and ALDOT 242	Worksheet BMT-58, Report Form BMT-16

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
		In-place Density	Minimum one (1) test each compacted 8 in (200 mm) of fill height per 12 in (300 m) or fraction thereof	After compaction operations have been completed, and before placing next lift			ALDOT-222	Report on form BMT-57
							Or AASHTO T-191 when authorized	Report on form BMT-1B
		CBR	When Required***** Sample each ½ mile (1 km) or each soil change per roadway. Note: Both roadways may be represented by one sample from major cut areas. State on sample card if sample represents both roadways. *Consult Division Materials Engineer for individual project requirements	After completion of compaction and finished elevation checks. Sample top 12 in (300 mm) of subgrade	90 lb (45 kg)	ALDOT-105		This test is performed by the Central Testing Laboratory in Montgomery. Submit samples to Central Lab. Use Sample Information Card BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
		Soil Analysis	Minimum one (1) each 12 in (300 m) per roadway break samples at each soil change Sample top 12 in (300 mm) of subgrade	Same as for CBR Schedule	25 lbs (12 kg)	ALDOT-105	AASHTO T-88 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90 AASHTO M-145	Use worksheet forms BMT-17 and BMT-30, Report on form BMT-5
	Improved Roadbed from Approved Cuts and Borrow Pits. See Soils Profile for Approved Cut Areas	Moisture Density Standard	Minimum one (1) each per ½ mile (1000 m) per layer, or source change for each roadway	Sample after mixing process has been completed	25 lbs (12 kg)	ALDOT-105	AASHTO T-99	Worksheet form BMT-58, report on form BMT-16
		In-Place Density	Minimum one (1) each 1000 ft (300 m) per layer, per roadway	After compaction operations have been completed			ALDOT-210 for location ALDOT-222	Report on form BMT-57
							Or AASHTO T-191 when authorized	Report on form BMT-1B
		Visual for Oversize	Each 1000 ft (300 m) per layer, per roadway	Continuous checks during mixing and compaction operations				**Note:** Results should be recorded in Project Diary by station limits
	Improved Roadbed from Borrow Areas	Soil Analysis	Each 1000 ft (300 m) per layer per roadway	Sample after mixing process has been completed	25 lbs (12 kg)	ALDOT-105	AASHTO T-88 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90 AASHTO M-145	Use worksheet form BMT-17 and BMT-30. Report on form BMT-5

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
		CBR	Minimum 1 mile (1.5 km) per roadway – break at apparent soil changes **Note:** Certain types of material from approved borrow areas will require more tests. When this condition occurs, consult Division Materials Engineer for sampling frequency	After mixing process has been completed	90 lbs (45 kg)	ALDOT-210 ALDOT-105		Submit sample to Central Testing Laboratory. Use sample information card BMT-18
		Thickness Measure-ments	Each 150 m alternating left and right of centerline, each roadway	After compaction test has been approved and accepted			ALDOT-105	Worksheet Record in field notebook

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Structure Excavation and Backfill for Drainage Structures, and Minor Structures	General Backfill	As required by the Engineer	As directed by the Engineer	Before delivery to work site				
	Special Materials for General Backfill							
	Commercial Aggregates	Gradation Unit Weight	Pretested See ALDOT-249	See ALDOT-195 & ALDOT-249	AASHTO T-27	AASHTO T-2	AASHTO T-27 ALDOT-253 AASHTO T-19	Aggregate must be from an approved source. See Qualified Products List I-1 for approved sources
	Local Material	Permeability	1 test per each 3000 yd^3 (2500 m^3) or fraction thereof in each proposed source	Pretested and approved before delivery to work site	25 lbs (12 kg)	ALDOT-105		Submit samples to Central Lab, use Information Card BMT-18, Work Sheet Form BMT-30, Report Form BMT-5
		Gradation	Each 500 yd^3 (m^3) in each proposed source	Pretested and approved before delivery to work site	25 lbs (12 kg)	ALDOT-105	ALDOT-50	
	Foundation Backfill	As required by the Engineer	As directed by the Engineer	Before delivery to work site				

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Excavation for Bridges	General Backfill & Special Materials for General Backfill	See Section 214						
	Foundation Backfill	See Section 214						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Special Protection for Rock Slopes Rock Bolting	Bolts (Slotted or Headed)	Accepted on certification	Accepted on certification	Before incorporation in work See ALDOT-195, Sec 2.3				Send certifications to Division Materials Engineer
	Wedges		Accepted on certification	Before incorporation in work See ALDOT-195, Sec 2.3				Send certifications to Division Materials Engineer
	Expansion Shells With Tapered Plug		Accepted on certification	Before incorporation in work See ALDOT-195, Sec 2.3				
	Roof Plates		Accepted on certification	Before incorporation in work See ALDOT-195, Sec 2.3	1 each size plate			
Seam Sealing	Structural Concrete		See Section 501					
	Components							
	Cement							
	Coarse Aggregate		See Section 501					
	Fine Aggregate		See Section 501					
	Water		See Section 501					
	Concrete Additives		See Section 501					
	Concrete	Test Cylinders	Min. one set of 2 28 day cylinders per project	During pour	AASHTO T-141	AASHTO T-141	AASHTO T-22	

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Pneumatic Concrete Blanket Components							
	Cement		See Section 501					
	Aggregates		See Section 501					
	Water		See Section 501					
	Additives		See Section 501					
	Wire Mesh		See Section 501					
	Bolts & Plate Washers	Accepted on certification		Before incorporation in work See ALDOT-195, Sec 2.3				Send certifications to Division Materials Engineer
	Concrete	Test Cylinders	See ALDOT-231	During pour	ALDOT-231	ALDOT-231	ALDOT-231	
Asphalt Surfacing	Asphalt Cement	Physical	Certified Acceptance see ALDOT-243	See ALDOT-195 & ALDOT-243, sample from transporting vehicle if required by the Engineer	1 Gal. (4 L)	AASHTO T-40		Deliver to Central Lab. Use Sample Information Card Form BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Landslide Corrections Rock Buttress	Rock	Pretested See ALDOT-249	Visual check for compliance with Department specifications	Prior to incorporating into buttress				Must be from an approved source. See ALDOT-249
	Pipe	Pretested See ALDOT-364	See Section 606					Must be from an approved source. See ALDOT-364
	Filter Fabric	Physical	See Section 605 1 sample per lot	Prior to incorporating into work	Two (2) 6 ft (2 m) pieces width of roll		AASHTO M-288	Submit to Central Lab. Use BMT-18
	Filter Material (Coarse & Fine Aggregate)	Pretested	See Section 606 & ALDOT-249					Must be from an approved source. ALDOT-249
Special Filter Blanket	Filter Fabric (Woven or Non-woven)	Physical	See Section 605 1 sample per lot	Prior to incorporating into work	Two (2) 6 ft (2 m) pieces width of roll		AASHTO M-288	Submit to Central Lab
	Aggregate	Gradation	See Section 814	Prior to incorporating into work		AASHTO T-2	AASHTO T-27	Must be from an approved source ALDOT-249
Horizontal Drains	Pipe	Physical	Accepted on certification; if certification not available, sample one per lot	Prior to installation	6 ft. (2 m)	Random ALDOT-210		Submit to Central Lab Use BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Special Backfill	Special Backfill	Gradation Atterberg Limits	1 per each 2500 c.y..3 (2000 $m^{3})$	Prior to incorporation into work	See Table No. 1 AASHTO T-2	ALDOT-210 AASHTO T-2	AASHTO T-27 AASHTO T-88 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90 AASHTO M-145	See plans for requirements Use BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Treatment of Limesinks	Special Backfill Commercial Aggregate	Pretested	See ALDOT-249	See ALDOT-195				Must be from an approved source. ALDOT-249
	Seal Concrete	See Section 503						
	Reinforce-ment Steel	See Section 502						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Roadbed Processing	Modified Roadbed	Moisture Density Standard	Min. 1 each .5 mi. (1000 m) for each roadway. Break samples at apparent soil changes. Sample top 6 in. (150 mm)	Sample after mixing process is completed	25 .lbs (12 kg)	ALDOT-105	AASHTO T-99	Use Work Sheet Form BMT-58, Report Form BMT-16
		In-place Density & Moisture Content	Min. 1 test for each 1000 ft. (300 m) per roadway, sample Top 6 .in (150 mm)	After compaction process has been completed	50 .lbs (25 kg)		ALDOT-222 or AASHTO T-191 when authorized	Report Form BMT-57 Report Form BMT-1B
	Improved Roadbed (Upper Layer for Base & Pave Contracts Only)	Moisture Density Standard	Same test and frequency as shown for Modified Roadbed					
		In-place Density	Same as Modified Roadbed					
		Thickness Measurement	Same as Section 210					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Stabilized Roadbed	Commercial Aggregate	None	Pretested See ALDOT-249	See ALDOT-195 and ALDOT-249				Must be from an approved source. ALDOT-249
	Local Material	Gradation and Atterberg Limits when required	1 each 1000 ft (300 m) per roadway	After spreading but prior to scarification and mixing operations	25 lbs (12 kg)	ALDOT-105	AASHTO T-88 AASHTO T-89 as modified by ALDOT-232, AASHTO T-90 AASHTO M-145	Use Work Sheet Forms BMT-17 & 30, report on Form BMT-5
		Moisture Density Standard	Same frequency and test methods as shown for Modified Roadbed (Section 230)					
		In-place Density & Moisture Content	Same frequency and test methods as shown for Modified Roadbed (Section 230)					

Lime Stabilized Roadbed

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Lime Stabilized Roadbed	Water	Chemical	Sample each source of water. No test required for municipal water systems	Prior to beginning operations	1 gal (4 L)	A composite sample for different elevations should be obtained from ponds		Ship to Central Lab. in glass or plastic container. Use Sample Information Card Form BMT-18. Allow two weeks for test results
	Hydrated Lime	Chemical	Pretested or certified from approved source shown on Qualified Products List. If not pretested or certified, sample each tank truck or railroad car	Before incorporation in work See ALDOT-195	2 qt (1 L) Cans	AASHTO T-218		Ship one can from each shipment to Central Lab. Use Sample Information Card Form BMT-18. Store remaining cans until test report is received
	Quick Lime	Chemical & Physical	Pretested or certified from approved source shown on Qualified Products List. If not pretested or certified, sample each tank truck or railroad car			AASHTO T-218		
		Gradation	Min. 1 per each days shipment or 500t (t)				AASHTO T-27	
	Soil	Pulveriza-tion	One each mixing section not to exceed 1000 ft (300 m) as required for the class of stabilization specified	Before beginning compaction operations	10 lbs (5 kg)	ALDOT-105	ALDOT-110	Use BMT-18, Report Form BMT-78

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
		Moisture Density Standard	One each mixing section of roadbed before stabilization (Min. 1 per 1000 ft. (300 m) or each soil change)	After subgrade preparation operations have been completed	25 lbs. (12 kg)	ALDOT-105	AASHTO T-99	Use Work Sheet Form BMT-58, Report Form BMT-16
			One each mixing section	After lime has been spread and mixed. (After final increment for Class 1, and mellowing period for Class 2)	25 lbs. (12 kg)	ALDOT-105	ALDOT-223	Use Work Sheet Form BMT-58, Report Form BMT-16
		In-place Density & Moisture	One each mixing section not to exceed 1000 ft. (300 m)	After compaction operations have been completed			ALDOT-222 or ALDOT-223 or AASHTO T-191 when authorized	Report Form BMT-57, Report Forms BMT-112 & 113, Report Form BMT-1B
		Thickness Check	Each 150 ft. (50 m) alternating left and right of centerline	After compaction and surface smoothness operations have been completed			ALDOT-105	Report on Form BMT-16

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Soil, Soil Aggregate, and Aggregate Base and Subbase	Plant- (except for 100% crushed commercial aggregate), Road- , or Subbase Without Chemical Additives	Gradation	Each 500 ft. (150 m) each layer, each roadway.	Sample from roadway as soon as mixing process is completed	25 lbs. (12 kg)	ALDOT-105 ALDOT-210	Use AASHTO T-27 and T-11 for gradation of Crushed Aggregate Bases	Use Work Sheets Form BMT-17 & BMT-30, Report on Form BMT-5. If Pre-tested, (ALDOT-249) must be mixed in a plant or pugmill , hauled directly to job, and placed with a mechanical spreader.
		Clay Content When Required	For road- or yard-mixed bases containing 100% crushed commercial aggregate, sample each 1000 ft. (300 m) per layer per roadway; for plant-mixed (see Remarks), Pre-tested, see ALDOT-249.	Plant mixed base course may be sampled at plant from feeder belt on loose volume basis equivalent to 1000 ft. (300 m)	For crushed Aggregate Bases see AASHTO T-2 Table 1 for sample size	ALDOT-105	AASHTO T 88	
		Atterberg Limits					AASHTO T 89 as modified by ALDOT-232 AASHTO T 90 ALDOT-310	
		Moisture Density Standard	Min. 1 each 10,000 ft (3000 m) each roadway, each layer, or each proportion or component source change	Sample from roadway as soon as mixing process is completed	50 lbs.(25 kg)	ALDOT-105	AASHTO T-180 or ALDOT-140	Use Work Sheet Form BMT-58, Report Form BMT-16
					or 100 lbs (50 kg) for ALDOT-140		Or ALDOT-225 when authorized	Report Form BMT-112
		In-place Density and Moisture Count	Min. 1 each 1000 ft (300 m) each layer, each roadway	After compaction operations are completed		ALDOT-210	ALDOT-225 Or AASHTO T-191 and/or ALDOT-225 when authorized	Work Sheet From BMT-112. Report Form BMT-57, BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Soil, Soil Aggregate, and Aggregate Base and Subbase (continued)	Plant- (except for 100% crushed commercial aggregate), Road- , or Subbase Without Chemical Additives (continued)	Thickness Measure-ments	One for each 250 ft (75 m) alternating left and right of centerline	After compaction and surface smoothness requirements are met		ALDOT-105 ALDOT-210	ALDOT-105	Report Form BMT-16
	Soil, Soil Aggregate or Aggregate Base or Subbase Containing Cement or Lime	Plant or Equipment Check Tests	See Construction Manual for frequency, methods and reports					
		Gradation Clay Content When Required Atterberg Limits	Sample loose volume equivalent in yd^3 (m^3) to produce 500 ft (150 m) full width per layer per roadway When composed of 100 percent crushed aggregate sample loose volume equivalent yds^3 (m^3) to produce 1000 ft (300 m) full width per layer per roadway	For roadway or yard mixed operations, sample after all aggregate components have been spread and mixed and before addition of cement or lime. For plant-mixed operations sample aggregate components from belt before entering mixer	25 lbs. (12 kg)	ALDOT-105 or ALDOT-210	Same as Road or Yard-Mixed Operations	Same as Road or Yard-Mixed Operations

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Soil, Soil Aggregate, and Aggregate Base and Subbase (continued)	Soil, Soil Aggregate or Aggregate Base or Subbase Containing Cement or Lime (continued)	Moisture Density Standards	Min. 1 each 1000 ft. (300 m) or each mixing section if road or yard-mixed per roadway per layer	Sample from roadway after mixing of all has been completed	ALDOT-223	ALDOT-210 ALDOT-105	ALDOT-223 or ALDOT-225 when authorized	Report Form BMT-112
		In-place Density & Moisture	Min. 1 each 1000 ft. (300 m) or mixing section if road or yard mixed	Same as bases or subbases without chemical additives				
		Thickness Measure-ments	Same as bases or subbases without chemical additives					
	Cement		Pretested from an approved certified source	Prior to use, see ALDOT-195 and ALDOT-227				Submit sample to Central Lab., use Sample Information Card Form BMT-18 See List I-2 in the Qualified Products List
	Lime	Chemical	See Section 232					
	Water	Chemical	See Section 232					
			Shoulder layers constructed separately from travel ways--apply same sampling and testing frequency, except alternate left and right shoulders					

Drainage Plane Layer

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Drainage Plane Layer	Commercial Aggregate	Permeabil-ity	Pretested See ALDOT-249 one (1) stockpile sample per each 5000 t. (t)	Before incorporating into work		AASHTO T-2		All aggregate must be from an approved source. See List I-1 of the Qualified Products List
		Gradation Unit Weight	Pretested See ALDOT-249	Before incorporation in work See ALDOT-195	AASHTO T-27	AASHTO T-2	AASHTO T-27 AASHTO T-19 ALDOT-253	Report Form BMT-6
		Thickness	Each 250 ft. (75 m) alternate left and right shoulder, each roadway	Immediately after spreading		ALDOT-105		Report on Form BMT-16
	Special Outlets	See Section 605						
	Pipe Header Concrete, etc.							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Permeable Asphalt Treated Base	No density or air voids testing required. See Section 410 for all other requirements							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Bituminous Surface Treatments and Latex Modified Bituminous Surface Treatment	Liquid Bituminous Material	Analysis	See ALDOT-243	Before incorporation in work	1 qt (1 L) for asphalt cement. 4 qts (4 L) for emulsified asphalts	AASHTO T-40		Ship to Central Laboratory. Use metal cans for asphalt cement. Use plastic containers for emulsified asphalts. Sample information card Form BMT-18. If contamination is suspected, sample as required by Engineer
		Application Rate	See Construction Manual for frequencies, methods and, reports					
	Latex	Analysis	ALDOT-195; Section 2.3	Before incorporation				
		Compatibil-ity	ALDOT-195; Section 2.1.1	Before Mixing With Asphalt Emulsion			Article 811	ALDOT Specifications
	Aggregate	Gradation Unit Weight	Pretested. See ALDOT-249	Before incorporation in work. See ALDOT-195	AASHTO T-27	AASHTO-T-2	AASHTO T-27, T-19 ALDOT-253	Report loose unit dry weight kg/m^3. Use Form BMT-6

Slurry Seal

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Slurry Seal	Liquid Bituminous Material	Analysis	Same as Section as 401					
	Aggregate and Mineral Filler	Gradation	Same as Section 401					Contractor should submit samples of his proposed sources to the Central Laboratory at least two weeks before beginning operations for establishment of bitumen content
	Water	Chemical	Pretested by Central Laboratory. Sample each source proposed for use if a pond or stream. No test required for municipal systems	At least two weeks before beginning operations	4 qt. (4 L)	See Section 232		Ship to Central Laboratory for tests. Report on BMT-18
		Hardness	All Sources					
	Mixture	Bitumen Content	Minimum one daily	During operations	4 qt. (4 L)	ALDOT-210	AASHTO T-110, ALDOT-319	Report on BMT-20

Tack Coat

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Tack Coat	Bituminous Material	Analysis	Same as Section 401					
		Tempera-ture Correction Application Rate	See Construction Manual for frequencies, methods, and reports					BMT-4

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Repaved Bituminous Pavements	Recycled In-Place Bituminous Pavement	Equipment Checks	See Construction Manual for equipment check list and report forms					
		Abson Recovery of Asphalt Cement	Minimum 1 mile (1.5 km) per roadway	After mixing	1 gal (4 L)	ALDOT-210, AASHTO T-168		Submit to Division or Central Laboratory. Report on BMT-18
		In-Place Density	See Section 410					

Bituminous Material Used in Plant Mix Bases and Pavements

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Bituminous Material Used in Plant Mix Bases and Pavements	Liquid Bituminous Material	See ALDOT-243 and Section 410 for require-ments						

Planing or Milling of Existing Pavement

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Planing or Milling of Existing Pavement			See Construction Manual for equipment check lists and construction					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Asphalt Plant Mixes General Requirements	Plant Requirements	Design Mix	Minimum 1 per project for each mix and when component source or quality changes	Prior to beginning work for each mix	50 lb (25 kg) for each aggregate size and source 1 gal (4 L) for asphalt (binder) cement	AASHTO T-2	ALDOT-307 or ALDOT-344	Samples should be submitted by contractor to the Central Lab. At least 3 weeks prior to beginning of operations (See ALDOT-370)
		Asphalt Plant check	Minimum 1 per year or after each move or after plant has been substantially modified	Before beginning operations			ALDOT-324	Report on ALDOT-155 (See List I-5)
		Plant Laboratory and Equipment	Each move	Before beginning operations			ALDOT-349	Report on BMT-155
	Liquid Binder Shipments	Analysis	See ALDOT-243	Before incorporation into work see ALDOT-395	See storage tank samples below	AASHTO T-40		See storage tank samples below See List I-4
		Delivery Tempera-ture	Each shipment	Before unloading checked by Dept. inspector during normal working hours. Night time deliveries to be checked by contractor				
	Liquid Binder (Contractor's Storage Tanks)	Analysis	Sample plant storage tank when plant has been idle for extended period of time or has used different paving grades of asphalt material or has not received BMT-146 for shipments	Before incorporation into work See ALDOT-195	1 qt (1 L) for Asphalt Binder Cement 1 gal (4 L) for emulsified asphalt	AASHTO T-40		Ship to Central Lab with Information Card form BMT-18 Use metal cans for asphalt cement and plastic jugs for emulsified asphalts

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Natural Fine Aggregate	Gradation	See Specifications	During building or replenishing stockpile	10 lb (5 kg)	AASHTO T-2	AASHTO T-11 and AASHTO T-27	Report on form BMT-16
		Liquid Limit and Plastic Limit	Contractor minimum of one (1) per stockpile	Sample from stockpile prior to use	20 lb (10 kg)	AASHTO T-2	AASHTO T-89 as modified by ALDOT-232 AASHTO T-90	Report on form BMT-16
	Coarse Aggregate	Gradation	See Specifications	During building or replenishing stockpile	50 lb (25 kg)	AASHTO T-2	AASHTO T-11 and AASHTO T-27	Report on form BMT-16 See ALDOT-249 and List I-1
		Crushed Particles	See Specifications	During building and replenishing stockpile	10 lb (5 kg)	AASHTO T-2	ALDOT-310	Report on form BMT-16
	Manufactured Fine Aggregate	Gradation	See Specifications	During building or replenishing stockpile	20 lb (10 kg)	AASHTO T-2	AASHTO T-11 and AASHTO T-27	Report on form BMT-16
		Crushed Particles	See Specifications	During building or replenishing stockpile	10 lb (5 kg)	AASHTO T-2	ALDOT-310 AASHTO T-11 and AASHTO T-27	Report on form BMT-16
	Combined Mineral Aggregate	Clay	Contractor minimum of one test per 11,000 English tons (10,000 metric tons) or portion thereof or each source change. Department will test as needed.	Sample from belt or pugmill during production	10 lb (5 kg)	AASHTO T-2	ALDOT-50	Report on form BMT-16

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
	Asphalt Plant Mix	Asphalt Binder Content	See Specifications	During operations	See ALDOT-370	AASHTO T-168 ALDOT-210 and ALDOT-370	ALDOT-354	Use worksheet BMT-11 or BMT-65 Report on form BMT-20
		Sieve Analysis	See Specifications	During operations	See ALDOT-370 and Table 1 of AASHTO T-164	AASHTO T-168 ALDOT-370	ALDOT-371	Use worksheet BMT-11 Report on form BMT-20
		Dust / Asphalt Ratio	See Specifications	During operations				Report on form BMT-20
		Air Voids and VMA	See Specifications	During operations	See ALDOT-370	AASHTO T-168 ALDOT-370	ALDOT-307 ALDOT-353	Use worksheet form BMT-98 Report on form BMT-20
		Maximum Specific Gravity	See Specifications	During operations	See ALDOT-370	AASHTO T-168	AASHTO T-209	Use flask method with dryback. Report on form BMT-20
		Moisture Content	See Specifications	During operations	See ALDOT-370	AASHTO T-168	ALDOT-130	Report on form BMT-65 or worksheet form BMT-11
		Marshall Stability and Flow	See Specifications	During operations	See ALDOT-370	AASHTO T-168	ALDOT-307 or ALDOT-353	Report on form BMT-20
		Split Tensile (TSR)	See Specifications	During operations	30 lbs (15 kg)	AASHTO T-168 ALDOT-210	ALDOT-361	Use worksheet form BMT-43 Report on form BMT-20
		Coated Aggregate	Minimum of one (1) per project	First day’s operation and as needed thereafter	10 lb (5 kg)	AASHTO T-168	ASTM D-2489 (AASHTO T-195)	Report on form BMT-20

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
		In-Place Density	See specifications. Shoulders constructed separately from main roadway shall be tested alternately left and right on the frequency outlined in Special Provision	Test while mat is still warm		ALDOT-210	ALDOT-222 or ALDOT-350 AASHTO T-166	Report on form BMT-21 or form BMT-4
		Rate of Application	See Construction Manual for frequencies, methods, and reports					Report on form BMT-4
Special Requirements for Mixes Containing Reclaimed Asphalt Pavement (RAP)	Asphalt Plant Mixes Containing RAP	Abson Recovery and Viscosity	For mixes using more than 15 percent RAP, one (1) per each 2200 English tons (2000 metric tons) None required on 15 percent or less	During plant operations after mixing has occurred	1 gal (4 L)	AASHTO T-168 ALDOT-210	AASHTO T-164 AASHTO T-170 AASHTO T-202	Submit to Central Lab or its designee in a metal or plastic container with BMT-18
	RAP Stockpile	Gradation	See Specifications	During building or replenishing of stockpile	50 lb (25 kg)	AASHTO T-2	ALDOT-258 and ALDOT-319	Use worksheet BMT-11
		Asphalt Binder Content	Same as RAP gradation	During building or replenishing of stockpile	50 lb (25 kg)	AASHTO T-2	ALDOT-319	Use worksheet BMT-11
		Crushed Particles	Same as RAP gradation	During building or replenishing of stockpile	50 lb (25 kg)	AASHTO T-2	ALDOT-310	Use worksheet BMT-11 or BMT-16

Type of Construction	**Material**	**Test**	**Frequency of Acceptance Samples and Tests for Job Control**	**Construction Stages for Obtaining Sample or Test**	**Sample Size**	**Procedures**		**Remarks**
						Sampling Method	**Test Methods**	
Hot Bituminous Pavement	Bituminous Mix		See Section 410 for all general requirements					

Asphalt Binder Layer

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Asphalt Binder Layer	See Section 410 for requirements							

Polymer Modified Open Graded Friction Course

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Polymer Modified Open Graded Friction Course	No density or air void tests required. See Section 410 for all other requirements							

Stone Matrix Asphalt (SMA)
Fiber Stabilized Asphalt Concrete

Type of Construction	**Material**	**Test**	**Frequency of Acceptance Samples and Tests for Job Control**	**Construction Stages for Obtaining Sample or Test**	**Sample Size**	**Procedures**		**Remarks**
						Sampling Method	**Test Methods**	
Stone Matrix Asphalt (SMA) Fiber Stabilized Asphalt Concrete	See Section 410 for requirements							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Superpave Bituminous Concrete	See Section 410 for requirements							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Plant Mixed Friction Courses	See Section 410 for requirements							

Soil or Aggregate Type Surface

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Soil or Aggregate Type Surface	Commercial Aggregate	Gradation	Pretested See ALDOT-249	Before incorporation in work. See ALDOT-195 and ALDOT-249	AASHTO T-27	AASHTO T-2	AASHTO T-27, ALDOT-253	Work Sheet Form BMT-33. Report on Form BMT-6
		Unit Weight					AASHTO T-19	
		Thickness (When required by plans)	Check each 250 ft (75 m) alternating left and right of center line	Check immediately after spreading operation.			ALDOT-105	Report on BMT-16.
*If a material source is shown on the plans or if no specification requirements are set forth for local materials such as Sections 820, 821, 823, these tests may be waived. Thickness same as Commercial Aggregates.	*Local Material	Gradation Clay Atterberg Limits	Each 15,000 ft^3 (400 m^3)	After spreading or stockpiles before delivery to work site.	See Soil or Soil Aggregate Base or Subbase Section 301			

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Portland Cement Concrete Pavement			Study ALDOT-170 before beginning any Quality Control operations.					
	Quality Control Operation	Laboratory and Equipment Check List	See Construction Manual for frequency guides and reports.					
		Stock-piling Aggregates	Visual check daily on arriving shipments. Aggregate must be from an approved source and accompanied by BMT-10	Prior to use			ALDOT-175	Check approved source list in Materials, Sources, and Devices with Special Acceptance Requirements Manual before beginning stockpiling operations
		Design Mix	The design mix is furnished by the Central Laboratory prior to beginning operations	Approximately 35 days before production is to begin.	200 lbs (100 kg) FA, 400 lbs (200 kg) CA, 100 lbs (50 kg) Cement, 50 lbs (25 kg) Fly Ash, if used. Retarders Reducers Air En-training Agents 1 qt (1 L) metal containers	AASHTO T-2 Representa-tive Sample ALDOT-210 Note: See ALDOT-170		ALDOT Division or project personnel will sample all components and deliver to the Central Laboratory. Report on BMT-18
	Mix Components							
	Cement		Pretested from approved certified source	Prior to use see ALDOT-195 and ALDOT-227				Must be from an approved source. See list I-2, Materials, Sources and Devices With Special Acceptance Requirements. Report on BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Mineral and Mixtures (When required by job mix)		Pretested	Prior to use see ALDOT-195 and ALDOT-227				Must be from an approved source. See list I-3, Materials Sources and Devices With Special Acceptance Requirements.
	Fine Aggregate	Gradation and F. M.	See ALDOT-249	Before beginning operations and during production. See ALDOT-249				Aggregate must be from an approved source. See list I-1, Materials Sources and Devices With Special Acceptance Requirements. See ALDOT-249 and ALDOT-175
		Unit Weight	See ALDOT-249	Before beginning operations and during production		AASHTO T-2	AASHTO T-19	See List I-1, Materials, Sources, and Devices with Special Acceptance Requirements Manual
		Deleterious Materials	Pretested see ALDOT-249	Before beginning operations and during production		AASHTO T-2	AASHTO T-11	
	Coarse Aggregates	Gradation	Pretested see ALDOT-249	Before beginning operations and during production. See ALDOT-249	Table I AASHTO T-2	AASHTO T-2	AASHTO T-27, ALDOT-253	Aggregate must be from approved source. See ALDOT-249 and ALDOT-175
		Unit Weight	No set frequency for testing. Tests will be run when required by the Engineer	Before beginning operations and during production	Table I AASHTO T-2	AASHTO T-2	AASHTO T-19	
	Water		Approved prior to use	Prior to use. See Section 807		See Section 232		

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Air Entraining Agents, Retarders, and Water Reducers		Approved prior to use	Prior to use, see ALDOT-195 and ALDOT-170, Section 808, 809				Must be from approved source, see List II-1, Materials Sources and Devices with Special Acceptance Requirements Manual
	Rein-forcing Steel	See Section 502						
	Preformed Joint Filler	Physical	Pretested	Prior to use, see ALDOT-195	1 yd (1 m) by full depth minimum 6 in (150 mm)	AASHTO M-33 AASHTO M-153 AASHTO M-213 AASHTO M-220 ALDOT-210	Visual for damage	Submit samples to Central Laboratory. Report on BMT-18
	Preformed Elastomeric Joints (Compression Seals)	Chemical and Physical	Must be from an approved source for design. Sample at project level one sample per source, per size, per lot, or certified test reports	Prior to use, see ALDOT-195.	For joints up to and including 3 in (75 mm) submit 5 ft (1.5 m). For joints over 3 in (75 mm) submit 3 ft (1 m)	ALDOT-210	Visual for damage	Submit samples to Central Laboratory. Report on BMT-18
	Cork	Physical	Sample at project level and submit for testing to Central Laboratory or Certified test reports	Prior to use, see ALDOT-195	3 ft (1 m)	ALDOT-210 each lot each size each source	Visual for damage	Submit samples to Central Laboratory. Report on BMT-18
	Hot Pour	Physical	See ALDOT-195	See List III-4				List III-4 in Materials, Sources, and Devices with Special Acceptance Requirements

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Cold Pour	Physical	Same as Hot Pour	Same as Hot Pour				List III-4 in Materials, Sources, and Devices with Special Acceptance Requirements
	Lubricant Adhesive	Physical	ALDOT-195	See List II-9				List II-9 in Materials, Sources, and Devices with Special Acceptance Requirements
	Water Stop	Physical	Sample at project level and submit for testing to Central Laboratory, or certified test reports	Prior to use, see ALDOT-195	3 ft (1 m)	ALDOT-210		Submit samples to Central Laboratory. Report on BMT-18
	Curing Materials, Liquid Membranes, Burlap, Polyethylene Sheeting Waterproof Paper Sheeting, etc.		Accepted on certification	Prior to use, see ALDOT-195, Section 2.3		AASHTO M-148 AASHTO M-171		Submit certifications to Central Laboratory.
	Portland Cement Concrete Quality Control Tests	Batching Plant, Mixers and Trans-port Checks	Prior to starting operations				AASHTO M-157	See ALDOT-352
		Moisture Test for Fine and Coarse Aggregate	Before beginning each days production, then as often as necessary to compensate for moisture changes in the aggregate	See ALDOT-170	AASHTO T-255 AASHTO T-217 AASHTO T-142 AASHTO T-85	AASHTO T-2	AASHTO T-255 AASHTO T-217 AASHTO T-142 AASHTO T-85	Report on Form BMT-97 or BMT-122

						Procedures		
Type of Construction	**Material**	**Test**	**Frequency of Acceptance Samples and Tests for Job Control**	**Construction Stages for Obtaining Sample or Test**	**Sample Size**	**Sampling Method**	**Test Methods**	
		Test Cylinders and Beams	One set each per 2400 yd^2 (2000 m^2) or fraction thereof for each days placement. This frequency includes main travelways, acceleration and deceleration lanes, ramps and PCC shoulders.	During production	One set equals 1-7 day and 2-28 day cylinders, 2-14 day beams	AASHTO T-141	AASHTO T-23 AASHTO T-97 AASHTO T-177 ALDOT-328	
		Air Content	One test per 1000 ft (300 m) per 24 ft (8 m) wide roadway. Minimum 1 per each days operation	During production	AASHTO T-141	AASHTO T-141 and ALDOT-328	AASHTO T-152 or T-196	
		Slump	One test per each set of cylinders and beams or minimum of one per day	During production	AASHTO T-141	AASHTO T-141	AASHTO T-119	
		Monthly Reports	Monthly	During paving operation				Use report Form BMT-117 **Remarks**
	Ready Mix Concrete for Portland Cement Concrete Pavement		All Provisions of this Section (450) apply					See ALDOT-170. Use Report form BMT-122.

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
	Finished Portland Cement Concrete Pavement	Thickness Measure-ment	One core for 1000 ft (300 m) traffic lane or each fraction thereof. For shoulders 10 ft (3 m) wide same frequency as travel lane. Shoulders less than 10 ft (3m) 1 core each 2000 ft (600 m) ramps, acceleration and deceleration lanes, crossovers, etc. 1 core each.	After paving operation has been completed				This test is performed and reported by Bureau of Materials and Tests personnel
	Finished Portland Cement Concrete Pavement	Pavement Rough-ness Profile	See ALDOT-335					Notify Materials and Tests Engineer for Scheduling
	Epoxied Tie Bars	Pull Out	Minimum two per ½ mile (1 km) Kilometer	After epoxy has cured as recommended by producer. ALDOT-366		ALDOT-210	ALDOT-366	

Pressure Grouting and Repair of Portland Cement Concrete Pavement

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Pressure Grouting and Repair of Portland Cement Concrete Pavement	Quality Control Operations	Stockpiling Components	Visual check daily on arriving shipments. Cement, fly ash and aggregates must be from approved sources	Prior to use				Check Materials, Sources and Devices With Special Acceptance Requirements Manual before operations are begun
	Grout Mix Components							
	Cement		Shipped from approved certified source	Prior to use. See ALDOT-195 and ALDOT-227		AASHTO T-127		See List I-2, Materials, Sources and Devices With Special Acceptance Requirements Manual
	Fly Ash (When Required)		Shipped from approved certified source	Prior to use. See ALDOT-195 and ALDOT-227		AASHTO T-127		See List I-3, Materials, Sources and Devices With Special Acceptance Requirements Manual
	Fine Aggregate (When Required)	Gradation	Minimum one test daily See ALDOT-249	Prior to beginning each days operations		AASHTO T-2	AASHTO T-27	Use Work Sheet form BMT-33 & BMT-91. Aggregate must be from an approved source.
	Water		Approved prior to use	Prior to use. See Section 807.				
	Quality Control Test for Grout	Flow Test	Minimum one test daily, more frequent if deemed necessary	Prior to beginning each days operations and when necessary during production		ALDOT-338	ALDOT-338	Flow Cone Method
	Concrete Pavement Replacement		See Requirements of Section 501 and 450					
	Epoxied Tie Bars	Pull Out	Minimum three per 40 yd^3 (m^3) of concrete	After epoxy has cured as recommended by producer		ALDOT-210	ALDOT-366	

Cleaning and Sealing PCP Pavement Joints and Cracks

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Cleaning and Sealing PCP Pavement Joints and Cracks	Low Modulus Silicone Sealant	Physical	ALDOT-195; Section 2.4	Must come from List III-4 or go through the Product Evaluation Board				See Department's Materials, Sources, and Devices with Special Acceptance Requirements Manual
	Hot Pour Joint Sealant	Physical	ALDOT-195; Section 2.4. If not sample each lot. ALDOT-195; Section 2.1.3	Prior to use	One Container	ALDOT-210		
	Water-proofing Membrane		Must be from approved source	Prior to use				See List II-10 for requirements

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Structural Portland Cement Concrete	Quality Control Operations	See Section 450						
	Mix Components	See Section 450						
	Portland Cement Concrete Quality Control Tests	Batching Plant, Mixers and Transport Vehicle Checks	See Section 450					
		Moisture Tests, Coarse and Fine Aggregates	Major Structures See Section 450	See Section 450 for methods and report forms				
			Minor Structures 1 per pour	Before beginning operations				
		Slump	Same as Cylinder Schedule	During production	AASHTO T-141	AASHTO T-141	AASHTO T-119	Report on Form BMT-83
		Air Content	Same as Cylinder Schedule	During production	AASHTO T-141	AASHTO T-141 ALDOT-328	AASHTO T-152 or T-196	Report on Form BMT-83
		Test Cylinders	Major Structures one set of cylinders (1-7 day and 2-28 day) 40 yd^3 (m^3) or fraction thereof for each day's pour, excluding seal concrete and large pours. Additional cylinders shall be made for determining when to strip form or when to open to	During pouring operations		AASHTO T-141	AASHTO T-22	See Section 450

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
			traffic. For Seal Concrete make two extra sets (1-7 day and 2-28 day) at intervals directed by the Engineer. Additional cylinders shall be made for dewatering before 7 days. For large pours over 40 yd^3 (m^3), 1 set (1-7 day and 2-28 day) for each 4 hours of continuous concreting operation or major portion thereof with a minimum of one set per each individual structural unit (footing, column or cap) which exceeds 40 yd^3 (m^3)					
			Minor Structures 1 set of cylinders (1-7 day and 2-28 day) per each 40 yd^3 (m^3) poured, or minimum of 1 set per project if less that 40 yd^3 (m^3)					

						Procedures		
Type of Construction	**Material**	**Test**	**Frequency of Acceptance Samples and Tests for Job Control**	**Construction Stages for Obtaining Sample or Test**	**Sample Size**	**Sampling Method**	**Test Methods**	**Remarks**
		Test Cylinders for Pneumatically Applied concrete	See ALDOT-231	During Production		ALDOT-231	ALDOT-231	
		Tempera-ture of concrete	Major Structures each truckload until temperature stabilizes	During operations				See ALDOT-170 Report on Form BMT-122
		Monthly Reports	See Section 450					
	Ready Mix Concrete	Ready Mix Concrete must meet all require-ments of this section						
	Air En-training Agents, Reducers, Retarders, Curing Materials Water Stops Joint Fillers and Sealers	See Section 450						
	Reinforce-ment Steel	See Section 502						
	Welding Electrodes		Certified Tests from approved sources					See List II-12

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
	Permanent Steel Bridge Deck Forms		Certified tests from each producer	Before incorporation in work See ALDOT-195				
	Bridge Coating Material		ALDOT-195; Section 2.4	See List III-3 for acceptable materials. If product is not on this list see ALDOT-355 for information on product approval				List III-3 and ALDOT-355 are found in the Manual "Materials, Sources and Devices With Special Acceptance Requirements"
	Bridge Joint Seals	See Section 522						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Steel Reinforcement	Reinforce-ment Steel Bars	Chemical and Physical	Certified test reports for each heat of steel. ALDOT-195; Section 2.3. If not, sample each heat. ALDOT-195; Section 2.1.3	Prior to installation	3-Bars 24 in. (600 mm) long	Sample straight bars when possible 1 sample per heat	Visual for rust, scales and damage	Submit samples to Division or Central Lab. Use Information Card Form BMT-18
	Prestressing Strand	Physical	One sample for each 50,000 lb (25,000 kg) of same heat	Sample at the prestress yard prior to use	3-pieces 6 ft. (2 m) long	ALDOT-210	Visual for rust, scales and damage	Submit samples to Division or Central Lab. Use Information Card Form BMT-18
	Wire Mesh	Physical	Certified test reports; ALDOT-195; Section 2.3; If not sample ALDOT-195; Section 2.1.3	Prior to installation	1 piece24 in (600 mm) x 24 in.(600 mm) for each 8000 yds^2 (7000 m$^{2)}$ or fraction thereof	ALDOT-210	Visual for rust and damage	Submit sample to Central Lab. Use Information Card Form BMT-18
	Welded Steel Wire	Physical	Same as Wire Mesh		1 piece 24 in. (600 mm) x 24 in. (600 mm) for each heat or lot			
	Fabricated Bar or Rod Mat		Same as Wire Mesh		1 piece 24 in. (600 mm) x 24 in. (600 mm) per each 500 mats or fraction thereof		Visual for rust and damage	Submit sample to Central Lab. Use Information Card Form BMT-18
	Spiral Reinforce-ment	Physical	Same as Reinforcement Bars		3 pieces 24 in.(600 mm) long per each heat	ALDOT-210	Visual for rust and damage	Submit sample to Central Lab. Use Information Card Form BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
	Electrodes for Welding		ALDOT-195; Section 2.4	See List II-12 for acceptable electrodes Procedure II-12 for information	None	None	Visual for dampness and unsealed containers	List II-12 is found in the Manual "Materials, Sources and Devices with Special Acceptance Requirements"

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Structure Foundations	Foundation Backfill	See Section 214 or 215	See Construction Manual for frequencies, procedures, and reports					
	Concrete	See Section 501 Seal Concrete Cores						
	Piling	See Section 505						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Piling	Precast or Prestressed Concrete Piles	Physical	Pretested and stenciled DOT See ALDOT-195; Section 2.2.1	Before installation			Visual for damage	
	Cast in Place Concrete Piles	See Section 501 and 502						
	Steel Piles	Chemical and Physical	Certified tests for each heat stamped on each size pile ALDOT-195; Section 2.3	Before installation			Visual for damage	
	Timber Piles Treated or Untreated		Certified test See ALDOT 195; Section 2.3	Before installation			Visual for damage	
	Timber Sheet Piles		Certified test See ALDOT 195; Section 2.3	Before installation			Visual for damage	
	Steel Sheet Piles		Certified tests for each heat number stamped on each pile See ALDOT-195; Section 2.3	Before installation			Visual for damage	

Abutment and Bulkhead Anchors

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Abutment and Bulkhead Anchors	Prefabricated Metal or Precast Pretressed Concrete Bulkheads	Chemical and Physical	Precast ALDOT-195; Section 2.2.1 Metal ALDOT-195, Section 2.3	Before incorporation in work			Visual for damage	
	Wire Rope	Chemical and Physical	ALDOT-195; Section 2.3 or ALDOT-195; Section 2.1.3	Before incorporation in work	9 ft (3 m)	ALDOT-210	Visual for damage	Use Sample Information Card Form BMT-18
	Anchor Assemblies Including Miscellane-ous Metals	Chemical and Physical	ALDOT-195; Section 2.3 or ALDOT-195; Section 2.1.3	Before incorporation in work	1-each item	ALDOT-210	Visual for damage	Use Sample Information Card Form BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Structural Steel and Miscellaneous Metals	Structural Steel and Miscellaneous Metals	Chemical Physical	ALDOT-195; Section 2.3	Before incorporating in work				
	High Strength Fasteners	Chemical Physical	ALDOT—195, Section 2.1.3 plus ALDOT –195; Section 2.3 Check markings (see ALDOT-247)		Lot Size-- Bolt, Nut, Washer 800 or less 2 each; 801 to 8,000- 3 each; 8,001 to 35,000- 4 each; 35,001 to 150,000- 9 each; 150,001 & above-14 each	ALDOT-210	Visual for markings	See specification for Tension Calibration Instructions. Report on BMT-18
	Paints Oils Pigments	Chemical Physical	ALDOT-195; Section 2.2.2	Before delivery to work site				See List III-1, Qualified Products List
	Anchor Bolts	Chemical Physical	20 or less per project ALDOT-195; Section 2.3 or Section 2.1.3 More than 20 per project ALDOT-195; Section 2.1.3	Ship to project before sampling	1 each bolt, nut, washer per heat, lot, size, project	ALDOT-210		Submit certification to Central Laboratory with sample

Untreated and Treated Timber

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Untreated and Treated Timber	Timber	Physical	Certified Test See ALDOT-195; Section 2.3	Before installation			Visual for damage	

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Bridges	Components	See Sections 215, 501, 502, 505, 508, 509, 513, 521, and 522 for all applicable instructions						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Bridge Bearings	Elastomeric Bearing Pads	Physical and Chemical	ALDOT-195; Section 2.3 plus ALDOT-195; Section 2.1.3 or ALDOT-195; Section 2.2.2 1 Pad per lot or see ALDOT-368	Before installation	Complete pad	ALDOT-210	Visual for workmanship	See ALDOT-368 for details

Precast Non-Prestressed Concrete Bridge Members

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Precast NonPrestressed Concrete Bridge Members	Abutment Caps, Bent Caps, Span Sections, Curb Spans, Abutment Panels, Wing Panels, Wing Cap Panels		Pretested and stenciled DOT See ALDOT-364				Visual for damage	See ALDOT-364

Prestressed Concrete Bridge Members

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Prestressed Concrete Bridge	Girders and/or Span Sections	Physical	Pretested and stenciled DOT	Before delivery to work site See ALDOT-195			Visual for damage	See BMT-367

Linseed Oil Protective Coating for Bridge Decks Members

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Linseed Oil Protective Coating for Bridge Decks Members	Linseed Oil and Mineral Spirits	Chemical and Physical	Pretested or if not pretested sample at project level	Prior to mixing of components. See ALDOT-195	1 qt. (1 L) each	ALDOT-210 Each lot - Mix thoroughly before sampling		Ship to Central Lab. Use Information Card Form BMT-18

Waterproofing and Dampproofing

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Waterproofing and Dampproofing	Asphalt Cement	Physical	See ALDOT-243 If not pretested sample at project level	Before incorporation in work See ALDOT-195	1 quart (1 L)	AASHTO T-40		Ship to Central Lab. Use Information Card Form BMT-18
	Asphalt Plank	Physical	Certified Tests	Before incorporation in work See ALDOT-195		ALDOT-210	Check for damage and dimensions AASHTO M-46	Ship to Central Lab. Use BMT-18
	Water-proofing and Damp-proofing Fabric	Chemical and Physical	Pretested Certified Tests. If not sample at project level 1 sample per each 200 rolls or fraction thereof	Before incorporating in work See ALDOT-195	1 yard (1 m) by full width of roll	ALDOT-210	Visual check for damage	Submit samples to Central Lab. Use Information Card BMT-18
	Mortar	See Section 611						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Bridge and Sidewalk Handrail	Galvanized Steel Pipe, Steel Shape Beam Type Handrail and Accessories Nuts, Bolts and Washers Aluminum or Galvanized Steel Sidewalk Handrail and Steel Posts for Beam Type Handrail	Chemical and Physical	Certified Test Reports ALDOT-195; Section 2.3 or Sample at job ALDOT-195; Section 2.1.3	Before incorporating in work See ALDOT-195	1 each hardware and pipe items. 3 each nuts, bolts, and washers	ALDOT-210	Visual check for damage	Submit sample to Central Lab. Use Information Card BMT-18
	Timber Posts	Physical	Certified Test See ALDOT-195; Section 2.3				Visual for damage	
	Concrete Handrail	See Section 501						

Repair or Raising Existing Bridges

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Repair or Raising Existing Bridges	All New Components	See Section 510						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Steel Bridge Painting	Paints, Oils and Pigments	Physical	ALDOT-195; Section 2.4.		1 qt. (1 L) each component			See Procedure and List III-1 in Materials, Sources, and Devices with Special Acceptance Requirements Manual

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Bridge Joint Seals	Preformed Elastomeric Compression Seals	See Section 450						
	Un-Reinforced Diaphragm Seal	Physical	ALDOT-195; Section 2.1.3 1 sample per lot	Prior to installing	3 ft. (1 m)	ALDOT-210		Submit samples to Central Lab. Use Sample Information Card Form BMT-18
	Reinforced Diaphragm Seal	Physical	Certified Test Reports ALDOT-195; Section 2.3	Prior to installing				

Reinforced Concrete Box Culverts Precast Sections

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Reinforced Concrete Box Culverts Precast Sections	See Section 214, 501, and 502		Sections are pretested and stenciled DOT and Technician Number				Visual for damage	ALDOT-364

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Concrete Retaining Walls and Cribbing	See Section 214, 501, and 502							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Concrete Retaining Walls **Note!** This section is by job specific special provision	Concrete Face and Corner Panels		Pretested and stenciled or tagged DOT and technician number	Before incorporating into work			Visual for damage	ALDOT-364
	Concrete for Footings and/or Caps		See Section 501					
	Longitudinal Reinforcing Strips	Chemical and Physical	Certified mill test report or sample 1 per wall, per heat number ALDOT-195; Section 2.3 or Section 2.1.3	Before incorporating into work	1 strip	Random, ALDOT-210	Visual check for damage	Use Sample Information Card BMT-18
	Selected Backfill (Local Material)	Gradation Atterberg Limits	Minimum 1 per each 500 yds^3 (400 m^3) ALDOT-195	Before incorporating into work	See Table No. 1 AASHTO T-2	ALDOT-210 AASHTO T-2	AASHTO T-88 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90 AASHTO M-145	See Special Provision or plans for gradation requirements
	(Commercial Aggregate)	Gradation	See ALDOT-249 and ALDOT-195	Before incorporating into work	AASHTO T-27	AASHTO T-2	AASHTO T-11 AASHTO T-27 ALDOT-253 AASHTO T-19 ALDOT-210	Aggregate must be from an approved source. See List I-1, “Materials Sources and Devices with Special Acceptance Requirements.”
	Corner Units		Pretested and stenciled or tagged DOT and technician number	Before incorporating into work			Visual for damage	ALDOT-364

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
(Precast Units)	Concrete Face and Corner Panels		Pretested and stenciled or tagged DOT and technician number	Before incorporating into work			Visual for damage	ALDOT-364
	Concrete for Footings and/or Caps		See Section 501					
	Longitudinal Reinforcing Strips	Chemical and Physical	Certified mill test report each heat number ALDOT-195	Before incorporating into work				
	Selected Backfill (Local Material)	Gradation Atterberg Limits	Minimum 1 per each 500 yds.3 (400 $m^{3)}$	Before incorporating into work	50 .lb (25 kg)	ALDOT-210	AASHTO T-27 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90	See plans for gradation requirements
	Commercial Aggregate		Pretested See ALDOT-249					Aggregate must be from an approved source. See List I-1, “Materials Sources and Devices with Special Acceptance Requirements.”
(Cast in Place)	Corner Units			Before incorporating into work			Visual for damage	
	Cement	See Sections 501 and 815		See Materials, Sources, and Devices With Special Acceptance Requirements List I-2				Cement must be from an approved source

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Reinforced Steel	Accepted on Certifica-tion	Certified Mill Test Report ALDOT-195					Submit Certifications to Division Materials Engineer
	Aggregates		Pretested ALDOT-249	See Materials, Sources, and Devices With Special Acceptance Requirements List I-1				Aggregate must be from an approved source. See List I-1, "Materials Sources and Devices with Special Acceptance Requirements."
	Water	See Sections 501 and 807						
	Admixtures		Pretested	See Materials, Sources, and Devices With Special Acceptance Requirements List II-1				Admixtures must be from an approved source
	Joint Fillers, Sealers, and Waterstop Materials		Pretested	See Materials, Sources, and Devices With Special Acceptance Requirements List II-10 and III-4				

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Roadway Pipe Culverts	Concrete Pipe	Physical	Pipe are pretested and stenciled DOT and Technician Number	Before incorporation in work See ALDOT-195			Visual for damage	ALDOT-364
	Corrugated Metal Pipe Bituminous Coated Corrugated Aluminum or Metal Pipe Corrugated Aluminum Pipe	Chemical and Physical	Certified Tests	Before incorporation in work See ALDOT-195			Visual for Damage ALDOT-330	Submit BMT-60 with certifications
	Joint Sealers Liquid or Plastic	Chemical and Physical	Certified Tests	Before incorporation in work See ALDOT-195				
	Rubber Type Gaskets	Chemical and Physical	Certified Tests	Before incorporation in work See ALDOT-195				
	Mortar	See Section 611						
	Bedding and Backfill	See Section 210 and 214						See ALDOT-364

Corrugated Metal Structure Plate Pipe, Arch Pipe, and Arch Culverts (Coated and Uncoated)

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Corrugated Metal Structure Plate Pipe, Arch Pipe, and Arch Culverts (Coated and Uncoated)	Structural Plates, Arch Pipe and Arches and Foundation Metal Materials	Chemical and Physical	Certified Tests	Before delivery to work site See ALDOT-195			Visual for damage	See ALDOT-330 Submit BMT-60 with certifications
	Foundation	See Section 501, 509, or 611						
	Excavation, Bedding and Backfill	See Sections 210 and 214						

Corrugated Steel Slotted Drain Pipe

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Corrugated Steel Slotted Drain Pipe	Pipe	See Corrugated Steel Pipe Section 606	Certified test Reports					Submit BMT-60 with certifications

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Storm Sewers	Cast Iron Pipe, Ductile Iron Pipe, Vitrified Clay Pipe, ABS Composite Pipe, PVC Pipe Joint Sealers Bedding and Backfill	Chemical and Physical	Certified Test	Before incorporation in work See ALDOT-195				
	Concrete Pipe		Pretested ALDOT-364				Visual for damage	All pipe must be from an approved source
	Corrugated Metal Pipe	Chemical and Physical	Certified Test					Submit BMT-60 to Division Materials Engineer

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Side Drain Pipe	Vitrified Clay Pipe	See Sections 530 and 533						
	Concrete Pipe		Pipe are pre-tested and stenciled DOT and Technician Number				Visual for damage	ALDOT-364
	Corrugated Metal and Arch Pipe, Corrugated Aluminum and Arch Pipe Joint Sealers Backfill	See Sections 530 and 533						

Relaid Pipe

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Relaid Pipe	New Materials	See appropriate Sections 530, 531, 533, and 535						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Field Laboratories	See Specification							

Right of Way and Land Survey Markers

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Right of Way and Land Survey Markers	Marker Posts and Caps		Pretested ALDOT-364				Visual for damage	Markers must be from an approved source ALDOT-364

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Engineer's Field Office	See Specification							

Geotextile as Permeable Asphalt Treated Base Treatment

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Geotextile as Permeable Asphalt Treated Base Treatment	Filter Fabric	See Section 605						Submit sample to Central Lab Use BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Pavement Edge Drain	Aggregate	Permeability	See Section 315 Requirements					
		Gradation Unit Weight	Pretested ALDOT-249	Before incorporation into work See ALDOT-249	AASHTO T-27	AASHTO T-2	AASHTO T-11 AASHTO T-19 AASHTO T-27 ALDOT-253	All aggregate must be from an approved source
	Filter Fabric (Woven or Non-Woven)	Physical	Sample at project level 1 sample per each 20,000 ft.(6000 m)or fraction thereof per each lot or trace number per source ALDOT-195; Section 2.1.3	Before incorporation in work. Do not use until passing test report is received. Stored material must be protected from heat and sunlight	Two pieces 6 ft. (2 m) long by full width of roll	Select roll for each lot by ALDOT-210. Cut one piece from end of roll, unroll at least 30 ft. (10 m) and cut second piece	Visual for damages	Submit sample to Central Lab Use BMT-18
	Prefabricated Drainage Material	Physical	Certified Test	Before installation ALDOT-195				Must be from an approved source; List II-18
	Pipe for Underdrain	See Section 606						
	Concrete for Underdrain Outlet	See Section 501						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Pipe Underdrain	Concrete Pipe		Pretested and stenciled DOT and Technician Number				Visual for damage	ALDOT-364
	Corrugated Steel	Chemical and Physical	Certified Test ALDOT-330	See ALDOT-195			Visual for damage ALDOT-330	Submit BMT-60 with certification
	Coated Corrugated Steel Corrugated Aluminum Coated Corrugated Aluminum	Chemical and Physical	Certified Test ALDOT-330	See ALDOT-195			Visual for damage ALDOT-330	Submit BMT-60 with certification
	Vitrified Clay		Pretested ALDOT-364	Before installation See ALDOT-195			Visual for damage	Must be from an approved source
	PSP (PVC)	Physical	Certified Test If not, sample on project	Before installing See ALDOT-195	One 3 ft. (1 m) length each lot	ALDOT-210		Submit sample to Central Lab. Use BMT-18
	Corrugated Plastic Poly-ethylene (PE)	Physical	Certified Test If not, sample on project	Before installing See ALDOT-195	One 3 ft. (1 m) length each lot	ALDOT-210		Submit sample to Central Lab. Use BMT-18
	Filter Fabric (When Required)	See Section 605						
	Filter Material (Coarse Aggregate)	Gradation Unit Weight	Pretested See ALDOT-249	Before incorporation in work See ALDOT-195	AASHTO T-27	AASHTO T-2	AASHTO T-27 ALDOT-253 AASHTO T-19	Use Work Sheet Form BMT-33, Report Form BMT-6

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
	Fine Aggregate Local or Commercial	Gradation	Pretested See ALDOT-249	Before incorporation in work See ALDOT-195	AASHTO T-27	AASHTO T-2	AASHTO T-27 ALDOT-253	Use Work Sheet Form BMT-33, Report Form BMT-6
		Permeabil-ity	See Section 315 for requirements					Submit samples to Central Lab. Use BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Paving Geotextiles	Filter Fabric	See Section 605						

Separation Applications

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Separation Applications	Filter Fabric	See Section 605						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Aggregate Slope Protection	Aggregate		Pretested ALDOT-249					Aggregate must be from an approved source
	Filter Fabric	See Section 605						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Riprap	Stone	Size Check (Visual)	Pretested ALDOT-249	Before incorporation in work See ALDOT-195			If difference of opinion rises, see ALDOT-239	Must be from an approved source
	Aggregate for Filter Blanket	See Section 605						
	Filter Fabrics							
	Sacked Concrete	Size Check	1 Test per each 500 sacks	Before incorporation in work	5 sacks	ALDOT-210	Size check using laboratory measure	Report on Form BMT-16
	Sacks for Concrete							
	Aggregate	Gradation	Pretested ALDOT-249	Before incorporation in work				Aggregate must be from an approved source
	Cement	See Section 501						
	Water							
	Pre-Packaged Concrete Sacked Riprap	See Section 814						

Mortar for Masonry

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Mortar for Masonry	Cement Sand Water	See Section 501						
	Hydrated Lime		From approved source	Before incorporation in work See ALDOT-195				Lime must be from an approved source. Check List I-6

Rubble Masonry

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Rubble Masonry	Stone		Pretested ALDOT-249	Before incorporation in work See ALDOT-195				Stone must be from an approved source
	Mortar	See Section 611—For Cement, Sand, Water, and Lime						
	Concrete	See Section 501						
	Copings Bridge Seats and Backwalls	See Section 501 or 508						

Brick and Concrete Block Masonry

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Brick and Concrete Block Masonry	Brick or Concrete Block	Physical	Minimum one (1) sample per source per project	Before incorporation in work See ALDOT-195	Brick— AASHTO T-32 Block-- Ten (10) blocks each lot each source	ASTM C-90 AASHTO T-32 and ALDOT-210	See Section 805	Submit to Division Materials Engineer Use BMT-18
	Mortar	See Section 611						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Slope Paving	Concrete	See Section 501	Must be from approved sources					Consult Division Materials Engineer for approved sources
	Steel Reinforce-ment	See Section 502						
	Joint Fillers and Sealers	See Section 502						

Grouted Rubble Slope Drain

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Grouted Rubble Slope Drain	Stone	See Section 612						
	Grout	See Section 611 for Cement, Sand, Water, and Lime						
	Base Course Material			Before incorporation in work				Consult Division Materials Engineer for approved source

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Soil Cement Flume	Cement	Chemical	See Section 501					
	Water	Chemical	See Section 501					
	Aggregate		Pretested ALDOT-249	Before incorporation in work				Consult Division Materials Engineer for approved sources
	Joint Filler	See Section 501						
	Solid Sod	See Section 654						
	Curing Compound		Certified Tests	Before incorporation in work			AASHTO M-148	

Bituminous Treated Glass Fiber Flumes

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Bituminous Treated Glass Fiber Flumes	Glass Fibers	Chemical Physical	From approved Source	Before incorporation in work See ALDOT-195				See List II-8 in Materials, Sources, and Devices with Special Acceptance Requirements Manual for approved sources
	Asphalt Emulsion		See ALDOT-243	Before incorporation in work				

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Concrete Sidewalks and Driveways	Concrete	See Section 501 for all requirements						
	Reinforcing Steel	See Section 502						
	Curing Compound		Certified Test	Before incorporating into work			AASHTO M-148	

Prefabricated Pipe Culvert Headwalls

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Prefabricated Pipe Culvert Headwalls	Concrete End Sections and Concrete End Sec-ions with Metal Sleeves Metal End Section Grates		Pretested and stenciled DOT and Technician Number				Visual for damage	ALDOT-364

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Minor Structure Concrete	Concrete	See Section 501 for all require-ments						
	Reinforcing Steel	See Section 502						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Inlets, Junction Boxes Manholes and Miscellaneous Drainage Structures	Concrete	See Section 501	Pretested and stenciled DOT and Technician Number (If precast)				Visual for damage	ALDOT-364 (If precast)
	Brick or Block Masonry	See Section 613						
	Castings Covers Grates Pipes Precast Inlets and Manholes	Physical	Certified Test Reports	Before delivery to work site See ALDOT-195			Visual for damage	

Resetting Gratings, and Covers for Catch Basins, Inlets and Manholes

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Resetting Gratings, and Covers for Catch Basins, Inlets and Manholes	New Materials	See Section 621						
	Masonry	See Section 613						
	Concrete	See Section 501						

Curb, Gutter and Combination Curb and Gutter

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Curb, Gutter and Combination Curb and Gutter	Concrete	See Section 501						
	Expansion Joint Fillers	See Section 450	Certified Test	Before incorporating into work			AASHTO M-148	
	Concrete Curing Compounds	See Section 450						
	Foundation Backfill (When Required)	See Section 214						

Concrete Median Strip

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Concrete Median Strip	Concrete	See Section 501						
	Curing Compound	See Section 450						

Concrete Median and Safety Barrier

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Concrete Median and Safety Barrier	Precast Barriers	Physical	Pretested and stenciled DOT and technician number	Before delivery to work site				See ALDOT-364
	Concrete For Cast In Place Barriers	See Section 501						See ALDOT-170
	Steel Reinforcing	See Section 502						
	Backfill	See Section 214						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Guardrail and Barrier Rail	Steel Beam Guardrail		Accepted on Brand Registration	See ALDOT-195; Section 2.4			Visual for damage	See List II-17 in Materials, Sources, and Devices with Special Acceptance Requirements Manual
	Aluminum Beam Guardrail							
	Steel Barrier Rail							
	Aluminum Barrier Rail							
	Wire Rope		Certified Test	See ALDOT 195; Section 2.3				
	Steel Posts and Blocks	Chemical and Physical	Certified Test See ALDOT-195; Section 2.3	See ALDOT-195			Visual for damages	Report on Form BMT 170
	Aluminum Posts and Blocks							
	Treated Timber Posts and Blocks	Physical	Certified Test See ALDOT-195; Section 2.3	Before delivery to work site			Visual for damages	See ALDOT 348 Report on Form BMT 170
	Concrete for End Anchors	See Section 501						

Guardrail or Barrier Rail Reset

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Guardrail or Barrier Rail Reset	New Materials	Chemical and Physical	See Section 630 for all requirements					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Headlight Glare Screen	Glare Screen	Chemical and Physical	Certified Tests See ALDOT-195; Section 2.3	Before delivery to work site			Visual for damages	
	New Post	Chemical and Physical	See Section 630					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Chain Link Industrial Fence	Chain Link Fence Barbed Wire	Chemical and Physical	Certified Tests or sampled at project level. One sample per project	Before delivery to work site See ALDOT-195	3 ft (1 m) by width of roll		Visual for damages and rust	Submit with BMT-18
	Metal Line Post	Chemical and Physical	Certified Tests or sampled at project level	Before delivery to work site See ALDOT-195	1 each		Visual for damages	Submit with BMT-18
	Metal Corner Post	Same as Line Post						
	Metal Brace Post	Same as Line Post						
	Caps Miscellane-ous Hardware and Fittings Gates and Fittings Protective Cage Tubing	Chemical and Physical	Certified Tests or sampled at project level	Before incorporation in work See ALDOT-195	1 each		Visual for damages and rust	Submit with BMT-18
	Concrete for Setting Posts		Small amounts may be obtained from any source approved by Division Materials Engineer without Job Control Tests. Amounts greater than 175 yds^3 (135 m^3) on any project see Section 501 Minor Structure Frequency					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
	Tension and Tie Wire	Chemical and Physical	Certified Tests. See ALDOT-195; Section 2.3, or sampled at project level	Before installation	Tension- 1- 3 ft. (1 m) tie, 3 each			Submit with BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Woven Wire Fence	Woven Wire	Chemical and Physical	Certified Tests ALDOT-195; Section 2.3, or sampled at project level	Before installation	3 ft. (1 m)			Submit with BMT-18
	Gates, Miscellane-ous Hardware and Fittings, Tension and Tie Wire	See Section 634						
	Wood Line Post	Physical	Certified Test ALDOT-195; Section 2.3	Before installation			Visual for damages	
	Wood Corner Post	Physical	Certified Test ALDOT-195; Section 2.3	Before installation			Visual for damages	
	Wood Brace Post	Same as Wood Corner Post						

Barbed Wire Fence

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Barbed Wire Fence	See Section 634 and 635 for all applicable items							

Fence Reset

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Fence Reset	New Materials		Approval of replacement material shall be made by the Engineer; No testing of this material will be required unless such is ordered by the Engineer					

Minor Utility Adjustments

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Minor Utility Adjustments	New or Salvaged Materials		No set frequency for testing. All materials to be tested will be as scheduled by the Department's Construction or Electrical Engineer					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Water Pipe	Pipe	Chemical and Physical	Certified Tests or sampled at project level	Before delivery to work site See ALDOT-195	3 ft (1 m)		Visual for damages	Submit with BMT-18
	Fittings							
	Joint Sealing Materials							

Type of Construction	**Material**	**Test**	**Frequency of Acceptance Samples and Tests for Job Control**	**Construction Stages for Obtaining Sample or Test**	**Sample Size**	**Procedures**		**Remarks**
						Sampling Method	**Test Methods**	
Fire Hydrant	New Materials	Chemical and Physical	Certified Tests	Before installing see ALDOT-195				

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Water Meters and Valve Boxes	New Materials	Chemical and Physical	Certified Tests	Before installing see ALDOT-195				

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Sanitary Sewers	Vitrified Clay Pipe	Physical	See ALDOT-364	Before delivery to work site See ALDOT-195; Section 2.3			Visual for damages	ALDOT-364
	Plain or Reinforced Concrete Pipe	Physical	Pretested ALDOT-364				Visual for damages	ALDOT-364
	Cast Iron Pipe	Physical	Certified Tests or sample at project level	Before delivery to work site See ALDOT-195	3 ft (1 m)		Visual for damages	Submit with BMT-18
	Ductile Iron Pipe							
			Certified Test or sample at project level	Before delivery to work site See ALDOT-195	3 ft (1 m)		Visual for damages	Submit with BMT-18
	ABS Composite Pipe	Physical						
	PVC Pipe and Fittings	Chemical and Physical	Certified Tests or sample at project level	Before delivery to work site See ALDOT-195	3 ft (1 m)		Visual for damages	Submit with BMT-18
	Coated Smooth Flow Metal Pipe	Chemical and Physical	Certified Tests	Before delivery to work site See ALDOT-195			Visual for damages	Certification with BMT-60
	Joint Sealers	See Section 530 for all types and require-ments						

Encasement Pipe for Utilities

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Encasement Pipe for Utilities	Pipe	Chemical and Physical	Certified Tests or sampled at project level	Before delivery to work site See ALDOT-195	3 ft (1 m)		Visual for damages	Submit with BMT-18

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Topsoil	Topsoil	Visual for Quality	Must be from source shown on plans or previously approved areas				Visual	

Ground Preparation and Fertilizer for Erosion Control

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Ground Preparation and Fertilizer for Erosion Control	Fertilizer	Chemical	Certified analysis attached to each bag or test report for bulk shipment	Before incorporation in work See ALDOT-195				Analysis should be attached to Form BMT-16
	Agricultural Limestone or Basic Slag	Chemical and Physical	Certified Tests	Before incorporation in work See ALDOT-195				

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Seeding	Seed	Analysis	Certified Test Each bag of seed shall have attached a tag or label certifying to contents, tests and analysis	Before incorporation in work See ALDOT-195				
	Fertilizer	See Section 651						
	Mulching Materials	See Section 656						
	Application Rates		See Construction Manual for frequencies and reports					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Sprigging	Sprigs		Sprigs must be from a source approved in advance by the Engineer				Visual for condition at time of use	See Section 860
	Fertilizer	See Section 651						
	Mulching Materials	See Section 656						
	Erosion Control Material	See Section 659						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Solid Sodding	Sod	Physical	See Construction Manual	Sod must be from an acceptable source		Random Strips	Size and condition checks	
	Fertilizer	See Section 651						
	Erosion Control Material	See Section 659						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Mulching	Hay	Physical (Moisture)	Test for moisture as scheduled in Construction Manual. Minimum one (1) test per project	Before application	10 lbs (5 kg)	ALDOT-210 Each truck	ALDOT-240	
		Application Rate	See Construction Manual for frequency, procedures, and reports					
	Straw	Moisture and Application Rate	Same as Hay					
	Excelsior (Wood)	Moisture and Application Rate	Same as Hay (See previous page for Hay)					
		Particle Size	See Section 860.03	Before delivery to work site			Visual	
	Wood Cellulose Fiber or Natural Wood Fiber	Air Dry Weight	See Section 860.03	Before delivery to work site			Visual	
		Moisture and Application Rate	See Hay; previous page					
	Asphalt Adhesive	Visual for Quality and Suitable for Use	Certified Tests See ALDOT-243					
		Application Rate	See Construction Manual					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Tackafiers							See List II-20, Qualified Products List
	Erosion Control Netting	See Section 659						
	Glass Fiber with Asphalt Adhesive	See Section 617						
	Forest Litter, Hulls, Manure and Sawdust	Classifica-tion	Source must be approved before delivery to project begins				Visual	
	Sphagnum Moss Peat	Physical	Certified Test by approved producer	Before delivery to work site		Random	Visual	
	Pine Bark, Red Wood or Other Approved Bark	Classifica-tion	Must be from an acceptable source	Before incorporation in work				

Grassy Mulch

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Grassy Mulch	Grassy Mulch	Application Rate	Mulch must be from an approved source. Minimum one (1) test per day	During application		Random	Visual measurement of volume and area	
	Fertilizer	See Section 652						

Hydro-Seeding and Mulching

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Hydro-Seeding and Mulching	Fertilizer	See Section 651						
	Mulch	See Section 656						
	Seed	See Section 652						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Erosion Control Netting	Jute, Cotton Rayon, Polyester Yarn, Plastic, Cotton Rayon or Excelsior Blanket, Glass Fiber Staples	Physical	Certified Test ALDOT-195; Section 2.4 or ALDOT-195; Section 2.3 plus ALDOT-195; Section 2.1.1	Before incorporation in work				See List II-11 of the "Materials, Sources, and Devices with Special Acceptance Requirements" Manual See ALDOT-195
	Asphalt Adhesive	See Section 656						

Vines, Shrubs and Tree Planting

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Vines, Shrubs and Tree Planting	Fertilizer	Analysis	See Section 651	To be inspected prior to planting operations				
	Vines, Shrubs, Seedlings and Trees	Physical	Each individual bale bundle or plant shall bear a legible label giving the name and size of the plant and the quantity contained in the bale or bundle				Visual	
	Wire and Bracing Materials, Paper and Twine, Paint Protective Hose, Burlap, Drain Tile, Pipe	Physical	These items may be hardware shelf items from reputable manufacturers. No samples or tests required				Visual and suitable for intended use	
	Plant Topsoil	See Section 650						
	Tree Root Protection Material	See Section 663						

Transplanting Trees, Shrubs, and Vines

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Transplanting Trees, Shrubs, and Vines	See Section 660 for all new materials							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Tree Wells and Tree Root Protection	Concrete	See Section 501						
	Rubble Masonry	See Section 612						
	Brick or Concrete Block Masonry	See Section 613						
	Tree Root Protection Material	Gradation	Minimum one (1) per source per project, and as needed to control size	Prior to incorporation	50 lbs (25 kg)	AASHTO T-2	AASHTO T-27	Use Work Sheet Form BMT-33, report on Form BMT-6

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Temporary Erosion Control	See Sections 610, 651, 652, 653, 654, 656, 657, 658, and 659 for all applicable requirements							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Pest Control	Insecticides		May be shelf items approved by Agriculture Department. No test required					

Pre-Emergent Soil Sterilization Treatment

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Pre-Emergent Soil Sterilization Treatment	Soil Sterilization Material		Shelf items from manufacturers prequalified by U.S. Department of Agriculture or Alabama Agriculture Experiment Station. (No test required)					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Post-Emergent Herbicide Treatment	Synthetic Auxins		Pre-qualified manufacturers approved by U.S. Department of Agriculture and the State of Alabama Agriculture Department. Formulations to be approved by the Department's Landscape Engineer					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Traffic Stripe	Reflective or Nonreflective Paint	Chemical and Physical	ALDOT-195; Section 2.4 List V-4 (Permanent) List V-3 (Temporary) Verify batch numbers of permanent paints	Prior to use				Materials, Sources, and Devices With Special Acceptance Requirements Manual
	Thermo-plastic Strips (Cold Applied)	Physical	ALDOT-195; Section 2.4 List V-4 (Permanent) List V-3 (Temporary)	Prior to use				Materials, Sources, and Devices With Special Acceptance Requirements Manual
	Thermo-plastic (Hot-Pour)	Chemical Physical	ALDOT-195; Section 2.4 List V-4 Verify batch numbers	Prior to use				Materials, Sources, and Devices With Special Acceptance Requirements Manual
	Drop-on Spheres	Chemical Physical	ALDOT-195; Section 2.2.2 Verify batch numbers if not ALDOT-195; Section 2.1.3	Prior to use See ALDOT-195	Three (3) bags per each 100,000 lbs. (45,000 kg) or fraction thereof	ALDOT-210		Use Sample Information Card Form BMT-18

Traffic Control Markings and Legends

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Traffic Control Markings and Legends	See Section 701 for all applicable requirements							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Pavement Markers	Single or Double Reflectors	Physical	ALDOT-195; Section 2.4 List V-2	Prior to use				Materials, Sources, and Devices With Special Acceptance Requirements Manual
	Bituminous Adhesive Materials	None	ALDOT-195; Section 2.4 List V-2	Prior to use				Materials, Sources, and Devices With Special Acceptance Requirements Manual

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Delineators and Hazard Markers	Single Reflectors and Multiple Reflector Units	Physical	ALDOT-195; Section 2.4	Prior to use			Visual for damage and dimensions	See List V-2, Materials, Sources, and Devices With Special Acceptance Requirements Manual
	Aluminum Backup Plates							
	Standard or Special Sign Panels	Chemical Physical	ALDOT-195; Section 2.3 or Section 2.1.3	Prior to use	See ALDOT-245		Visual for damage and dimensions	Use BMT-18
	Steel and Flexible Posts							
	Concrete for Posts		See Section 501					No test cylinders required

Object Safety Markings

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Object Safety Markings	Reflective Paint	Chemical Physical	ALDOT-195; Section 2.4	Prior to use				See List V-5, Materials, Sources, and Devices With Special Acceptance Requirements Manual
	Nonreflective Paint	Chemical Physical	ALDOT-195; Section 2.3 or Section 2.1.3	Prior to use	1 qt. (1 L)			

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Mileposts	See Section 710 for all requirements							

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Roadway Signs	Standard Sign Panels	Chemical and Physical	ALDOT-195; Section 2.3 plus ALDOT-195; Section 2.1.3 if project has over 200 square feet of panel (20M ^{2})	Prior to installation	1 sign	See ALDOT-245		Pick from signs where multiple panels of the same type are used when possible
	Porcelain Enameled Panels	Physical	ALDOT-195; Section 2.3 plus ALDOT-195; Section 2.1.3	Prior to installation	3 in (75 mm) x 12 in (300 mm) color sample			See ALDOT-245
	Laminated Panels	Chemical Physical	ALDOT-195; Section 2.3	Prior to installation				
	Sign Supports (Tubular and Beam)	Chemical and Physical	ALDOT-195; Section 2.3 or ALDOT-195; Section 2.1.3	Prior to installation	3 ft (1 m) each type			Subitem 880 See ALDOT-245
	Sign Supports (Light-weight Bend-away)	Chemical and Physical	ALDOT-195; Section 2.3 or ALDOT-195; Section 2.1.3	Prior to installation	3 ft (1 m)			Subitem 880
	Miscellaneous Metals	Chemical and Physical	ALDOT-195; Section 2.3	Prior to installation				
	Bolts and Nuts (Standard strength)	Physical	ALDOT-195; Section 2.1.3. Certified Test Report	Prior to installation	Three (3) each per size			
	Bolts and Nuts (High strength)	Chemical and Physical	ALDOT-195; Section 2.3 and ALDOT-195; Section 2.1.3	Prior to installation	See Section 508 for Chemical and Physical plus five (5) each for torque			See ALDOT-245 for torquing requirements

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
	Anchor Bolts and Nuts	Chemical and Physical	ALDOT-195; Section 2.3 and ALDOT-195; Section 2.1.3 when project requires over twenty (20)	Prior to installation	One (1) bolt, nut, and washer per heat, lot, size			
	Demountable Copy	Chemical and Physical	ALDOT-195; Section 2.3	Prior to installation				
	Prismatic Reflectors	Physical	ALDOT-195; Section 2.4	Prior to installation				See List V-2, Materials, Sources, and Devices With Special Acceptance Requirements Manual
	Concrete and Steel Footings	See Sections 501, 502, and 508 for all applicable requirements						

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Overhead Roadway Sign Structures	Signs	See Section 710						
	Structural Steel	Chemical and Physical	Certified Test Reports ALDOT-195; Section 2.3	Prior to Installation				
	Illumination and Electrical Equipment		All items must be approved by the Department's Electrical Engineer					
	Concrete and Steel for Foundations		See Sections 501 and 502					
	Anchor Bolts	Physical Chemical	See Section 508					

Overhead Sign Structures Renovation or Relocation

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Overhead Sign Structures Renovation or Relocation	Any New Materials	Chemical Physical	ALDOT-195; Section 2.3 or Section 2.1.3	Prior to installation	See Remarks			Sample materials at frequencies set for new structures

Portable Concrete Safety Barriers and Impact Attenuators

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Portable Concrete Safety Barriers and Impact Attenuators	Portable Concrete Safety Barriers		Pretested and stenciled DOT	Before delivery to site See ALDOT-195 for previously used portable concrete safety barriers			Visual for damage	**Note:** ALDOT furnished barriers will not require test reports See ALDOT-364 Contractor supplied barriers to be retained by the Department must be supplied new.
	Impact Attenuators		Certified Test	Before delivery to site See ALDOT-195			Visual for damage	**Note:** ALDOT furnished attenuators will not require test reports

Furnishing and Installing Traffic Control Equipment

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Furnishing and Installing Traffic Control Equipment	Equipment		All traffic control equipment may be production run stock or Certified Test reports					Contact Traffic Engineer for requirements and reports
	Anchor Bolts	Physical Chemical	See Section 508					

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Traffic Control Devices for Work Zones	Signs Barricades and Other Traffic Control Devices	None required	Approved by Engineer before installation				Visual for damage	

Portable Sequential Arrow and Chevron Unit

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Portable Sequential Arrow and Chevron Unit	New Units		Approved by Engineer				Visual for size and damages	

Furnishing and Installing Electrical Ducts

Type of Construction	Material	Test	Frequency of Acceptance Samples and Tests for Job Control	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Furnishing and Installing Electrical Ducts	Electrical Equipment		Contact the Department's Electrical Engineer for required test reports					

NUMERICAL INDEX OF INDEPENDENT ASSURANCE SAMPLING AND TESTING SCHEDULE

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Excavation Embankment Construction	Unclassified Excavation and Borrow Excavation	Moisture Density Standard and In-Place Density	One (1) per each 10 Acceptance Tests randomly spread throughout project. None required on 19,000 m^3 or less	In-place density test at same point in the process as the Acceptance Test	12 kg AASHTO T-2	ALDOT-105 and ALDOT-210	AASHTO T-99	IAS&T-D Item Send new P.D. sample to Central Laboratory for each In-Place Density Test
							ALDOT-222	
							AASHTO T-191 when authorized	Make comparisons in accordance with ALDOT-341
	Improved Roadbed from Borrow Areas	Soil Analysis	One (1) per layer per 3 km per roadway. None required on 1.5 km or less	Sample at same point in the process as the Acceptance Test	12 kg AASHTO T-2	ALDOT-105	AASHTO T-88 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90 AASHTO M-145	IAS&T-D Item Send sample to Central Laboratory Make comparisons in accordance with ALDOT-341

<table>
<tr><th rowspan="2">Type of Construction</th><th rowspan="2">Material</th><th rowspan="2">Test</th><th rowspan="2">Guide Frequency for Independent Assurance Samples and Tests</th><th rowspan="2">Construction Stages for Obtaining Sample or Test</th><th rowspan="2">Sample Size</th><th colspan="2">Procedures</th><th rowspan="2">Remarks</th></tr>
<tr><th>Sampling Method</th><th>Test Methods</th></tr>
<tr><td rowspan="3">Roadbed Processing</td><td rowspan="2">Modified Roadbed</td><td rowspan="2">Moisture Density Standard and In-place Density</td><td rowspan="2">One (1) per 2 miles (3 km) per roadway. None required on 1 mile (1.5 km) or less. None required on areas to be stabilized</td><td rowspan="2">In-place density test at same point in the process as Job Control</td><td>25 lbs (12 kg)
AASHTO T-2</td><td>ALDOT-105</td><td>AASHTO T-99. See Specification Section 306 for T-99 method</td><td>IAS&T-D Items
Send new P.D. sample to Central Laboratory for each in-place density test</td></tr>
<tr><td>AASHTO T-191 when authorized</td><td></td><td>ALDOT-222 or AASHTO T-191 (when authorized)</td><td>Make comparison in accordance with ALDOT-341</td></tr>
<tr><td>Improved Roadbed</td><td>Moisture Density Standard and In-place Density</td><td>One (1) per 3 miles (5 km) per roadway per layer (Upper layer for base and pave contracts only). None required on 1 miles (1.5 km) or less</td><td>(Same Stage, Size, Procedures and Remarks as Modified Roadbed)</td><td></td><td></td><td></td><td>IAS&T-D Item</td></tr>
</table>

Stabilized Roadbed

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Stabilized Roadbed	Blended Mixture of Roadbed Material and Stabilizing Material	Moisture Density Standard and In-place Density	(Same as Modified Roadbed)					IAS&T-D Item (same as modified roadbed)

Lime Stabilized Roadbed

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Lime Stabilized Roadbed	Blended Mixture of Roadbed Material and Lime	In-place Density	Same as Modified Roadbed, but use Job Control's ALDOT-223 Standard, instead of submitting a new Moisture Density Standard					IAS&T-D Item

<table>
<tr><th rowspan="2">Type of Construction</th><th rowspan="2">Material</th><th rowspan="2">Test</th><th rowspan="2">Frequency of Independent Assurance Samples and Tests</th><th rowspan="2">Construction Stages for Obtaining Sample or Test</th><th rowspan="2">Sample Size</th><th colspan="2">Procedures</th><th rowspan="2">Remarks</th></tr>
<tr><th>Sampling Method</th><th>Test Methods</th></tr>
<tr><td rowspan="6">Soil, Soil Aggregate, and Aggregate Base and Subbase</td><td rowspan="2">Plant- (except for 100% Crushed Commercial Aggregate), Road- or Yard Mixed Base or Subbase without chemical additives</td><td>Gradation</td><td rowspan="2">One (1) per 2 miles (3 km) per roadway for the completed course thickness, when the specification is the same. None required on 1 mile (1.5 km) or less</td><td rowspan="4">Sample at same point in the process as Job Control</td><td rowspan="4">25 lb (12 kg)

For Crushed Aggregate Bases see AASHTO T-2 Table 1 for sample size</td><td rowspan="4">ALDOT-105

ALDOT-210</td><td rowspan="2">AASHTO T-88

AASHTO T-89 as modified by ALDOT-232

AASHTO T-90

ALDOT-310</td><td rowspan="4">IAS&T-D Item

Submit soil analysis samples to Central Laboratory

Make comparison in accordance with ALDOT-341</td></tr>
<tr><td rowspan="2">Clay Content when required</td></tr>
<tr><td rowspan="2">Plant Mixed, 100% Crushed Commercial Aggregate</td><td rowspan="2">For bases containing 100% Crushed Commercial Aggregate, frequency of one (1) per 12,000 T (11,000 t) per roadway for the completed course thickness. None required on 7,500 T (6,800 t) or less</td><td rowspan="2">See AASHTO T-27 & T-11 for Crushed Aggregate Bases</td></tr>
<tr><td>Atterberg Limits</td></tr>
<tr><td rowspan="2">Plant, Road, or Yard Mixed</td><td rowspan="2">Moisture Density Standard and In-place Density</td><td rowspan="2">One (1) per 2 miles (3 km) per roadway per layer, for roadway layers

None required on 1 mile (1.5 km) or less</td><td rowspan="2">In-place density test at same point in the process as Job Control</td><td>50 lb (25 kg)</td><td>ALDOT-105</td><td rowspan="2">AASHTO T-180

or

ALDOT-225 when authorized</td><td rowspan="2">Submit new P.D. or L.V.D. sample for each In-Place Density Test to Central Laboratory

Make comparison in accordance with ALDOT-341</td></tr>
<tr><td>100 lb (50 kg)</td><td>ALDOT-140</td></tr>
</table>

Type of Construction	Material	Test	Frequency of Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Soil, Soil Aggregate, and Aggregate Base and Subbase (Continued)	Plant Mixed, 100% Crushed Aggregate	Moisture Density Standard and In-place Density	Same frequency as Plant Mixed containing 100% Crushed Commercial Aggregate	In-place density test at same point in the process as Job Control	Same as above	ALDOT-210	ALDOT-222 or AASHTO T-191 when authorized	ALDOT-222 or AASHTO T-191 when authorized
		Thickness Measure-ment	One (1) per 2 miles (3 km) per roadway for the completed course thickness, when the specification is the same. None required on 1 mile (1.5 km) or less	Measure at same point in the process as job control		ALDOT-105 ALDOT-210	ALDOT-105	IAS&T-D Item Report Form BMT-154
	Soil, Soil Aggregate or Aggregate Base or Subbase Containing Cement or Lime	In-place Density	(Same as Base and Subbase Without Chemical Additives, but use Job Control's ALDOT-223 Standard, instead of submitting a new Moisture Density Standard)					IAS&T-D Item
		Thickness Measure-ment	Same as Base and Subbase Without Chemical Additives					IAS&T-D Item
			Shoulder layers constructed separately from travelways-apply same sampling and testing frequency, except alternate left and right shoulders					IAS&T-D Item

Drainage Plane Layer

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Drainage Plane Layer	Commercial Aggregate	Gradation	One (1) sample per 2 miles (3 km) per roadway, alternate left and right shoulder. None required on 1 miles (1.5 km) or less	Sample on project	50 lbs. (25 kg) AASHTO T-2	AASHTO T-2	AASHTO T-27	IAS&T-D Item Submit samples to Central Laboratory Make comparison in accordance with ALDOT-341
		Thickness Measure-ment	One (1) per 2 miles (3 km) per roadway, alternate left and right shoulder. None required on 1 mile (1.5 km) or less	Measure as same point in the process as Job Control		ALDOT-105		IAS&T-D Item Report on Form ALDOT-154

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Permeable Asphalt Treated Base	No density or air voids required. See Section 410 for all other requirements							IAS&T-D

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Asphalt Surface Treatments	Liquid (Binder) Material	Analysis	One (1) per grade per source per 100,000 gals (375,000 L). None required on 10,000 gals (37,500 L) or less. This applies to all Alabama Department of Transportation supervised projects and secondary projects	See ALDOT-243	1 qt. (1 L) for asphalt 4 qts. (4 L) for emulsified asphalts	AASHTO T-40		IAS&T-D Items Ship to Central Laboratory. Use metal cans for asphalt. Use plastic containers for emulsified asphalt
	Aggregate	Gradation	One (1) per size per 5,000 English tons (4,500 metric tons). None required on 1,000 English tons (900 metric tons) or less	Sample on project	See AASHTO T-27 AASHTO T-2	AASHTO T-2	AASHTO T-27	IAS&T-D Item Submit samples to Central Laboratory Make comparisons in accordance with BMT-341

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Asphalt Plant Mixes General Requirements	Liquid (Binder) Material	Analysis	Same as Section 401					
	Asphalt Mix	Asphalt Cement Content	One (1) per 10 production days. Patching, leveling, and widening is excluded. None required on 2,000 English tons (1,800 metric tons) or less Total wearing, binder and base layers separately	Sample at the same point in the process as Acceptance Samples	25 lbs. (12 kg)	AASHTO T-168 ALDOT-210	ALDOT-354	IAS&T-D Item Submit samples to Division Laboratory. Make comparisons in accordance with ALDOT-341
		% Air Voids	One (1) per 10 production days. None required on 2,000 tons (1,800 t) or less Total wearing, binder and base layers separately	Sample at the point in the process as Acceptance Samples	25 lbs. (12 kg)	AASHTO T-168	ALDOT-353	IAS&T-D Item Submit samples to Division Laboratory. Make comparisons in accordance with ALDOT-341

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Asphalt Plant Mixes General Requirements (continued)	Asphalt Mix (continued)	In-place Density. See specifica-tion Section 306 for require-ments	One (1) core per lane per lift for ea. 50,000 ft. (15,000 m). or (1) core per lane per lift per project if less than 50,000 ft. (15,000 m). None required on 2,000 tons (1800t) or less. None required on patching, leveling, or widening. Total wearing, binder and base layers separately *Shoulders constructed separately from travelway shall alternate left and right. Use same frequency as above.	Use only core method at the same point in the process as Acceptance Samples		ALDOT-210 AASHTO T-166	AASHTO T-166	IAS&T-D Item Submit sample to Division Laboratory. Make comparisons in accordance with ALDOT-341

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Hot Asphalt Pavement	See Section 410 for all requirements							IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Polymer Modified Open Graded Friction Course	No density or air void tests required. See Section 410 for all other requirements							IAS&T-D Item

Stone Matrix Asphalt (SMA) Fiber Stabilized Asphalt Concrete

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Stone Matrix Asphalt (SMA) Fiber Stabilized Asphalt Concrete	See Section 410 for all requirements							IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Superpave Bituminous Concrete	See Section 410 for all requirements							IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Improved Bituminous Concrete	See Section 410 for all requirements							IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Portland Cement Concrete Pavement	Cement	Chemical and Physical	One (1) per month. None required on projects with less than 10,000 yd^2 (8,000 m^2) pavement	See ALDOT-227. Sample at concrete plant. This applies to all DOT supervised projects and secondary projects	1 gal (4 L)	AASHTO T-127 Note Paragraph 3		IAS&T-D Item Ship to Central Laboratory in metal containers
	Fly Ash (When Required by Job Mix)	Chemical and Physical	One (1) per 3 km. (none required on projects with less than 10,000 yd^2 (8000 m^2) pavement	Sample at concrete plant	1/2 gal (2 L)	AASHTO T-127 Note Paragraph 3		IAS&T-D Item Ship to Central Laboratory in metal containers
	Fine Aggregate	Gradation and F. M.	Same as Fly Ash	Sample at the same point in the process as Job Control	10 lbs (5 kg)	AASHTO T-2	AASHTO T-27 ALDOT-253	IAS&T-D Item Ship to Central Laboratory Make comparison in accordance with ALDOT-341
	Coarse Aggregates	Gradation	Same as Fly Ash	Sample at the same point in the process as Job Control	25 lbs (12 kg) AASHTO T-2	AASHTO T-2	AASHTO T-27 ALDOT-253	IAS&T-D Item Ship to Central Laboratory Make comparison in accordance with ALDOT-341

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
	Finished Portland Cement Concrete Pavement	Thickness Measure-ment	One core for 1000 ft (300 m) traffic lane or each fraction thereof. For shoulders 10 ft (3 m) wide same frequency as travel lane. Shoulders less than 10 ft (3 m) wide one (1) core each 2000 ft (600 m). Ramps, acceleration and deceleration lanes, crossovers, etc., one (1) core each	After paving operation has been completed		AASHTO T-24	AASHTO T-148	IAS&T-M Items
		Compres-sive Strength Test					AASHTO T-23 (In Central Laboratory)	
		Steel Placement					Measure in Central Laboratory	

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Structural Portland Cement Concrete	Mix Components		See Section 450, but sample Aggregates and Fly Ash at frequency of one (1) per 1,000 yd^3 (800 m^3) and sample cement at frequency of one (1) per month. None required on projects with less than 200 yd^3 (150 m^3) concrete					
	Portland Cement Concrete	Air Content	One (1) per each set of cylinders	Same point in the process as Job Control	AASHTO T-141	AASHTO T-141 ALDOT-328	AASHTO T-152 or AASHTO T-196	IAS&T-D Item
		Slump	One (1) per each set of cylinders	Same point in the process as Job Control	AASHTO T-141	AASHTO T-141	AASHTO T-119	IAS&T-D Item
		Test Cylinders	One (1) set of two, 28-day cylinders for each 500 yd^3 (400 m^3) None required on projects with less than 200 yd^3 (150 m^3) concrete	Same point in the process as Job Control		AASHTO T-141	AASHTO T-23 and ALDOT-340	IAS&T-D Item Make comparisons in accordance with ALDOT-341

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Steel Reinforcement	Reinforce-ment steel bars	Physical	One (1) sample any heat, any bar size, for each 100,000 lbs (45,000 kg) None required on projects with less than 200 yd^3 (150 m^3) concrete			Three (3) bars 24 in. (600 mm) long Sample straight bars when possible		IAS&T-D Items

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	**Test Methods**	
Piling	Precast or Pre-stressed Concrete Piles	Fine and Coarse Aggregates, Cement, Fly Ash (If Used), Cement	One (1) each per 28 days during production. None required on projects with less than 200 yd^3 (150 m^3) of concrete	See Section 501				IAS&T-M Item
		Pre-stress Cable (Strand)			Cable: Three (3) each 6 ft (2 m)	Cable: ASTM A-416	Cable: ASTM A-416	Do not repeat samples on heat numbers
		Test Cylinders	One (1) set of two 28-day cylinders per 28 days during production. None required on projects with less than 200 yd^3 (150 m^3) of concrete	Same point in the process as Job Control. (Cure cylinders with Job Control cylinders and test them on same machine as the Job Control cylinders)		AASHTO T-141	AASHTO T-23	IAS&T-M Item Make comparisons in accordance with ALDOT-341
		Air Content and Slump	One (1) per each set of cylinders	See Section 501				IAS&T-M Item
	Cast In-Place Concrete Piles	See Section 501						IAS&T-D Item

Drilled Shafts

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Drilled Shafts	See Section 501							IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Bridges	All Components	See Section 501						

Type of Construction	**Material**	**Test**	**Guide Frequency for Independent Assurance Samples and Tests**	**Construction Stages for Obtaining Sample or Test**	**Sample Size**	**Procedures**		**Remarks**
						Sampling Method	**Test Methods**	
Prestressed Concrete Bridge Members	See Section 505							IAS&T-M Item

Reinforced Concrete Box Culverts

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Reinforced Concrete Box Culverts	See Section 501							IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Concrete Retaining Walls and Cribbing	Concrete for Footing and/or Caps	See Section 501						IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Concrete Retaining Walls **Note:** This Section is by Job Specific Special Provision	Selected Backfill (Local Materials)	Gradation Atterberg Limits	One (1) per 7500 yd^3 (6000 m^3) or less	Same point in the process as the Acceptance Test	See AASHTO T-2, Table No. 1	ALDOT-210 AASHTO T-2	AASHTO T-27 AASHTO T-89 as modified by ALDOT-232 AASHTO T-90 AASHTO M-145	IAS&T-D Item See Special Provision or plans for gradation requirements. Make comparison in accordance with ALDOT-341
	(Commercial Aggregate)	Gradation	See Section 401					IAS&T-D Item

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures: Sampling Method	Procedures: Test Methods	Remarks
Pavement Edge Drains	Aggregate	Gradation	See Section 401					IAS&T-D Item Sample if aggregate is used

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Guardrail and Barrier Rail	Steel Beam Guardrail	Coating Thickness	One spot check rail using thin film gauge (none required on projects with less than 400 ft (120 m)	Prior to or during assembly or after it is assembled in place	See Remarks		Per manufactur-ers instructions	IAS&T-D Item Average of five readings at different locations. Report results to Certification and IAS&T-M Offices on BMT-16

Pavement Markers Class A

Type of Construction	Material	Test	Guide Frequency for Independent Assurance Samples and Tests	Construction Stages for Obtaining Sample or Test	Sample Size	Procedures		Remarks
						Sampling Method	Test Methods	
Pavement Markers Class A	Single and Double Lens	Physical	One (1) sample each type on projects requiring more that 1000 markers. When less than 200 markers of any one type are used, no sample will be required for that type	Prior to installation	Three (3) each	ALDOT-210	ASTM E 1696	IAS&T-D Item

NUMERICAL INDEX OF ALABAMA DEPARTMENT OF TRANSPORTATION PROCEDURES

ALDOT Number	Title
ALDOT-335	Measuring Profile Index of a Paved Surface
ALDOT-338	Test Method for Flow of Grout Mixtures (Flow Cone Method)
ALDOT-340	Method of Testing "IAS&T" Concrete Cylinders
ALDOT-341	Standard Procedures for Comparing Independent Assurance Samples and Tests (IAS&T) and Acceptance Test Results
ALDOT-342	Summary of Tests (BMT-38)
ALDOT-344	Design Method for Selecting the Grade of Recycling Agent and Optimum Asphalt Cement Content of Hot-Mix Recycle Bituminous Mixtures
ALDOT-348	Acceptance of Treated Timber Products by Certification
ALDOT-349	Hot Mix Asphalt Field Testing Equipment
ALDOT-350	In-Place Bituminous Plant Mix Density Measurements
ALDOT-352	Certification Program for Ready-Mixed Concrete Plants
ALDOT-353	Field Method for Determining Air Void Content and Marshall Stability and Flow of Bituminous Mixtures
ALDOT-354	Asphalt Content of Bituminous Mixture by the Nuclear Method
ALDOT-355	General Information Concerning Materials Sources and Devices with Special Acceptance Requirements
ALDOT-358	Jack Calibration Procedure
ALDOT-361	Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
ALDOT-362	Procedure for Measurement of the Surface Temperature of Pavement
ALDOT-364	Procedure for Inspection of Concrete Pipe, Precast Manholes, Precast Box Culverts, Precast Non-Prestress Concrete Bridge Members and Miscellaneous Precast Products
ALDOT-366	Test Method for Pull Out on Steel Tie Bars Secured in Concrete with Epoxy
ALDOT-368	Sampling Procedures for Elastomeric Bridge Bearing Pads
ALDOT-369	Procedure for Acceptance of Materials used in the Construction of Rest Areas and Welcome Centers

ALDOT-50-83
METHOD FOR DETERMINING PARTICLE SIZE ANALYSIS OF SOILS (SUBBASE AND BASE COURSE)

1. Scope

1.1. This method covers the procedure for the quantitative determination of the distribution of particle sizes in soils.

2. Applicable Documents

2.1. AASHTO T-87, Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

2.2. AASHTO T-248, Reducing Field Samples of Aggregate to Testing Size

2.3. AASHTO T-27, Sieve Analysis of Fine and Coarse Aggregates

2.4. AASHTO M-231, Weights and Balances used in Testing of Highway Materials

2.5. AASHTO M-92, Wire Cloth Sieves for Testing Purposes

2.6. Alabama Department of Transportation Standard Specifications (Section 820 through 825 and/or any Special Provisions that may apply).

3. Apparatus

3.1. Balances - The balances shall conform to AASHTO M-231, Class D for samples less than 2000 g and Class E for samples of 2000 g or more.

3.2. Oven - The oven shall be capable of maintaining a uniform temperature not to exceed 140°F (60°C). (To prevent the physical properties from changing.).

3.3. Sieves - Suitable sieve sizes shall be selected to furnish the information required by the specifications covering the material to be tested. (These sieves shall conform to the Standard Specifications for Sieves for Testing Purposes - AASHTO M-92.)

3.4. Bottle for Clay Content - This bottle should be round having a capacity of 500 ml and measuring approximately 6 in. (150 mm) in height.

4. Procedure

4.1. Reduce the sample to the correct size and weight in accordance with AASHTO T-248.

4.1.1. Samples having 20% or more of coarse aggregate are reduced to 10 lb (5 kg.) Samples not having an appreciable amount of aggregate are reduced to a weight of 5 to 8 lb(2-4 kg)

4.2. Dry sample at a controlled temperature not to exceed 140°F (60°C.).

4.3. Pulverize the dried material with mortar and pestle, or other means, taking care not to reduce the particle sizes. Determine the particle sizes of the material in accordance with AASHTO T-27. Discard all material retained on the No. 8 (2.36 mm) sieve.

4.4. Halve all material passing the No. 8 (2.36 mm sieve), with one portion being used for the Atterberg tests and the other portion being used to test for silt, clay, total sand and sieve analysis on the sand.

4.5. Weigh out 200 g of material to be washed over the No. 200 (75 µm) mesh sieve for determining the total sand and for a sieve analysis on this sand. Record this weight as "A".

4.5.1. Wash this material over a No. 200 (75 µm) mesh sieve until the water passing through this sieve appears to be clear and clean. Empty the washed material into a clean pan. Allow to settle and pour off excess water and dry. The dry weight of this material is recorded as "B".

4.5.2. Calculate the percent materials passing the No. 200 (75 µm) sieve using the formula:

$$\frac{A-B}{A} \times 1000$$

4.6. Using the material recorded in 4.5 as the "A" weight, separate into series of sizes using such sieves as are necessary to determine compliance with the specification of the material under test.

4.6.1. Calculate the percentage of material retained on each sieve by dividing the weight retained on each sieve by the original weight of material recorded as "A".

4.6.2. Calculate the percentages passing each sieve by subtracting the retained percentage from 100 and record as percent passing.

4.7. Clay Content - Weigh out 50 g of material to use in determining the clay content. Place in a bottle as described in Article 3.4. Add (50 to 100 mm^3) of 5% soda ash solution along with (2000 mm^3) of water. Shake vigorously and finish filling bottle to 6 in.(150 mm) line. Allow to settle for eight (8) minutes. At the end of this time, syphon off the water to the 50 mm line, being careful not to disturb the settled material. This cycle is repeated until the end of the eight minute period, the liquid is clear enough to see the face of a watch when held behind the bottle. Empty the contents into a pan and allow to settle for eight minutes. Syphon off the water and dry the material. The material left is silt and sand.

4.7.1. Weigh the dried material. Calculate the percent clay as follows:

$$\frac{\text{Original sample weight - Weight of dried sample x 100}}{\text{Original weight of sample}}$$

Report as percent clay

Note: In addition to the procedure described under Article 4, some subgrade soils and crushed aggregate base may require that the sieve analysis and material passing the No. 200 (No. 75 µm) sieve be based on the total sample. When this is the requirement, calculate these percentages by multiplying the percent passing each sieve as required by the specification by the percent passing the No. 8 (2.36 mm) sieve.

Example:	60% passing the No. 8 (2.36 mm) sieve
	12% passing the No. 200 (75 µm) sieve
Calculation:	12% x 60% - 7.2 percent passing the No. 200(75 µm) sieve based on the total sample

5. Reporting

5.1. Report all test results on form BMT-30.

ALDOT-105-83
METHOD OF SAMPLING LAYERS OF EMBANKMENT, MODIFIED ROADBED, IMPROVED ROADBED, SUBBASE OR BASE COURSE, MATERIAL PITS AND SAMPLING FOR CALIFORNIA BEARING RATIO TESTS

1. Scope

1.1. This procedure covers sampling methods for soils to be used in the various roadway components.

2. Sampling Tools

2.1. Hand or power auger, pick or mattock and square or round point shovel.

3. Method of Sampling for Gradation and Atterberg Limit Tests

3.1. By using an auger, pick and a square point shovel, dig a hole or trench of sufficient length to provide visual inspection of the face of the material exposed. The depth of the hole is governed by the thickness of the layer and should extend slightly below the layer to be sampled.

3.2. The sample should be taken by removing material from the exposed face being careful to include approximately the same amount of material from the bottom to the top of the sample hole. Several passes from the bottom to the top of the hole may be necessary to obtain a sample of sufficient size.

3.3. Place 25 to 30 lbs (10 to 15 kg) of the material being sampled into a clean sample sack for transporting to the field, Division or Central Laboratory as required.

3.4. Include a sample card, Form BMT-18, with all pertinent information regarding the sample. The card should be folded so that the written information is protected from moisture in the sample. The sample card is then placed in the sack and the sack tied with heavy twine. The sample without the sample card is worthless.

4. Thickness Measurements

4.1. Dig a test hole as outlined above through the compacted layer to be measured. Remove the material from the hole in a manner that will allow visual inspection to determine the limits of the layer being measured.

4.2. Place a straight edge over the surface of the layer and measure to the dividing line of the underlying layer. Record this measurement in a field notebook. Report the measurement on Form BMT-16.

5. Sampling Material Pits

5.1. Using an earth auger, either manual or power, the soil is remove from the test hole an auger full at a time. The soil should be placed in a circle around the test hole with each auger full in a separate pile.

5.2. The length of auger stems are usually 3 ft. (1 m) for manual augers and 6 ft. (2 m) for power augers. At the end of each 3 or 6 ft. (1 or 2 m) section of the circle of soil, a pile should be offset from the circle to indicate the depth from which the material was removed from the hole. This method readily indicates the depth of stripping required, the total depth of usable material, and information regarding stratification of the material.

5.3. Samples are taken from the completed test hole by taking a small amount of soil from each auger pile and placing it in a clean sample sack. If a soil analysis is required, each sample should weigh 25 to 30 lb (10 to 15 kg) and should be submitted to the Division Laboratory. If a soil analysis and C.B.R. is required, a sample weighing 100 lbs (45 kg) should be submitted to the Central Laboratory.

5.4. Include a sample card, Form BMT-18, in each sample sack of soil with all pertinent information such as stratification, underground water, rocks or boulders encountered and any other information that will be useful in working the pit.

5.5. When completed, all test holes must be filled with dry friable material with special effort being made to fill the hole completely from bottom to top, allowing over--fill for future settlement.

5.6. Test holes should be arranged over the pit area by using a base line and a grid system so that the boundaries of the pit and test hole location may be reestablished. A sketch should be made showing distances to the test holes using trees, fences or other natural landmarks. The sketch should be filed in the project records for future use.

6. Method of Sampling for C.B.R. Tests

6.1. C.B.R. samples from a "cut" section of a roadway should be taken of the material at the grade line and 6 in. (300 mm) below. This is done by the use of earth augers, either manual or power. No material will be sampled above the grade line unless the material is to be used in a "fill section" or for subbase or base layers. If a C.B.R. is required, it will be sampled by the same method as shown in Section 5.

6.2. When sampling at the grade line, the depth of the sample hole must be measured and extreme care must be taken to assure that the sample comes from the proper elevation as shown on the plan and profile sheets.

6.3. If the sample is taken from an open cut or slope, material should be taken along the entire slope from bottom to top and submitted as a composite sample.

6.4. The sample size for C.B.R. tests is approximately 100 lbs (45 kg.)

6.5. Three (3) sample cards, BMT-18, must be included in each sample sack clearly marked that the material is for C.B.R. tests. Also, the cards must be completely filled out showing all pertinent information such as station, type material, depth at which sample was taken and any other information that may be of use.

6.6. When sampling is completed, the auger hole should be filled as previously described in Section 5.5

ALDOT-110-82
PULVERIZATION OF SOIL AFTER LIME STABILIZATION

1. Scope

1.1. This procedure covers sampling of lime stabilized soil for sieve analysis.

2. Class I (first increment) Lime Stabilization

2.1. When Class I (first increment) lime stabilization is used, a visual inspection shall be made after the lime is spread and mixed. After completion of the mixing and water application, all material, including stone and gravel, shall pass visual inspection of a No. 200 (75 um) sieve. Record in the field book that visual inspection has been made and is accepted each 1000 ft. (300 m.).

3. Class I (second increment), Class II, or Class III Lime Stabilization

3.1. When Class I (second increment), Class II, or Class III lime stabilization is used, a representative sample is taken every 1000 ft. (300 m.) A hole is dug approximately 2 ft (60.0 cm) wide to a full depth of stabilized material, with vertical face on one side. With shovel point, a sample is taken from bottom to top of hole (approximately 10 lbs. (5 kg)). This sample is taken during final mixing operation and **before** water is applied. This material is screened over the 2 in. (50 mm) sieve and No. 4 (4.75 mm) sieve by hand shaking--**DO NOT FORCE THE LARGE PARTICLES THROUGH**. Record weights and calculate percent passing by the following method:

$$\%\ \text{Passing} = \frac{\text{Weight Total Sample - Weight Retained x 100}}{\text{Weight Total Sample}}$$

ALDOT-130
MOISTURE CONTENT OF BITUMINOUS MIXTURES BY DRYING

1. Scope

1.1. This method provides two procedures for determining the moisture content of bituminous mixtures. Section 4 describes the method for drying in a conventional or convection oven, which may be used for bituminous mixtures containing any type of aggregate material including slag aggregate or metal. Section 5 describes the method for drying in a microwave oven, which is not to be used for bituminous mixtures which contain slag aggregate or metal.

1.2. This standard may involve hazardous materials, operations, and equipment. This standard does not address all the safety problems associated with its use. It is the responsibility of users of this standard to consult and establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1. AASHTO T 168 - Sampling Bituminous Paving Mixtures.

2.2. AASHTO T 164 - Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.

2.3. ALDOT-354 - Asphalt Content of Bituminous Mixture by the Nuclear Method.

2.4. ALDOT-361 - Resistance of Compacted Bituminous Mixture to Moisture Induced Damage.

3. Sample

3.1. Samples taken to determine the moisture content of the mixture shall be taken from the hauling vehicle as soon as possible after the vehicle is loaded. Immediately after taking the sample it shall be placed into a tarred moisture tight container and weighed as soon as possible. Any moisture condensing on the sealed container lid shall be accounted for and included in the moisture determination. The container lid shall be dried and weighed along with the uncovered moisture sample.

4. Drying in Conventional or Convection Oven

4.1. Significance and Use

4.1.1. This procedure describes the method for determining the moisture content of a bituminous mixture by drying in a conventional or convection oven. It may be used for bituminous mixtures containing any type of aggregate material including slag aggregate or metal.

4.2. Apparatus

4.2.1. A balance with sufficient capacity to determine the mass of the combined sample, pan, and cover, with a readability and sensitivity of at least 0.0035 oz (0.1 g).

4.2.2. A thermostatically controlled conventional or convection oven capable of maintaining the temperature at 230 ± 9°F (110 ± 5°C).

4.2.3. A covered pan of sufficient size for the test sample to be spread out to a maximum depth of 1.5 in (40 mm). An aluminum cake pan 11 x 7 x 1.5 in (275 x 175 x 40 mm) has been found satisfactory.

4.2.4. Scoop, sample container with sealed lid, and heat resistant gloves.

4.3. Procedure

4.3.1. Determine the tare mass of the drying pan and cover, and record to the nearest 0.0035 oz (0.1 g).

4.3.2. A test sample of approximately 2.65 lbs (1200 g) shall be obtained as described in Section 3.

4.3.3. Immediately place the test sample in drying pan, determine and record the mass of the pan, cover, and sample to the nearest 0.0035 oz (0.1 g). This mass must be taken as soon as possible, but no longer than 10 minutes after the test sample is obtained. The drying pan should be covered during handling and determining the mass of the sample, but uncovered during drying.

4.3.4. Determine the mass of the test sample to the nearest 0.0035 oz (0.1 g) and record as the original test sample mass. Spread the sample of bituminous mixture to a uniform depth, assuring there is no loss of the sample.

4.3.5. Place the pan and sample in the oven. After drying for 90 minutes, determine the mass and record the mass of the pan, cover, and sample to the nearest 0.0035 oz (0.1g).

4.3.6. Return the pan and sample to the oven and dry for an additional 20 minutes. Determine the mass of the pan, cover, and sample, and record the mass to the nearest 0.0035 oz (0.1 g). Determine and record the mass of the test sample to the nearest 0.0035 oz (0.1 g) and check to see if constant mass has been attained. Constant mass shall be defined as the mass at which further drying at 230 ± 9°F (110 ± 5°C) does not alter the mass more than 0.05 percent of the original test sample mass in a 20 minute heating cycle. If the sample has not attained constant mass, continue the 20 minute heating and mass determination cycles until constant mass is attained.

4.3.7. The percent moisture shall be calculated and reported as given in Section 6.

5. Drying in Microwave Oven

5.1. Significance and Use

5.1.1. This procedure describes the method for determining the moisture content of a bituminous mixture by drying in a microwave oven. It is not to be used for bituminous mixtures which contain slag aggregate or metal.

5.2. Apparatus

5.2.1. A balance with sufficient capacity to determine the mass of the combined sample, pyrex container, and cover, with a readability and sensitivity of at least 0.0035 oz (0.1 g).

5.2.2. Microwave oven with variable power control and 1 cubic foot (0.03 cubic meter) minimum capacity.

5.2.3. Covered pyrex container capable of holding a minimum 1.1 lbs (500 g) bituminous mixture test sample.

5.2.4. Thermometer capable of measuring to 350°F (180°C).

5.2.5. Scoop, sample container with sealed lid, and heat resistant gloves.

5.3. Determination of Power Control Setting

5.3.1. Determine the power control setting of the microwave oven which will be used to dry the test sample to constant mass by the following:

5.3.2. Set variable power control of microwave to approximately 50% power.

5.3.3. Place 500 mL (or 500 g) of tap water in the pyrex container. Record temperature of water as "T1." Heat the 500 mL of water for 5 minutes. Record temperature of water as "T2." The difference between temperature "T1" and "T2" should be 77 ± 1°F (25 ± 0.5°C).

5.3.4. If the difference between temperature "T1" and "T2" is too low (or high), increase (or decrease) the variable power control and repeat section 5.3.3.

5.4. Procedure

5.4.1. Determine the tare mass of the pyrex container and cover, and record to the nearest 0.0035 oz (0.1 g).

5.4.2. A minimum test sample of approximately 1.1 lb (500 g) (for normal mixtures, i.e., nominal maximum aggregate size of one inch) shall be obtained as described in Section 3.

5.4.3. Immediately place the test sample in the pyrex container. Determine and record the mass of the container, cover, and sample to the nearest 0.0035 oz (0.1 g). This mass must be taken as soon as possible, but no longer than 10 minutes after the test sample is obtained. The drying container shall be covered during handling and weighing of the sample, but uncovered during drying.

5.4.4. Determine the mass of the test sample to the nearest 0.0035 oz (0.1 g) and record as the original test sample mass. Spread the sample of bituminous mixture to a uniform depth, assuring there is no loss of the sample.

5.4.5. Place the pyrex container and sample in the microwave oven and dry using the power setting determined in Section 5.3. After 30 minutes, determine the mass and record the mass of the pyrex container, cover, and sample to the nearest 0.0035 oz (0.1 g). Determine the mass of test sample and record to the nearest 0.0035 oz (0.1 g).

5.4.6. Return the pyrex container and sample to the microwave and dry for an additional 5 minutes. Determine the mass of the pyrex container, cover, and sample and record the mass to the nearest 0.0035 oz (0.1 g). Determine and record the mass of the test sample to the nearest 0.0035 oz (0.1 g) and check to see if constant mass has been attained. Constant mass shall be defined as the mass at which further drying at the predetermined power control setting does not alter the mass more than 0.018 oz (0.5g) in a 5 minute heating cycle. If the sample has not attained constant mass, continue the 5 minute heating and mass determination cycles until constant mass is attained. Care should be taken to avoid overheating the sample. The appearance of blue smoke is an indication of overheating. If overheating does occur, the test should be repeated at a lower power control setting.

5.4.7. The percent moisture shall be calculated and reported as in Section 6.

6. Calculation and Reporting

6.1. Determine the percent moisture as follows, and report to the nearest 0.1 percent.

$$\text{Percent Moisture} = \frac{A-B}{B} \times 100$$

Where: A = Original (wet) mass of test sample.
B = Constant (dry) mass of test sample.

ALDOT-140-84

METHOD OF TEST FOR DETERMINING THE LABORATORY VIBRATED DENSITY BY THE STANDARD VIBRATORY TEST ON GRAVEL AND CRUSHED AGGREGATE MATERIALS

1. Scope

1.1. This method of test is for determining the maximum density and optimum moisture on a given gradation of base material.

2. Applicable Documents

2.1. AASHTO T-2
AASHTO T-19 For Mold Calibration
AASHTO T-27
AASHTO T-100
AASHTO T-248

3. Apparatus

3.1. Mold - The mold shall be a solid wall, metal cylinder manufactured with dimensions and capacity shown in 3.1.1 below.

3.1.1. An 8 in. (200 mm) mold having a capacity of 0.25 ft^3 ± 0.015 ft^3 (0.0071 m^3 ± 0.0004 m^3) with an internal diameter of 8 in ± 0.10 in. (200 mm ± 3 mm) and a height of approximately 8 in ± 0.5 in.(200 mm ± 10 mm) equipped with a detachable metal collar, 4 in. (100 mm) in height.

Note: Molds currently in use which exceed the Volume shown in 3.1.1 may be continued in use provided the results obtained on a comparison sample fall within the precision limits acceptable for multi-laboratory results.

3.2. Base Plate - A steel plate, 0.24 in.(6 mm) in thickness, with an external vibrator riveted or bolted to the underside. This plate shall be equipped with a threaded collar, or other means for attaching the mold.

3.3. Support Rods - The support rods shall be of steel, adequate in size, to support the mold and plate assembly during the test. The ends of these rods are embedded in a heavy concrete cast base. These rods may carry large rubber stoppers above and below the base plate that is attached to the top of these rods for added resilience.

3.4. Pedestal for LVD Machine - See page 2.

3.5. Vibrator Motor - The vibrator motor shall be set to produce 500 lbs (2500 N.)

3.6. Balances or Scales - The balances or scales shall have a capacity of 30,000 g, graduated to 9 g.

3.7. Ovens - An oven with sufficient capacity to hold moisture samples capable of maintaining a temperature of 230 ± 9°F (110°C ± 5°C).

3.8. Steel Straight Edge - A steel straight edge at least 12 in. (300 mm) long and 0.10 in. (3 mm) thick.

3.9. Moisture Sample Containers - Moisture sample containers capable of holding a minimum of 5 lbs (2.3 kg).

3.10. Mixing pans 36 in x 36 in x 6 in (900 mm x 900 mm x 150 mm) trowels, scoop, etc.

4. Sample

4.1. A blended mixture of gravel and soil, or a graded crushed aggregate meeting the specification requirements.

5. Procedure

5.1. Determine the gradation of the sample submitted.

5.2. The gradation of the material submitted will be used to establish a job mix formula. From this same material, the Laboratory Vibrated Density will be determined. This LVD will be used to control the field densities for all material whose gradation falls within plus or minus five (5) percent for each sieve shown on the job mix formula.

5.2.1. Samples for the LVD test shall be air or oven dried with oven temperatures not exceeding 140°F (60°C) until less than one (1) percent moisture remains.

5.3. Two (2) percent water, by weight, will be mixed thoroughly and uniformly with a dried sample weighing approximately 60 lbs (27 kg).

5.4. A representative portion of the sample shall be taken from the pan of mixed material to determine the water content (minimum of 6 lbs (3 kg)).

5.5. With the collar attached to the mold, sufficient material is then placed in the mold to produce a slightly overflowing condition, and vibrated for three (3) minutes. The mold is then removed from the base plate and the collar detached. The material shall be struck off level with the top of the mold and the weight of the material established. (mold + sample - mold weight)

5.6. Successive increments of water in sufficient amount to increase the moisture content of the sample by approximately two (2) percent (usually 2.0 to 3 lb (0.9 to1.4 kg)) shall be added and the procedure in 5.4 and 5.5 repeated for each increment of water added, until there is a substantial decrease in the wet weight of the vibrated sample.

6. Calculations

6.1. The optimum moisture content and dry weight per yd^3 (m^3) of the material vibrated shall be calculated as follows:

$$W = \frac{w_1 - w_2 \times 100}{w_2} \qquad D = \frac{D_1 \times 100}{W + 100}$$

Where:
W = Optimum moisture content in percent based on the weight of oven dry material.
w_1 = Weight of wet material.
w_2 = Weight of oven dry material.
D = Dry weight/yd^3 (m^3) of vibrated material.
D_1 = Wet weight/yd^3 (m^3) of vibrated material.

7. Plotting And Determining The Moisture-Density Relationship

7.1. The calculations in 6.1 are made to determine the moisture content and corresponding oven-dry weight/yd^3 (m^3) of the compacted material for each determination made.

7.2. The moisture content is plotted as abscissas and the dry weight/yd^3 (m^3) as ordinates. A smooth line will be drawn through these points to establish a curve.

7.3. The moisture content corresponding to the peak of the curve shall be the Optimum Moisture Content for the compaction specified herein.

7.4. The oven-dry weight in grams/g^3 (m^3) of the soil at optimum moisture shall be termed Laboratory Vibrated Density for the compaction specified herein.

8. Reporting

8.1. Report the following item for each test on form BMT-16.

8.1.1. Optimum Moisture Content to nearest 0.1%.

8.1.2. Lab Vibrated Density (LVD) to nearest lb (kg.)

8.1.3. Gradation

1. If the material is 100 percent crushed stone, gravel or slag, the gradation will be reported, based on the sample as a whole.

2. If the material is a blend of stone and soil binder, it will be reported in the currently used method based on splitting the sample on the No. 8 (2.36 mm) sieve.

8.1.4. Specific Gravity (AASHTO T-100).

8.1.5. Percent Voids or Porosity

8.1.6. Calculate the Voids as follows:

$$\frac{(A \times W) - C}{A \times W} \times 100$$

Where:
A = Specific gravity of material.
W = Wt./yd^3 (m^3) of water.
C = Plotted dry wt./ yd^3 (m^3) of material.

9. Precision Statement

9.1. Reproducibility (multi-laboratory) - Two results obtained from the same material by different operators in different laboratories should be considered suspect if they differ by more than fifteen (15) percent of their mean for Optimum Moisture and 3lb/ft^3 (46.8 kg/m^3) for Maximum Density.

Pedestal for L.V.D. Machine

The 0.5 in. (13 mm) steel rods are 12 in. (300 mm) long. The bottom 6 in. (150 mm) will be cast in the concrete, leaving a 6 in.(150 mm) stub above the concrete. A 6 in. (150 mm) piece will be threaded to fit the base plate of the machine and will be furnished. The center to center location of the rods is very important since they will be connected to the ones on machine base with rubber tubing. The #10 rubber stoppers are to be cast 0.2 in.(6 mm) deep in the bottom block; are obtainable at the Montgomery Central Lab. Everything pertaining to the machine will be furnished but a 3-phase, 220 volt line will be necessary to install the starter box.

Dimensions shall be sufficient to produce a block weighing a minimum of 200 lbs (92 kg).
See Materials and Tests Soils Laboratory for design of L.V.D. Machine.

ALDOT-155
ASPHALT PLANT CHECK LIST

Company: ____

Location: ____________________Inspected By: _______________________Date:____________________

Type Plant and Manufacturer Name: ______________________________________

Maximum Batch: _____________________________ .lb (kg)

Rated English (Metric) Tons Per Hour:__________________________

Project No.: ________________________________County: ____________________________________

General Specification Section

Batch Plants: Sections I thru XXI, XXX.
Continuous Plants: Sections I thru XII, XXII thru XXVI, XXX.
Dryer Drum Plants: Sections I thru XII, XXVII thru XXX.

I Stockpiles

1 Properly Separated.
Yes___No ___

2 Material Segregated.
Yes___No ___

3 Has Contractor submitted and received approval of his intended Materials Sources and his Job Mix Formula?
Yes___No ___

4 Is area clean and properly kept?
Yes___No ___

II General Requirements for all Plants

1 Are tanks for storage of bituminous material equipped for heating the material under effective and positive control at all time?
Yes___No ___

2 Are tanks for storage of bituminous material properly heated?
Yes___No ___
By what means?____________

3 Is a circulating system for the bituminous material of adequate capacity to provide proper and continuous circulation between storage tank and proportioning units during the entire operating period?
Yes ___ No ___

4 Is the discharge end of the bituminous material circulating pipe kept below the surface of the bituminous material in the storage tank?
Yes ___ No ___

5 Are all pipe links and fittings steamed, oil jacketed or otherwise properly insulated to prevent heat loss?
Yes ___ No ___

6 Is storage tank capacity such as to insure continuous operation of the plant and uniform temperature of the bituminous material when it is mixed with the aggregate?

7 Are tanks accurately calibrated to 100 gal. (400 L) and accessible for measuring the volume of the bituminous material?
Yes ___ No ___

8 Is a sampling top and valve provided in the bituminous storage tank or in the feed line between the pump and the return line discharge?
Yes ___ No ___

9 Is a drainage receptacle provided for flushing the outlet prior to sampling?
Yes ___ No ___

III Anti-Strip and Other Additive Systems

1 Is Anti-Strip material added at plant site?
Yes ___ No ___

2 If Anti-Strip material is added at plant site, does the anti-strip system meet ALDOT-320 Specifications?
Yes ___ No ___

3 If other approved additives are used, are they handled in accordance with an established procedure?
Yes ___ No ___

IV Cold Feed System

1 Number of Cold bins.
____

2 Does plant have mechanical means for uniformly feeding the aggregates into the dryer?
Yes ___ No ___

3 Does cold feed have a synchronized proportioning method when blending aggregates from two or more bins?
Yes ___ No ___

4 If mineral filler is required, is a separate bin provided?
Yes ___ No ___

5 Is the feeder for mineral filler furnished with the feeder drive positively interlocked and synchronized with the aggregate feeds?
Yes ___ No ___

V Dryer

1 Number of dryers.
____

2 Is a dryer of satisfactory design provided?
Yes ___ No ___

VI Dust Collectors and Emission Controls

1 What type dust collector is provided?
____

2 Can the material collected in the dust collector be wasted or any part or all of the material be returned to the aggregate mixture?
Yes ___ No ___

3 If baghouse fines are recirculated into the mix, are they handled in accordance with AASHTO M-156?
Yes ___ No ___

4 Does the plant meet applicable limitations on emissions in accordance with Article 107?
Yes ___ No ___

5 Has company received Permit to Operate from EPA?
Yes ___ No ___ (Attach copy to plant check list)

VII Thermometric Equipment

1 Is an armored recording thermometer located in the bituminous material feed line near the discharge end at the mixer unit?
Yes ___ No ___

2 Is the plant equipped with approved recording thermometers, pyrometers, or other recording thermometric instruments at the discharge end of the dryer?
Yes ___ No ___

3 Has accuracy of pyrometers or thermometers been checked?
Yes ___ No ___

VIII Surge and Storage Bins

1 Is plant equipped with surge or storage bins?
Yes ___ No ___

2 What type bin?
Surge ___ or Storage ___

3 Is unit enclosed, insulated, weather proof?
Yes ___ No ___

4 Is unit equipped with material level indicator?
Yes ___ No ___

5 Is the indicator visible from plant operator or weighmaster's station?
Yes ___ No ___

6 Is conveyer system covered and insulated (if necessary) so as to prevent excessive loss of heat during transfer of material from mixing plant to storage bin?
Yes ___ No ___

7 Does storage bin have acceptable heating system?
Yes ___ No ___

8 Are the storage or surge bins equipped with load cells to determine the net amount of mix delivered from the bin?
Yes ___ No ___

IX Safety and Inspection Provisions

1 Are gears, pulleys, chains, sprockets and other dangerous moving parts thoroughly protected?
Yes ___ No ___

2 Is an unobstructed and adequately guarded passage provided and maintained in and around the truck loading space for visual inspection purposes?
Yes ___ No ___

3 Does plant have adequate and safe stairways or guarded ladders to plan units such as, mixer platforms, control platforms, hot storage bins, bituminous storage tanks, etc., where inspections are required?
Yes ___ No ___

4 Is an inspection platform provided with a safe stairway for sampling the bituminous mixture from loaded trucks
Yes ___ No ___

X Truck Scales/Load Cell Scales

1 Are truck scales capable of weighing the entire vehicle at one time?
Yes ___ No ___

2 Do scales have a digital printing recorder or automatic weight printer?
Yes ___ No ___

3 Have scales been checked and certified by a reputable scales company in the presence of an authorized representative of the Department?
Yes ___ No ___

4 Date checked. ____________ Agency Name ______________________________

5 Is copy of Certification available?
Yes ___ No ___

6 Remarks: ______________________________
____
____
____

XI Transportation Equipment

1 Are truck bodies clean, tight and in good condition?
Yes ___ No ___

2 Do trucks have covers to protect material from unfavorable weather conditions?
Yes ___ No ___

3 Is soapy water or other approved products available for coating truck bodies to prevent material from sticking?
Yes ___ No ___

4 Type of material used. ______________________________

XII Provisions for Testing

1 Does size and location of laboratory comply with specifications?
Yes ___ No ___

2 Is laboratory properly equipped? (Use ALDOT 349, Hot Mix Asphalt Field Testing Equipment, as an equipment checklist.)
Yes ___ No ___

3 Is laboratory acceptable?
Yes ___ No ___

Special Requirements for Batch Plants

XIII Weigh Box or Hopper

1 Is weigh box large enough to hold full batch without running over or hand raking?
Yes___No ___

2 Does gate close tightly so that material cannot leak into the mixer while a batch is being weighed?
Yes___No ___

XIV Aggregate Scales

1 Are scales equipped with adjustable pointers or markers for marking the weight of each material to be weighed into the batch?
Yes___No ___

2 Are ten 50 lb (25 kg) weights available for checking scales?
Yes___No ___

3 Has accuracy of weights been checked?
Yes___No ___

4 Scale check (Aggregate Scale)
Date checked. ______________Capacity ______________________________
Make ____Serial # _______

5 Springless Dial _______________or Multiple Beam __________________
Load Cells __________or Other ___________

Applied Load lbs. (kg)	Dial Reading	Difference	% Error	Lb. (kg.) Error plus/minus
500 (227)			.5	0.5 lb (1.25 kg.)
1000 (454)			.5	1.0 lb (2.27)
1500 (680)			.5	8.0 lb (3 75)
2000 (907)			.5	10 lb (4.54)
2500 (1134)			.5	13.0 lb (6.25)
3000 (1361)			.5	16 lb (7.50)
3500 (1588)			.5	20.0 lb (8.75)
4000 (1814)			.5	22 lb (10.0)
4500 (2041)			.5	25.0 lb (11.25)
5000 (2268)			.5	28 lb (12.50)
5500 (2495)			.5	30 lb (13.75)
6000 (2722)			.5	33 lb (15.0)
6500 (2948)			.5	35 lb ((16.25)
7000 (3175)			.5	38.0 lb (17.5)
7500 (3402)			.5	41.0 lb (18.75)
8000 (3629)			.5	44.0 lb (20.0)

6 If the plant is equipped with beam type scales, are the scales equipped with a device to indicate at least the last 200 lb (100 kg) of the required load?
Yes ___ No ___

XV Bituminous Materials Bucket

1 Is bucket large enough to handle a batch in a single weighing so that the bituminous material will not overflow, splash or spill?
Yes ___ No ___

2 Is the bucket steamed, or oil-jacketed or equipped with properly insulated electric heating units?
Yes ___ No ___

3 Is the bucket equipped to deliver the bituminous material over the full length of the mixer?
Yes ___ No ___

XVI Bituminous Materials Scales

1 Scale Check (Bituminous Scales)
Date checked. ___________ Capacity _________________________
Make ____________________________ Serial # ______________

Applied Load lb.-kg.	**Dial Reading**	**Difference**	**% Error**	**Lb. kg. Error plus or minus**
110 lb (50 kg.)			.5	0.5 (.25)
220 lb (100 kg.)			.5	1.10(.50)
330 lb (150 kg.)			.5	1.60 lb. (.75)
440 lb (200 kg.)			.5	2.2lb (1.0)
550 lb (250kg.)			.5	2.7 .lb (1.25)

2 Are scales equipped with a device to indicate at least the last 10 kg of the approaching total load?
Yes ___ No ___

XVII Screens

1 Condition of Screens:
Satisfactory _____ Unsatisfactory _______

2 Do the plant screens have adequate capacity and size range to properly separate all the aggregate into sizes required for proportioning so that they may be recombined consistently?
Yes ___ No ___

XVIII Hot Bins

1 Number of bins.
____

2 Are bins properly partitioned?
Yes___No ___

3 Are bins equipped with overflow pipes?
Yes___No ___

4 Will gates cut off quickly and completely?
Yes___No ___

5 Can samples be obtained from bins?
Yes___No ___

6 Are bins equipped with device to indicate the position of aggregate at the lower quarter point?
Yes___No ___

XIX Bituminous Control

1 Are means provided for checking the quantity or rate of flow of bituminous material?
Yes___No ___

2 Time required to add bituminous material into pugmill.
____

XX Mixer Unit for Batch Method

1 Is the plant equipped with an approved twin pugmill batch mixer that will produce a uniform mixture?
Yes___No ___

2 Can the mixer blades be adjusted to insure proper and efficient mixing?
Yes___No ___

3 Are the mixer blades in satisfactory condition?
Yes___No ___

4 What is the clearance of the mixer blades?
___________in

5 Does the mixer gate close tight enough to prevent Leakage?
Yes___No ___

6 Does the mixer discharge the mixture with appreciable segregation?
Yes ___ No ___

7 Is the mixer equipped with time lock?
Yes ___ No ___

8 Does timer lock the weigh box gate until the mixing cycle is completed?
Yes ___ No ___

9 Will timer control dry and wet mixing time?
Yes ___ No ___

10 Can timer be set in five second intervals throughout the designated mixing cycles?
Yes ___ No ___

11 Can timer be locked to prevent tampering?
Yes ___ No ___

12 Is a mechanical batch counter installed as part of the timing device?
Yes ___ No ___

XXI Automation of Batching

1 If the plant is fully automated, is an automatic weighing, cycling and monitoring system installed as part of the batching equipment?
Yes ___ No ___

2 Is the automatic proportioning system capable of weighing the materials within the specified tolerances?
Yes ___ No ___

Special Requirements for Continuous Mixing Plants

XXII Gradation Control Unit

1 Does plant have means of accurately checking the proportioning of each bin size of aggregate by weight?
Yes___No ___

2 Are feeders interlocked and equipped with a dust-proof revolution counter graduated to one tenth of a revolution?
Yes___No ___

3 Are mix proportions set up on the basis of Kilograms of each aggregate bin size per revolution?
Yes___No ___

4 Does the graduation control unit have interlocked feeders mounted under the bin compartments?
Yes___No ___

5 Does each bin have a feeder mechanism, subject to control by positive means, to control the rate of flow of aggregate drawn from each respective bin compartment?
Yes___No ___

6 Are gates adjustable and provided with locks?
Yes___No ___

7 Is means provided to establish flow rate in Kilograms per revolution by scale weight?
Yes___No ___

XXIII Weigh Calibration of Bituminous Material & Aggregate Feed

1 Is plant equipped with means of calibrating gate openings and bituminous material flow by means of weight test samples in Kilograms per revolution?
Yes___No ___

2 Can each bin be fed into suitable test boxes and bin material be confined in individual test receptacles?
Yes___No ___

3 Is equipment supplied so aggregate in each compartment can be weighed separately?
Yes___No ___

4 Are test containers of convenient size to obtain a composite weight of at least 660lb.(300 kg)?
Yes___No ___

XXIV Synchronization of Aggregate and Bituminous Material Feed

1 Are satisfactory means for coordinating aggregate flow and bituminous material flow?
Yes___No ___

2 Are means provided to check the flow rate of bituminous material by scale weight per revolution?
Yes ___ No ___

XXV Mixer Unit for Continuous Method

1 Does the plant have an approved twin pugmill type and capable of producing a uniform and acceptable mixture?
Yes ___ No ___

2 Are the paddles adjustable for angular position on the shafts and reversible to retard the flow of the mix?
Yes ___ No ___

3 Are the mixers equipped with discharge hoppers or other facilities to prevent segregation during discharge?
Yes ___ No ___

4 Does the mixer carry a manufacturer's plate giving the volumetric contents of the mixer at the several heights, inscribed on a permanent gauge?
Yes ___ No ___

5 Has the pugmill capacity, at operating height, been determined by means of a volume gauge on the side of the mixer?
Yes ___ No ___

6 Has a weight per unit volume relationship of the coated loose mix been determined?
Yes ___ No ___

7 Has the mixing time been determined?
Yes ___ No ___

XXVI Automation of Continuous Mixing Plants

1 Does plant have devices of automatically sampling and weighing the quantity of each hot bin aggregate size during either a number of revolutions of the plant or a known interval of time?
Yes ___ No ___

2 Is the plant capable of proportioning the bituminous material within the tolerances of the design?
Yes ___ No ___

Special Requirements for Dryer-Drum Mixers

XXVII Aggregate Delivery System

1 Are cold feed bins equipped with devices to indicate when the level of the aggregate in each bin is below the quarter point?
Yes ___ No ___

2 Does the cold feed have an automatic shut off system that activates when an individual feeder is interrupted?
Yes___No ___

3 Are provisions available for conveniently sampling the full flow of the material from each cold feed and the total cold feed?
Yes___No ___

4 Is the total feed weighed continuously?
Yes___No ___

5 Are provisions provided for automatically correcting the wet aggregate weight to dry aggregate weight?
Yes___No ___

6 Is the flow of aggregate dry weight displayed digitally in appropriate units of weight and time and totalized?
Yes___No ___

7 Are means provided for diverting aggregate delivery into trucks, front-end loaders, or other containers for checking accuracy of aggregate delivery system?
Yes___No ___

8 Is plant equipped with a scalping screen for aggregate prior to entering on the conveyor weigh belt?
Yes___No ___

XXVIII Bituminous Material Delivery System

1 Are satisfactory means provided to introduce the proper amount of bituminous material into the mix?
Yes___No ___

2 Does the delivery system for metering the bituminous material prove accurate within ±1 percent?
Yes___No ___

3 Does the bituminous material delivery interlock with aggregate weight control?
Yes___No ___

4 Is the bituminous material flow displayed in appropriate units of volume or weight and time and totalled?
Yes___No ___

5 Can the bituminous material be diverted into distributor trucks or other containers for checking accuracy of delivery systems?
Yes___No ___

XXIX Drum Mixer

1 Is the drum mixer capable of drying and heating the aggregate to the moisture and temperature requirements set forth in the Specifications and capable of producing a uniform mix?
Yes ___ No ___

2 Does plant have provisions for diverting mixes at start-up and shutdowns or where mixing is not complete or uniform?
Yes ___ No ___

XXX Is plant approved for use?
Yes ___ No ___
If not, explain what needs to be corrected. (Show Item Number)

____
____
____
____
____

Signed:____
Inspector

Approved:____
Materials Engineer

ALDOT-170-82
METHOD OF CONTROLLING CONCRETE OPERATIONS FOR STRUCTURAL PORTLAND CEMENT CONCRETE

TABLE OF CONTENTS

Section Title **Page**

1. Scope

1.1. This procedure shall establish the compliance requirements for the control of all aspects of concrete operations pertaining to concrete structures as set forth by the Alabama Department of Transportation, herein referred to as ALDOT or as the Department.

2. Referenced Documents

2.1. ALDOT Specifications:

2.1.1. 501 Structural Portland Cement Concrete.

2.1.2. 801 Coarse Aggregate.

2.1.3. 802 Fine Aggregates.

2.1.4. 806 Mineral Admixtures.

2.1.5. 807 Water.

2.1.6. 808 Air Entraining Additives.

2.1.7. 809 Chemical Admixtures for Concrete.

2.1.8. 815 Cement.

2.2. ALDOT Procedures:

2.2.1. 175 Method for Stockpiling Coarse Aggregate for All Purposes.

2.2.2. 352 Certification Program for Portland Cement Concrete Producers.

2.2.3. 355 General Information Concerning Materials, Sources, and Devices with Special Acceptance.

2.2.4. 405 Certification and Qualification Program for Concrete Technicians and Concrete Laboratories.

2.2.5. 407 Calibration Verification of Truck Mounted Water Meters.

2.3. BMT Forms:

2.3.1. 10 Notice for Acceptance of Aggregates.

2.3.2. 75 Concrete Mix Design.

2.3.3. 83 Concrete Placing Daily Report.

2.3.4. 95 Monthly Concrete Plant Checklist.

2.3.5. 114 Certified Cement Shipment.

2.3.6. 122 Concrete Batch Ticket.

2.4. AASHTO Standards:

2.4.1. T 22 Compressive Strength of Cylindrical Concrete Specimens.

2.4.2. T 24 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

2.4.3. T 126 Making and Curing Concrete Test Specimens in the Laboratory.

2.4.4. T 255 Total Evaporable Moisture Content of Aggregate by Drying.

2.4.5. M 157 Ready-Mixed Concrete.

2.5. ASTM Standards:

2.5.1. C 457 Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete.

2.5.2. C 642 Test Method for Density, Absorption, and Voids in Hardened Concrete.

2.5.3. C 823 Practice for Examination and Sampling of Hardened Concrete in Constructions.

2.5.4. C 856 Practice for Petrographic Examination of Hardened Concrete.

2.6. ACI Standard:

2.6.1. 211.1 Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

3. Materials

3.1. Materials shall meet the requirements in Division 800 of the Department’s Specifications and shall be from approved sources as listed in the Department’s manual, “Materials, Sources, and Devices with Special Acceptance Requirements”. Specific reference is made to the following sections of the specifications and approved lists from the manual.

3.1.1. Cement, Section 815 and List I-2.

3.1.2. Fine and coarse aggregates, Sections 801 & 802 and List I-1.

3.1.3. Mineral admixtures, Section 806 and List I-3.

3.1.4. Chemical admixtures, Sections 808 & 809 and List II-1.

3.1.5. Water, Section 807.

4. Mix Design

4.1. Using the Master Proportion Table in Item 501.02(c)2 of the Department's Specifications as a guide, the concrete producer shall establish the proportion of materials for each class and type of concrete in the form of a one cubic yard {cubic meter} concrete mix design.

4.2. The proposed concrete mix design shall undergo a verification mix design test. Verification mix design tests shall be performed by Concrete Technicians certified by the Department and shall be performed at an independent laboratory qualified by the Department or the concrete producer's laboratory qualified by the Department. A laboratory qualified by the Department shall conform to the procedure outlined in ALDOT–405.

4.3. Verification mix design tests shall be performed as follows:

4.3.1. Mix proportions shall be selected on the basis of laboratory trial batches using at least three different water-cementitious ratios that will produce a range of strength encompassing the 28-day Target Compressive Strength (f'cr) required for each class and type of concrete.

4.3.2. Trial mixtures shall be made using the exact materials that the concrete producer intends to use during actual production. Trial mixtures shall be made following the methodology described in the American Concrete Institute procedure ACI 211.1.

4.3.3. The Target Compressive Strength used to select mix proportions with a required minimum 28-day compressive strength (f'c) shall be determined using the following equations:

4.3.3.1. For f'c less than 3000 psi {21 MPa}
$f'_{cr} = f'_{c} + 1000$ psi {7 MPa}

4.3.3.2. For f'c from 3000 to 5000 psi {21 to 35 MPa}
$f'_{cr} = f'_{c} + 1200$ psi {8.5 MPa}

4.3.3.3. For f'c greater than 5000 psi {35 MPa}
$f'_{cr} = f'_{c} + 1400$ psi {10 MPa}

4.3.4. For each water-cementitious ratio, at least three test cylinders for each test age shall be made and cured in accordance with AASHTO T 126. Cylinders shall be tested at 7 and 28 days in accordance with AASHTO T 22.

4.3.5. The air content and temperature of the concrete for each trial batch shall be reported.

4.3.6. Laboratory trial mixes shall be designed for the maximum permitted slump and air content.

4.3.7. For each trial mixture, a curve shall be plotted showing the relationship between water-cementitious ratio and strength, and the relationship between 7-day and 28-day strengths.

4.4. Separate verification mix design tests shall be performed for each combination of cementitious materials and each combination of admixtures proposed for use. Separate verification mix design tests shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations.

4.5. Changes in a mix design, other than the ones allowed in Division 500 of the Department's specifications, shall require a new mix design verification test.

5. Submittal of Concrete Mix Design

5.1. The concrete producer shall submit to the State Materials and Tests Engineer a letter requesting approval of the proposed concrete mix design. This letter shall be accompanied by the verification concrete mix design tests and supporting information. The following minimum supporting information shall be required prior to approval of any mix design:

5.1.1. The source and type of each material proposed, including vendor codes.

5.1.2. The individual gradation of each aggregate, the combined gradation of the total blended aggregates, the fineness modulus of fine aggregate, and the saturated-surface-dry (SSD) specific gravity and absorption of all aggregates.

5.1.3. The Class and Type of the proposed concrete mix and the proportions for one cubic yard {cubic meter}.

5.1.4. Freshly mixed concrete properties. This shall include actual results for slump, air content, and temperature of the concrete for each trial mix.

5.1.5. Evaluation of compressive strength test results showing the Target Compressive Strength.

5.1.6. Laboratory trial mixtures and three point curves.

5.2. A laboratory Quality Control Manager or a Technical Service Manager authorized by the laboratory performing the verification mix design, or a professional Engineer, licensed in the State of Alabama and not employed by ALDOT, shall sign all test results and supporting data submitted to the Department.

6. Mix Design by the Department

6.1. Upon request from the concrete producer, the Department will perform verification tests with the concrete producer supplying all the materials and paying the applicable fees as stated in ALDOT-355.

6.2. The Department will provide a mix design to the concrete producer for each verification test requested. This mix design shall then be the property and responsibility of the concrete producer.

6.3. For each verification test requested to the Department, the concrete producer shall submit the following:

6.3.1. A letter to the State Materials and Tests Engineer requesting a verification test mix. The Class and Type of mix design requested shall also be included in this letter.

6.3.2. The type, source, and vendor code of each of the concrete mix ingredients shall be submitted as part of the request.

6.3.3. The following amounts of material shall be submitted to the Concrete Section of the Bureau of Materials and Tests:

6.3.3.1. 300 lb {140 Kg} of cement

6.3.3.2. 150 lb {70 Kg} of mineral admixtures

6.3.3.3. 600 lb {280 Kg} of fine aggregate

6.3.3.4. 1200 lb {560 kg} of coarse aggregate

6.3.3.5. One quart {liter} of each chemical admixture

6.3.4. Chemical admixtures used in a concrete mix shall be from the same manufacturer (i.e. air-entraining agents and water reducer and retarder admixtures).

6.4. The verification test request and materials shall be submitted to the Concrete Section of the Bureau of Materials and Tests, at least 45 calendar days prior to the intended date of using the concrete mix.

7. Approved Concrete Mix Design Distribution

7.1. Upon approval, the Bureau of Materials and Tests will provide the concrete producer with BMT-75 form containing the approved concrete mix design(s) from which the concrete producer shall choose to use in supplying concrete to Department projects.

7.2. The concrete mix design will not show a project number. The concrete mix design shall be valid for a period of four years, but it can be used only if the concrete producer maintains its National Ready Mix Concrete Association (NRMCA) certification status.

7.3. Prior to use of any concrete on a specific project, the Contractor shall submit BMT-75 for review and approval of the concrete mix design to the Division Materials Engineer along with the project number, County, Class and Type of concrete requested, and a description of the structure where the concrete mix will be used. This request shall be done a minimum of seven calendar days prior to use of the concrete mix design.

7.4. The Division Materials Engineer will review the information on BMT-75 and verify that the concrete mix design(s) submitted meets the requirements for the project contract. The Division Materials Engineer will also verify that the concrete producer has a current NRMCA certification prior to granting approval to use a concrete mix on a specific project.

7.5. The Division Materials Engineer, upon approval, will notify the Contractor. If the mix design submitted does not meet the requirements for the specific project and structure, the Division Materials Engineer will notify the Contractor of the reason(s) for non-approval.

7.6. Upon approval, the Division Materials Engineer will submit copies of the approved concrete mix design(s), with the project number of the designated project recorded in the proper location on the approved mix design document, to the Bureau of Materials and Tests.

7.7. The Division Materials Engineer may approve the use of back-up plants on any project provided that the materials used by each of the plants are compatible (i.e. the use of the same type of cementitious materials or the same type of aggregates may be allowed even if from different sources). Back-up plants will only be allowed when technical difficulties hinder the primary plant from providing concrete to the job site within the Department specifications. When the use of a back-up plant is allowed, the Project Engineer will maintain records of exact placement locations for further reference.

7.8. Copies of the approved design concrete mix shall be kept in the project files and at the concrete producer's plant at all times.

8. Re-Approval of Concrete Mix Design

8.1. For concrete mix design(s) that have performed satisfactorily in the field and for which the concrete producer wishes to continue use after the four-year approval period, the Concrete Section of the Bureau of Materials and Tests will perform a re-evaluation.

8.2. The concrete producer shall request a re-evaluation of the mix design to the State Materials and Tests Engineer not earlier than 30 calendar days prior to the expiration of the concrete mix.

8.3. The concrete producer shall submit with the re-evaluation request the minimum following information:

8.3.1. Original data submitted with original concrete mix design approval.

8.3.2. Statistical analysis of data collected from concurrent placements since the time the concrete mix design was originally approved.

8.3.3. The statistical analysis shall meet all the minimum following requirements:

8.3.3.1. Control charts of individual strengths, slumps, and air content test results.

8.3.3.2. Control charts showing the moving average for the individual strength, slump, and air content test results. The moving average shall be based on the previous five tests.

8.3.3.3. Documentation relating to the concrete compressive strength shall be submitted for the 7 and 28 day test specimens. Note that for the purpose of strength, a test shall be defined as the average of the strengths of two cylinders made from the same sample of concrete and tested at the designated age.

8.3.3.4. Statistical analysis shall be performed on data collected on a minimum of 30 consecutive tests.

8.3.3.5. Separate sets of test data shall be submitted for each Class and Type of concrete mix design to be re-evaluated. All submitted data shall reflect the dates upon which the actual tests were conducted.

8.3.3.6. Any additional information that the concrete producer deems relevant to the performance of the concrete produced.

8.3.3.7. The following formulas shall be used in deriving the average, standard deviation, and coefficient of variation.

x_i = Value of an individual test
n = Total number of tests
$\bar{x}$ = Mean value of all tests (x_i) as calculated from:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

s = Standard deviation of the test results as calculated from:

$$s = \sqrt{\frac{n\sum_{i=1}^{n} x_i^2 - \left(\sum_{i=1}^{n} x_i\right)^2}{n(n-1)}}$$

C_v = The coefficient of variation as calculated from:

$$C_v = \left(\frac{s}{\bar{x}}\right)100$$

8.4. Re-approval of the concrete mix design will be at the sole discretion of the State Materials and Tests Engineer.

9. Inspection of Concrete Plants and Concrete Equipment

9.1. All equipment, tools, and machinery necessary for forming, mixing, placing, finishing, and curing concrete shall be in satisfactory working condition before the Contractor will be allowed to place concrete on Department projects. The Department reserves the right to inspect this equipment at any time to insure its workability.

9.2. Concrete plants shall maintain NRMCA certification status. Concrete plants shall also meet the requirements of Section 501 of the Department's Specifications and AASHTO M 157.

9.3. Moisture probes shall be calibrated every six months by comparing readings obtained from the moisture meter with the total moisture content of the aggregates as determined by AASHTO T 255.

9.4. Concrete transit mixers shall be equipped with an approved in line water-metering device capable of accurately measuring the amount of water discharged into the concrete load to within ± 1% of the reading indicated. The accuracy of water meters shall be determined as per ALDOT-407.

9.5. Each transit mixer shall be equipped with an approved automatic counter that shall record the number of drum revolutions regardless of the drum speed.

9.6. The Division Materials Engineer will assign a certified Concrete Technician employed by the Department to conduct monthly concrete plant inspections. The results of the plant inspections shall be recorded on BMT-95.

10. Handling and Storage of Materials

10.1. Cementitious Materials:

10.1.1. Cementitious materials shall be stored in weatherproof and properly ventilated bins to prevent moisture accumulation.

10.1.2. At all times, cementitious materials shall be exposed to air as little as practical to avoid partial hydration from the moisture in the air.

10.1.3. The equipment used to haul cementitious material shall be maintained leak-proof and contaminant free.

10.2. Aggregates:

10.2.1. Aggregates shall be handled and stored in a way that minimizes segregation and degradation and prevents contamination by deleterious substances.

10.2.2. Aggregate stockpiles shall be built up in successive horizontal layers of uniform thickness to minimize segregation. The work should be done in such a manner as to reduce to a minimum the rolling of aggregates down the slope of the stockpile. Dampening can reduce segregation of fine aggregate that is dry enough to be free flowing.

10.2.3. Keep the moisture content of aggregates as uniform as possible. Variation in the moisture content of aggregates increases the variability of the concrete produced. Aggregate stockpiles shall be allowed adequate time for drainage to a uniform moisture content before use.

10.2.4. Section 801 of the Department's specifications requires that the stockpiling of coarse aggregate be done as per ALDOT-175. It shall be the responsibility of the producer's Concrete Technician, certified by ALDOT, to ensure proper stockpiling operations.

10.2.5. Aggregates of different grading or from different sources shall be stored separately. Bulkheads or dividers high enough to avoid contamination shall separate stockpiles.

10.2.6. Moisture and gradation tests on both coarse and fine aggregate shall be made as per ALDOT-352.

10.3. Chemical Admixtures:

10.3.1. Liquid admixtures shall be stored in watertight drums or tanks and protected from freezing.

10.3.2. Admixtures in the form of powder, flakes, or semisolids shall be diluted into a solution prior to use, following the manufacturer's recommendations.

10.3.3. Admixtures stored for more than six months shall be re-tested before use and rejected if it fails to conform to any of the requirements of Sections 808 and 809 of the Department's specifications.

11. Control of Mixing Operations

11.1. The Producer's Concrete Technician, certified by ALDOT, shall refer to the approved concrete mix design in regard to the desired proportions of each ingredient that enters into the mix.

11.2. Before concrete production, the Producer's Concrete Technician, certified by ALDOT, shall check that all materials used are from Department approved sources.

11.3. The Producer's Concrete Technician, certified by ALDOT, shall be responsible for aggregate moisture adjustments. Each concrete mix design will produce a specific volume of concrete; any changes in the moisture content of the aggregates will result in changes of produced concrete volume

11.4. Specifications for the control of mixing operations, including on the job mixing requirements, are found in the following documents:

11.4.1. Standard Specifications for Highway Construction, Section 501.

11.4.2. ALDOT-352.

11.4.3. AASHTO M 157.

11.5. The Producer's Concrete Technician, certified by ALDOT, shall check the temperature of the Portland cement, IP cement, and mineral admixtures. Cement shall not be used if its temperature is greater than 150 °F {65 °C}. The temperature of the cement and mineral admixtures shall be checked daily and before the concrete mixing operation is started. The temperature readings shall be recorded in the Concrete Plant Diary.

11.6. The Producer's Concrete Technician, certified by ALDOT, shall take the temperature of the concrete at the plant after mixing. The actual temperature reading shall be recorded in BMT-122.

11.7. The Producer's Concrete Technician, certified by ALDOT, shall test the concrete at the plant, for slump and entrained air, each day after the first load of concrete is batched and every 100 cubic yards {75 cubic meters} or fraction thereof for each class and type of concrete produced for the Department. The result shall be recorded in BMT-122 and in the Concrete Plant Diary.

11.8. The producer shall maintain a quality control plan covering a minimum of testing schedules for concrete and concrete materials, equipment calibration, personnel certification, and documentation. The quality control plan shall be maintained at the plant and readily available to the Department for review.

11.9. The Producer's Concrete Technician, certified by ALDOT, shall keep records of all plant operations in the Concrete Plant Diary. He/she shall record all instructions received from the Project Engineer and all instructions that he/she gives to others during Department concrete production. All calculations that are necessary to fill out BMT-122 and any other information affecting the production of concrete shall be recorded in the Concrete Plant Diary.

12. Time Limitations for Delivery of Concrete

12.1. The maximum time of delivery for concrete, from the time the cement is added to the aggregates to the time the concrete is placed into the forms, shall be as specified in the table below.

TEMPERATURE OF CONCRETE	MIX WITHOUT RETARDER ADMIXTURE	MIX WITH RETARDER ADMIXTURE
LESS THAN 85 °F {30 °C}	1 HOUR	1 HOUR AND 45 MINUTES
85 °F {30 °C} OR MORE	45 MINUTES	1 HOUR AND 15 MINUTES

13. Concrete Placing

13.1. Concrete shall be placed as per the requirements in Section 501 of the Department's specifications. The plans and contract for the project shall be checked for special concrete placing requirements.

13.2. Concrete shall be deposited continuously as near as possible to its final position. Concrete shall be placed in horizontal layers of uniform thickness and each layer shall be thoroughly consolidated before the next is placed.

14. Records and Reports

14.1. The Project Engineer shall keep records and reports of all concrete operations. The records and reports will be used to determine if Department specifications are properly followed. Some records and reports will be used to control concrete operations and to ensure timely action in taking corrective steps to avoid substandard quality.

14.2. The concrete producer shall keep proper records and reports for all concrete operations performed at the concrete plant.

14.3. The concrete producer shall keep on file the following minimum references, records, and reports. Some of these documents may be accessed from the Department's website at `www.dot.state.al.us`

14.3.1. Copy of Alabama Department of Transportation specifications.

14.3.2. Copy of Alabama Department of Transportation Testing Manual.

14.3.3. Copy of the Materials, Sources, and Devices with Special Acceptance Requirements manual.

14.3.4. Copy of AASHTO Specifications. Part I and II.

14.3.5. Approved concrete mix design.

14.3.6. BMT-10.

14.3.7. BMT-83,

14.3.8. BMT-114.

14.3.9. BMT-122.

14.3.10. Test reports for all compressive strength tests.

14.3.11. Concrete Plant Dairy with records of moisture corrections and aggregate gradations.

14.3.12. Copy of NRMCA Certification.

14.3.13. Control charts for air content, slump, and strength for each Class and Type of concrete mix.

15. Procedure for Forensic Investigations

15.1. The testing laboratory will notify the Division Materials Engineer when the compressive strength of the specimens tested is below the specified strength.

15.2. The Division Materials Engineer will conduct an investigation on the substandard concrete to determine the cause of the low break. The results of the investigation and recommendation will be reported to the State Materials and Tests Engineer.

15.3. The State Materials and Tests Engineer will forward the Division's findings and recommendations and any additional recommendation to the State Construction Engineer for final handling.

15.4. The Division Materials Engineer may request the assistance of the Bureau of Materials and Tests to perform forensic investigations that are outside the Division's capabilities. This request must be in writing (letter, fax, or e-mail), addressed to the State Materials and Tests Engineer, attention Concrete Section, stating the problem and request.

15.5. Upon receiving the forensic investigation request, the Concrete Section of the Bureau of Materials and Tests will determine if an investigation is necessary, which may include coring and/or petrographic analyses, to determine the cause(s) of the problem.

15.6. A core investigation will be conducted by the Concrete Section of the Bureau of Materials and Tests, or its consultant, as follows. For structural components that are not accessible or too small for coring, the Department may use other methods to determine the acceptability of the concrete.

15.6.1. Delineate the area on the structure representing the set of concrete cylinders with substandard strength.

15.6.2. The Swiss hammer instrument will be used to select a location for coring within the affected area of the structure.

15.6.3. The procedure for the use of the Swiss hammer is as follows:

15.6.3.1. For linear members the length of the member affected will be divided into ten equal segments or three foot {one meter} long segments if the affected length is greater than thirty feet {ten meters}.

15.6.3.2. For area members the area of the member affected will be divided into sixteen equal segments or nine square foot {one square meter} segments if the affected area is greater than 150 square feet {fifteen square meters}.

15.6.3.3. Three Swiss hammer readings will be taken in each segment and averaged. The segment with the lowest average readings will be the location for coring.

15.6.4. Three cores will be obtained, cured, and tested within 42 days from concrete placement. One set of three cores will be obtained for every set of low compressive strength cylinders. Cores will be obtained within 35 days after placement of the concrete to allow for the required curing and testing to be completed within the above stated 42 days. The Materials and Tests Engineer shall approve any deviation from this schedule in writing.

15.6.5. A laboratory qualified by the Department, as per ALDOT-405, shall be used by the Contractor to obtain the cores. Cores shall be obtained as per AASHTO T 24 and immediately protected and shipped to the Bureau of Materials and Tests, attention Concrete Section, with all pertinent information. An ALDOT representative will be present during the coring operation

15.6.6. Extreme caution will be taken to ensure that no reinforcing steel or prestressed strands are cut during the coring operation.

15.6.7. Core specimens will be measured, cured, and tested in accordance with AASHTO T 24. Proper strength correction factor will be applied to cores having a length-to-diameter (L/D) ratio less than two.

15.7. The Concrete Section of the Bureau of Materials and Tests, or its consultant, will conduct a petrographic investigation. The petrographic investigation will be conducted as follows:

15.7.1. The specimens for petrographic analyses will be obtained at the same time that core specimens are obtained.

15.7.2. Specimens for petrographic analyses will be prepared and tested in accordance to the following specification:

15.7.2.1. ASTM C 457.

15.7.2.2. ASTM C 642.

15.7.2.3. ASTM C 823.

15.7.2.4. ASTM C 856.

15.8. The core investigation and petrographic investigation will be used to determine the acceptability or rejection of substandard concrete.

15.9. The Department reserves the right to use other types of investigation as necessary to fully determine the cause(s) for substandard concrete, and use them to determine the acceptability or rejection of the questionable concrete.

15.10. The State Materials and Tests Engineer will forward its findings and recommendations to the State Construction Engineer and copy the State Bridge Engineer and Division Engineer.

16. Repair of Core Drilled Holes

16.1. All accepted members shall have cores holes repaired using the same concrete mix design used to originally cast the members.

16.2. The following procedure outlines the minimum requirements to repair core drilled holes:

16.2.1. Mixing of concrete shall be completed a minimum of 45 minutes prior to placing.

16.2.2. The concrete mix shall be re-mixed without adding water just before placing.

16.2.3. The area to be repaired shall be prepared by scarifying and roughening the concrete surface.

16.2.4. Apply an approved Type II or Type V Epoxy in accordance with the epoxy manufacturer's recommendations.

16.2.5. The re-mixed concrete shall be packed in place with small tools and consolidated by tamping.

16.2.6. The repair shall be cured for seven days using wet curing or approved membrane-curing compounds. For repairs on bridge decks, only wet curing shall be allowed.

16.2.7. After curing, the repaired area shall be finished so as to provide a uniform appearance with the adjacent concrete.

16.3. Other repair methods may be used if requested in writing to, and approved by, the State Materials and Tests Engineer. Alternate repair procedures shall not be used until approved by the State Materials and Tests Engineer.

ALDOT 175
METHOD OF STOCKPILING COARSE AGGREGATE FOR ALL PURPOSES

1. Scope

1.1. This method of stockpiling coarse aggregate is intended to keep stockpiles from segregating.

2. Equipment

2.1. Crane equipped with a clamshell, front-end loader or bulldozer equipped with large pneumatic tires.

3. Procedure

3.1. Stockpiles shall be placed on firm, well drained ground that is free of any material that could cause contamination. Stockpiles shall be built in layers of uniform thickness and not in cone-shaped piles which result in segregation of piles. After the first layer of the stockpile is placed, heavy transporting equipment shall not be allowed to run on top of this layer as this tends to degrade the aggregate by grinding the particles together, also contaminating the aggregate with mud and other deleterious substances from the wheels or tracks of the vehicle. If the stockpile is to be constructed in more than one layer in height, the aggregate shall be dumped in a small pile at the base of the stockpile, then moved over the stockpiled layer in place by a crane equipped with a clamshell, front-end loader or bulldozer equipped with large pneumatic tires. If there is any doubt by the inspector that the aggregate has been degraded, obtain a sample and run gradation on the first layer of the stockpile before the equipment is used and compare this gradation with original gradation test. After the equipment has run on the layer twenty passes over a given point, obtain sample and run gradation test. If the gradation test shows the aggregate is being degraded to the extent that it fails to meet the specifications, the equipment being used shall be replaced by another type.

ALDOT 195-83
DOCUMENTATION AND ACCEPTANCE OF MATERIALS USED IN HIGHWAY AND BRIDGE CONSTRUCTION

1. Scope

1.1. All materials used in the construction of Alabama Department of Transportation projects must be inspected, tested, or approved prior to incorporation into the project. The inspection and documentation process should provide the project with the documentation necessary to complete the "Summary of Tests" (BMT-38) at the completion of the project. The necessity for this documentation can be found in Section 106 of the Department's Standard Specifications.

1.2. Several methods of acceptance have been established to cover the wide variety of materials used in construction. The "Acceptance Sampling and Testing Schedule" found in the Department's Testing Manual divides these materials by pay item and outlines the minimum method of acceptance for these materials. This document gives a more detailed description of these methods.

2. Categories Of Acceptance

2.1. On The Job Sampling--This is the most used acceptance method. This form of acceptance will take precedence over other forms. Should there be doubt as to the quality of a material then this method should be used. Authorization for sampling materials can be found in Subarticle 106 of the Standard Specifications. Materials are sampled and/or inspected as they arrive on the project and testing is then conducted by one of the following.

2.1.1. On site testing by project personnel.

2.1.2. Testing conducted at a Division Laboratory.

2.1.3. Testing conducted at the Department's Central Laboratory.

2.2. Pretested Materials--Pretesting is done for a variety of materials. These materials are generally sampled by personnel from the Central Laboratory or Division and are tested prior to shipment to the project. Authority to use these materials is obtained by the following.

2.2.1. Premarked stock--These materials will be either stamped, marked or provided with some form of Department verification (test report) that the product has been tested and approved. Should there be doubt then this documentation should be verified with the Bureau of Materials and Tests.

2.2.2. Batch or Lot Numbers--Some materials are marked by the producer's batch, lot, or heat numbers. These groups are sampled and tested as a group. Test reports will be issued for all or a portion of the group. Authorization or verification for use may be obtained by contacting the Bureau of Materials and Tests.

2.2.3. Test reports are generally not issued on pretested stocks until shipping releases are submitted to the Bureau by the producers or suppliers. Therefore, there will be a time delay between the use of the material and receipt of the test report.

2.3. Certified Test Reports--Many items are accepted on the basis of certified test reports furnished by the producer. These tests are conducted by company and/or private laboratories. They should be submitted to the Project Engineer via the Contractor. The Project Engineer will submit these test reports to the Bureau of Materials and Tests in lieu of samples of these materials. They will be checked to assure that they contain actual test results for all parameters required in the specification and that they meet the requirements of the specification. This report will then be placed in the Bureau project file and a Bureau test report issued to the project. Certifications found to be incomplete or having failing test results will be stamped as inadequate and returned to the project so that the contractor can resolve the deficiencies.

2.4. Materials, Sources, and Devices with Special Acceptance Requirements--The Department has elected to accept certain products according to special programs. The Product Evaluation Board oversees these programs. The Bureau of Materials and Tests publishes the manual, by the same name, containing both the procedures and list of products falling into this category. Each list has an individual procedure established for it. The Project Engineer must consult the procedure before using these materials.

2.5. Small Quantities--When a contract requires miscellaneous materials (i.e. fence posts, nuts, bolts, etc.) in quantities smaller than normal lots for testing purposes, such quantities may be accepted by visual inspection or by manufacturer's certification. When authorized by the Division Materials Engineer, acceptance on a visual basis, by project personnel, will be documented on Form BMT-16. The Project Engineer will document the quantity accepted along with the observed physical characteristics such as dimension measurements where applicable, general condition, workmanship, appearance, etc.

3. Guaranteed Material

3.1. The Project Engineer will have occasions when the Contractor will want to use materials before test reports are in hand. Section 106 of the Standard Specifications, allows the Contractor to use certain materials prior to testing under specified conditions. The Prime Contractor is required to execute a Material Guaranty Form (BMT-73).

3.2. The Material Guaranty Form (BMT-73) is an agreement between the Prime Contractor and the Department. The Prime Contractor agrees to remove all materials in-stalled under this agreement, as well as any related materials, without additional cost to the Department, should the material fail to meet specifications when tested.

3.3. The Material Guaranty Form (BMT-73) should not be open-ended. The Project Engineer should use discretion in allowing its use. Subarticle 106 states: "The Engineer reserves the right to refuse permission for use of materials on the guaranty basis at any time".

ALDOT-210-90
SELECTING SAMPLES BY THE RANDOM NUMBERS METHOD

Definition: A random sample is a sample taken by the use of a sampling plan in which each unit of a lot must have an equal chance of being chosen.

The following is an explanation of the procedure of sampling by random numbers. This system of sampling can be used for all types of materials. It can be used to determine the location for sampling (as stations along a roadway and distances from a pavement edge), truck numbers, or the point in production for sampling. We will give five examples. This procedure may be expanded to other materials and circumstances as needed.

Example No. 1

This example procedure will result in stratified random samples. The procedure is used when sampling is accomplished as construction progresses. The material that is to be sampled must be divided into lots. Then it must be determined how many samples will be required to represent a lot so that the lot can be divided into sublots.

In this example we will select stations and distances from the right edge of a base course from which samples shall be taken to represent base course layers for 50 stations of a project. For this example, we will use Station 137+00 to 187+00 as the lot. The width to be sampled will be 24 ft. (7.2 m) and the location of the sample will be measured from the right edge of the base. We will use five samples to represent the 50 station lot. Five sublots will be set up from which the five stratified random samples are selected. Use the following steps to select where the five samples will be taken.

1. The 50 station lot is first divided into 10 station sublots as shown. Each sublot will be 10 stations or 1000 ft (300m) in length.

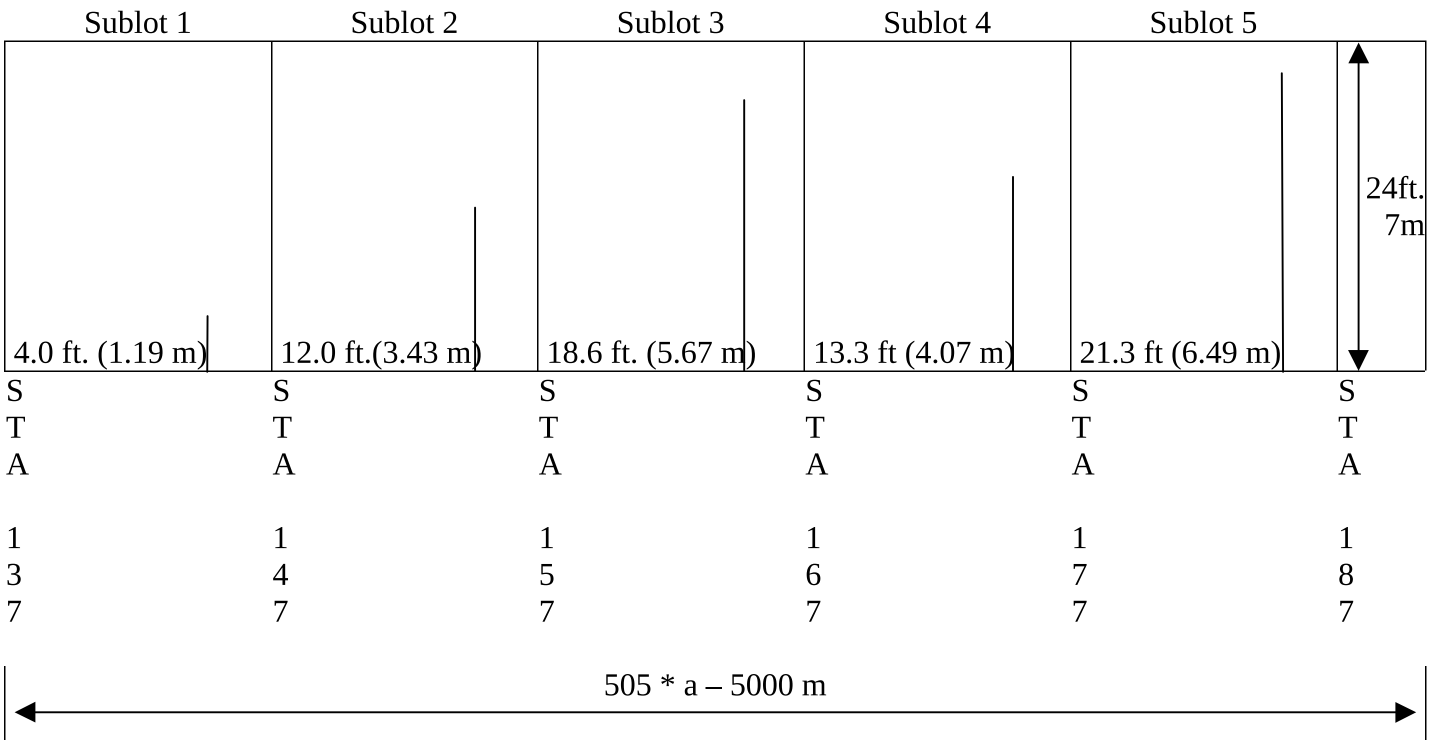


Figure 1. Stratified Random Samples for 50 Station Lot

2. Select five consecutive random numbers to locate the samples in each sublot (0.947, 0 942, 0.150, 0.195 and 0.448). The preferred method of generating the five consecutive random numbers is with an electronic calculator. However, the included Table of Random Numbers may be used. The five numbers above were from Block "A." The Table of Random Numbers may be entered at any point to select these numbers. If the table is used, an effort should be made to randomize the selection of the starting point.

3. The five consecutive random numbers are multiplied by 10, which is the total number of stations in each sublot. The product is added to the beginning station for the sublots, as shown below, to determine the longitudinal stationing at which samples are taken. 100 ft. (100 m) = 1 station.

Sample Number	
1	0.947 x 10 = 9.47 or 9+47 Stations + 137+00 = Station 146+47
2	0.942 x 10 = 9.42 or 9+42 Stations + 147+00 = Station 156+42
3	0.150 x 10 = 1.50 or 1+50 Stations + 157+00 = Station 158+50
4	0.195 x 10 = 1.95 or 1+95 Stations + 167+00 = Station 168+95
5	0.448 x 10 = 4.48 or 4+48 Stations + 177+00 = Station 181+48

You will note that the above results in two stations being selected close together. This is acceptable when the sampling is done by randomization.

4. To select the transverse distance from the right edge of the base course, five additional consecutive random numbers are selected and calculations are made using the 24 ft (7.2 m) distances from the right edge of the base. The numbers below are from Block "B" in the Table of Random Numbers.

Sample Number	
1	0.165 x 24 ft.(7.2 m)= 3.96 ft. (1.19 m) from right edge of base course
2	0.477 x 24 ft. (7.2 m) = 11.4 ft (3.43 m)from right edge of base course
3	0.788 x 24 ft.(7.2 m) = 18..9 ft. (5.67 m)from right edge of base course
4	0.566 x 24 ft. (7.2 m)= 16.0 ft. (4.07 m)from right edge of base course
5	0.901 x 24 ft. (7.2 m)= 21.6 ft. (6.49 m) from right edge of base course

5. From the above calculations we find the following sampling schedule for the fifty station lot:

Sample Number	Station	Distance From Right Edge
1	146+47	3.96 ft (1.19m)
2	156+42	11.4 ft (3.43m)
3	158+50	18.9 ft (5.67m)
4	168+95	16.0 ft (4.07m)
5	181+48	21.6 ft (6.49m)

Example No. 2

This example procedure will result in random samples. The procedure is used when the entire population is available for sampling at one time. The project shows 9,657 reflective roadway markers are required. The specifications require that each 3,000 unit lot be represented by 50 units or samples. This will result in four lots to represent the project. The markers are packaged 50 fifty to each carton. The following procedure is used to select random samples to represent this project.

1. Separate the 9,657 markers into four lots. This will result in 60 cartons to each whole lot.

2. Stack the cartons for each lot in an arrangement that will permit numbering each carton consecutively from one to 60.

3. Select 50 consecutive random numbers with an electronic calculator or the Table of Random Numbers. The following numbers are from Block "C" of the Table of Random Numbers. Multiply each number by 3,000. This product is the roadway marker number selected for one sample of 50 samples to represent the lot of 3,000 markers.

.265 x 3000 = 795
.217 x 3000 = 651
.307 x 3000 = 921
.879 x 3000 = 2637
.755 x 3000 = 2265
.007 x 3000 = 21
.649 x 3000 = 1947
.841 x 3000 = 2523
.062 x 3000 = 186
.446 x 3000 = 1338
.998 x 3000 = 2994
.749 x 3000 = 2247
.517 x 3000 = 1551
.253 x 3000 = 759
.640 x 3000 = 1920
.904 x 3000 = 2712
.231 x 3000 = 693
.986 x 3000 = 2958

.106 x 3000 = 318
.398 x 3000 = 1194
.698 x 3000 = 2094
.796 x 3000 = 2388
.348 x 3000 = 1044
.358 x 3000 = 1074
.698 repeated number
skip to next number
.864 x 3000 = 2592
.335 x 3000 = 1005
.909 x 3000 = 2727
.740 x 3000 = 2220
.601 x 3000 = 1803
.425 x 3000 = 1275
.428 x 3000 = 1284
.919 x 3000 = 2757
.892 x 3000 = 2676
.195 x 3000 = 585
.058 x 3000 = 174

.220 x 3000 = 660
.631 x 3000 = 1938
.432 x 3000 = 1296
.082 x 3000 = 246
.296 x 3000 = 888
.602 x 3000 = 1806
.602 x 3000 = 1806
.919 repeated number
skip to next number
.648 x 3000 = 1944
.239 x 3000 = 717
.291 x 3000 = 873
.858 x 3000 = 2574
.761 x 3000 = 2283
.463 x 3000 = 1389
.993 x 3000 = 2979
.919 repeated number
skip to next number
.501 x 3000 = 1503

The above gives the exact number of each sample. The sample can be located by dividing each number by 50 to determine the carton number. For example, to locate Sample No. 795, 795 is divided by 50. This division yields 15.9 which represents 15 full cartons plus 0.9 x 50 = 45 additional markers. This means the sample will be in carton 16. Count to the forty-fifth marker, by any system in carton 16, and select that marker to represent Sample No. 795. If the samples were packaged 100 to the carton, then, 795 divided by cartons of 100 markers = seven full cartons with the ninety-fifth sample in carton eight being the one desired. Repeat the above procedure to find each sample.

Example No. 3

This example procedure will result in stratified random samples where a lot is represented by one day's production of hot bituminous mixture. The procedure is used when sampling is accomplished during production.

In this example, specifications require that a sample be taken for each testing increment. One sample of each testing increment will be picked randomly and split between the State and the Contractor.

1. The day's production is divided into several testing increments depending upon how many tons are produced. For this example three testing increments of 400 T (t) each will be used.

		0 t Begin Production
400 T (t)	Testing Increment 1	400 T (t)
400 T (t)	Testing Increment 2	800 T (t)
400T (t)	Testing Increment 3	1200 T (t) End Production

Figure 2. Stratified Random Samples for One Day Production Lot

2. The Departments technician will select three consecutive random numbers with an electronic calculator or from a table of random numbers.

   For the example random numbers 0.117, 0.239, and 0.491 were determined. These random numbers are multiplied by the testing interval of 400 T (t).

   0.117 x 400 = 47 T (t)
   0.239 x 400 = 96T (t)t
   0.491 x 400 = 196T(t)

3. Add the products from the above multiplications to the starting tonnages of the three testing intervals to determine the production ton for obtaining samples. The State technician will notify the Contractor no more than 15 minutes before each sampling time.

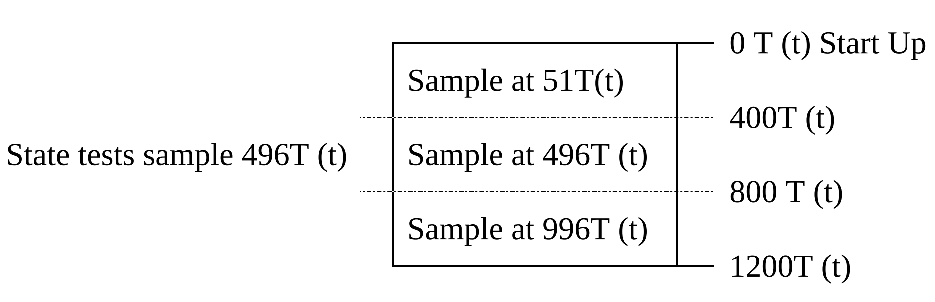
Sample		**Sampling Ton**
1	0 t + 47	51 T*(51t*)
2	400 t + 96	496 T (496t)
3	800 t + 196	996 T (996 t)

The first 50 T(t)being exempted from test, the 51st T(t) is sampled.

4. The Departments technician will select another random number to determine which split sample will be tested for verification purposes. For the example random number 0.333 is used. This number is multiplied by the number of tons in the lot (day's total production tonnage).

   0.333 x 1200 = 400 T (t)

   The sample taken nearest to this ton is tested by the State to verify the contractor's test results. In this example the second sample is tested for verification.



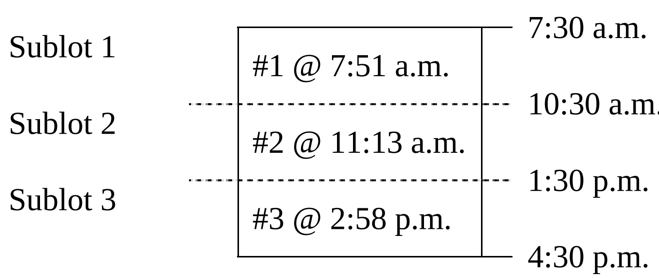
Example No. 4

This example procedure will result in stratified random samples where a lot is represented by one day's production of hot bituminous mixture. The procedure is used when sampling is accomplished during production.

In this example, assume the plant will operate nine hours, beginning at 7:30 a.m. and operating continuously (through lunch) until 4:30 p.m.

Specifications require a three hour testing increment. Using the following steps three sample times will be selected:

1. The day's production is divided into sublots using a three hour testing increment. The intervals are set up on production time and can be converted to clock time as illustrated below.



2. Select three consecutive random numbers with an electronic calculator or from the Table of Random Numbers. Random numbers (0.117, 0.239, and 0.491) are generated with an electronic calculator. These random numbers are multiplied by the time interval of 180 minutes (three hours) as shown below:

   0.117 x 180 = 21 min.
   0.239 x 180 = 43 min.
   0.491 x 180 = 88 min.

3. Add the products from the above multiplications to the starting times for the four intervals to determine the clock times for obtaining samples.

Sample		**Sampling Time**
1	7:30 a.m. + 21 min.	7:51 a.m.*
2	10:30 a.m. + 43 min.	11:13 a.m.
3	1:30 p.m. + 88 min.	2:58 p.m.

The first 50 T (t) being exempted from test, sampling may wait until the 51T*(51t*).

Samples should be secured from the truck being loaded at the sampling time or the next truck loaded following the scheduled sampling time. For the purpose of sampling, production time shall be defined as beginning with the loading of the first truck and ending with the loading of the last truck. Only in the case of there being no material available to sample, or no trucks from which to sample for at least 30 minutes, (and that time span includes a designated sampling time) should production time be suspended. If production time is suspended 30 minutes or more, sampling time will be adjusted accordingly. For this example, if no trucks were loaded from 2:30 p.m. until 3:30 p.m., the third sampling time would be adjusted one hour from 2:58 p.m. to 3:58 p.m. If no trucks were loaded from 2:30 p.m. until 2:59 p.m., there is no adjustment in sampling time.

Example No. 5

This example procedure will result in stratified random samples where a lot is represented by one day's production. The procedure is used when sampling is accomplished as construction progresses.

In this example, we will select stations and distances from he center line of a bituminous pavement from which samples shall be taken to represent the density for every 1000 ft. (300 m)of pavement. For this example, we will use Station 150+00 to Station 200+00 as the lot. The width to be sampled will be12 ft.(4 m)and the location of he sample will be measured from the centerline of the pavement. Use the following steps to select where the sample will be taken.

1. Select consecutive random numbers with an electronic calculator or from the Table of Random Numbers. Random numbers (0.284, 0.802, 0.146, 0.696, and 0.887) are selected from the Table of Random Numbers. The random numbers are multiplied by 10 which is the total number of stations in each test section3000 ft (1000 m).

Sample Number	
1	0.284 x 10 = 2.84 or 2+84 stations + 150+00 = 152+84
2	0.802 x 10 = 8.02 or 8+02 stations + 160+00 = 168+02
3	0.146 x 10 = 1.46 or 1+46 stations + 170+00 = 171+46
4	0.696 x 10 = 6.96 or 6+96 stations + 180+00 = 186+96
5	0.887 x 10 = 8.87 or 8+87 stations + 190+00 = 198+87

2. To select the transverse distance from the centerline of the pavement, five additional consecutive random numbers are selected and calculations are made using the 12 ft (4 m) distance from the centerline of the pavement. The numbers below are selected from the Table of Random Numbers.

Sample Number	
1	0.195 x 12(4) = 2.34 ft (0.78 m) from centerline of pavement
2	0.673 x 12(4) = 8.0 ft. (2.69 m) from centerline of pavement
3	0.112 x 12(4) = 1.34 ft. (0.45 m) from centerline of pavement
4	0.193 x 12(4) = 2.3 ft. (0.77 m) from centerline of pavement
5	0.651 x 12(4) = 7.8 ft. (2.60 m) from centerline of pavement

3. From the above calculations, we find the following sampling schedule for the lot:

Sample Number	**Station**	**Distance from the Centerline**
1	152+84	2.34 ft. (0.78m)
2	168+02	8.0 ft. (2.69m)
3	171+46	1.34 ft (0.45m)
4	186+96	2.3 ft. (0.77m)
5	198+87	7.8 ft. (2.60m)

Table of Random Numbers

.576	.730	.430	.754	.271	.870	.732	.721	.998	.239
.892	.948	.858	.025	.935	.114	.153	.508	.749	.291
.669	.726	.501	.402	.231	.505	.009	.420	.517	.858
.609	.482	.809	.140	.396	.025	.937	.310	.253	.761
.971	.824	.902	.470	.997	.392	.892	.957	.640	.463
.053	.899	.554	.627	.427	.760	.470	.040	.904	.993
.810	.159	.225	.163	.549	.405	.285	.542	.231	.919
.081	.277	.035	.039	.860	.507	.081	.538	.986	.501
.982	.468	.334	.921	.690	.806	.879	.414	.106	.031
.095	.801	.576	.417	.251	.884	.522	.235	.398	.222
.509	.025	.794	.850	.917	.887	.751	.608	.698	.683
.371	.059	.164	.838	.289	.169	.569	.977	.796	.996
.165	.996	.356	.375	.654	.979	.815	.592	.348	.743
.477	.535	.137	.155	.767	.187	.579	.787	.358	.595
.788	.101	.434	.638	.021	.894	.324	.871	.698	.539
.566	.815	.622	.548	.947	.169	.817	.472	.864	.466
.901	.342	.873	.964	.942	.985	.123	.086	.335	.212
.470	.682	.412	.064	.150	.962	.925	.355	.909	.019
.068	.242	.667	.356	.195	.313	.396	.460	.740	.247
.874	.420	.127	.284	.448	.215	.833	.652	.601	.326
.897	.877	.209	.862	.428	.117	.100	.259	.425	.284
.875	.969	.109	.843	.759	.239	.890	.317	.428	.802
.190	.696	.757	.283	.666	.491	.523	.665	.919	.146
.341	.688	.587	.908	.865	.333	.928	.404	.892	.696
.846	.355	.831	.218	.945	.364	.673	.305	.195	.887
.882	.227	.552	.077	.454	.731	.716	.265	.058	.075
.464	.658	.629	.269	.069	.998	.917	.217	.220	.659
.123	.791	.503	.447	.659	.463	.994	.307	.631	.422
.116	.120	.721	.137	.263	.176	.798	.879	.432	.391
.836	.206	.914	.574	.870	.390	.104	.755	.082	.939
.636	.195	.614	.486	.629	.663	.619	.007	.296	.456
.630	.673	.665	.666	.399	.592	.441	.649	.270	.612
.804	.112	.331	.606	.551	.928	.830	.841	.602	.183
.360	.193	.181	.399	.564	.772	.890	.062	.919	.875
.183	.651	.157	.150	.800	.875	.205	.446	.648	.685

ALDOT-222-82
IN-PLACE DENSITY AND MOISTURE MEASUREMENTS AND ESTABLISHING MOISTURE CORRELATIONS FOR NUCLEAR MOISTURE/DENSITY GAUGES

1. Scope

1.1. This method of test provides a non-destructive measurement of in-place density and moisture content of soils and/or aggregate bases and thick layers of bituminous mixtures of 225 lbs/yd^2 (120 kg/m^2) or greater.

Note 1: Operators shall have a current operator's card issued by the Bureau of Materials and Tests after completion of the Radiation Safety Course. Operators are also required to be certified as Roadway Technician's by the Bureau of Materials and Tests.

2. Applicable Documents

2.1. Radiological Safety Manual; Manufacturers Operating Manual Supplied with gauge; Nuclear Gauge Training Manual available from the Bureau of Materials and Tests; AASHTO T-265 Laboratory Determination of Moisture Content of Soils; M&T-14 Revised Technical Specifications for Nuclear Moisture/Density Gauges; ALDOT-341 Standard Procedures for Comparing Independent Assurance Samples and Tests (IAS&T); Acceptance Test Results; AASHTO T-166 Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens; and, ALDOT-210 Selecting Samples by the Random Numbers Method.

3. Nuclear Gauging Device

3.1. This device must meet M&T 14 Revised, available at the Bureau of Materials and Tests.

Note 2: Before acceptance, gauge will be checked on Alabama Department of Transportation calibration standards and gauge accuracy will be required to be within ± 1.5% (1.5 lbs) (0.6818 kg) of calibration standards.

4. Apparatus

4.1. Cans - Four cans with a capacity of 500 g minimum with lids to prevent loss of moisture.

5. Procedure for Standardizing Check of Equipment

5.1. Check the gauge against a reference standard at least twice a day or more frequently if climatic, transporting, background or other conditions necessitate.

5.2. When using a CPN MC-1 or a Troxler 3401-B, a warm-up period for the gauge is required (use the manufacturer's recommendations for warm-up). After warm-up, take five one-minute counts on reference standard and average (to be used as a Standard Count).

5.3. The average for the five one-minute counts should be within the permissible variations set forth in Table 1. If any one individual count is outside of the statistical limits, a repeat of the entire count run is required.

6. Table 1

Acceptable Range of Count Variations Used for Standardizing and Calibrating Moisture Density Nuclear Gauges

Average Standard Counts (ASC)	Permissible Variations ± (1.96 ASC)
70,000	± 520
45,000	± 415
36,000	± 375
16,000	± 250
7,000	± 165
4,000	± 125
3,000	± 107
2,000	± 88

7. Procedure For In-Place Density And Moisture Tests

7.1. Clear away all loose surface material or dried crust and obtain a plane sufficient in area to accommodate the gauge and extending 6 in. (150 mm) beyond the gauge housing. (A probe hole is required for a direct transmission type gauge.)

7.2. Where sheepsfoot and similar type tamping rollers have been used, remove the loose surface material to a depth at least equal to the deepest penetration of the roller foot.

7.3. Modes of transmission shall be as follows:

7.3.1. Direct - May be used on all materials exceeding 2 in. (50 mm) in thickness and will be required for embankment, roadbed and fine grained base layers.

7.3.2. Backscatter - For most bituminous mixtures, and high coarse aggregate content base layers.

7.3.3. Backscatter/Air Gap - For very open graded high coarse aggregate content base layers and bituminous mixtures.

Note 3: Careful seating of the gauge is necessary. The surface under the gauge must be plane. When direct transmission mode is used, the access hole for the probe must be perpendicular to the base plane. Minor depressions, not exceeding 0.13 in. (3 mm) may be filled with native fines removed from the layer being tested. (Ottowa sand or any fine sand may be substituted for native fines.)

7.4. Take one one-minute reading, recording both moisture and density counts.

7.5. Rotate gauge at least 90° over the same centerpoint and obtain one additional one-minute time reading and record the moisture and density counts.

7.6. When operating gauge within 24 in. (600 mm) of the edge of the road-bed or asphalt mat, use the following procedure. For initial reading, place gauge parallel to the edge of the layer being tested. Then, rotate gauge at 60° intervals (over same centerpoint) to obtain the next three (3) readings. The last reading should be taken opposite the first reading, leaving the gauge parallel to the edge of the layer being tested.

Note 4: Measurement counts should be repeated if any count varies more than ± five (5) times the square root of the average.

Note 5: Nuclear gauge systems having radiation source materials in individual housings must be separated at least 3 m when counts are being taken.

8. Calculations

8.1. Wet density

$$R = \frac{n}{asc}$$

Where
R = wet density count ratio
n = average count for the one minute time readings for density probe
asc = average standard count for density probe

8.1.1. Wet density (D) in lbs/ft^3(kg/m^3). Locate R on calibration chart and record corresponding wet density (D) to nearest 0.25 lb (0.113 kg).

Note 6: Manufacturers supply a computer print-out for density and moisture measurements. These measurements are to the nearest 0.5 lb (0.227 kg) for density and 0.25 lb (0.113 kg) for moisture. To record to nearest 0.2 lb (0.0909 kg), interpolation is required for the density printout.

8.2. Moisture Content

$$R_1 = \frac{n_1}{asc_1}$$

Where
R_1 = moisture count ratio
n_1 = average count for the one minute time readings for moisture probe
asc_1 = average standard count for moisture probe

8.2.1. Moisture content (M) in lbs/ft^3 (kg/m^3). Locate R on calibration chart and record corresponding moisture content (M) to nearest 0.2 lb (0.113 kg).

8.3. Dry density in lbs/ft^3 (kg/m^3)

$D_1 = D - M$

Where
D_1 = dry density in lb/ft^3 (kg/m^3)

8.4. Percent moisture

$$P = \frac{M}{D_1} \times 100$$

Where
P = percent moisture (soil dry basis)
M=moisture content in lb/ft^3 (kg/m^3)
D_1=dry density in lb/ft^3 (kg/m^3)

8.5. Percent comparative compaction

$$P = \frac{D_1}{D_2} \times 100$$

Where
P = percent of comparative compaction
D_1 = dry density in lbs/ft^3 (kg/m^3)
D_2 = control weight of material expressed in lbs/ft^3 (kg/m^3).

9. Correlation of Moisture and Density Curves

9.1. Correlation moisture curves, when deemed necessary, will be under the direction of the Materials and Tests Engineer. Moisture curves will be correlated to values determined by AASHTO T-265.

9.2. For a moisture correlation, run four separate density tests. Record wet density in lbs/ft^3 (kg/m^3) and moisture content in lbs/ft^3 (kg/m^3) from the nuclear gauge for each separate test. Obtain a moisture sample with a minimum weight of 500 g from each test site and place in cans for transportation to division lab. Run moisture samples per AASHTO T265 to obtain oven dried moisture content of the samples. Using the nuclear gauge wet density and moisture content in lbs/ft^3 (kg/m^3), along with the results (percent moisture) of the laboratory oven dried moisture tests, Division Materials personnel will determine an individual moisture correlation for each of the four separate density tests, and will then average the individual values to obtain an overall moisture correlation. Sound engineering judgment should be utilized in the averaging process. If one of the individual moisture correlation values is significantly different from the other values, it should not be included in the averaging process to determine the overall moisture correlation. After the moisture correlation has been determined, Division Materials personnel will report the value in writing, with a copy sent to the Central Office Materials Engineer. Data/Calculations used in determining the moisture correlation are to be placed in the project file at the Division office.

Note 7: Division Materials personnel will issue a temporary moisture correlation, if needed, based on gauge wet density and moisture content along with results from field dried moisture samples until oven dried results are available.

10. Procedure

10.1. Density of asphalt base and pavement layers determined by nuclear gauge readings will be correlated to density of core specimens obtained from the layer as determined by AASHTO T-166. Four core specimens from the layer being tested will be required for density curve correlations. The density correlation will be determined by establishing the difference between the average gauge density readings and the average bituminous core densities. If the average gauge wet density lbs/ft^3 (kg/m^3) is higher than the aver-age bituminous core density lbs/ft^3 (kg/m^3) the correlation will be negative. If the average gauge wet density lbs/ft^3 (kg/m^3) is lower than the average bituminous core density lbs/ft^3 (kg/m^3) the correlation will be positive.

Example: Average gauge wet density 130.0 lbs/ft^3 (2028.4 kg/m^3) average bituminous core density 137.5 lbs/ft^3 (2145.5 kg/m^3) equals a plus 7.5 lbs/ft^3 (117.1 kg/m^3) correlation.

Note 8: The density correlation shall be added to or subtracted from the nuclear gauge wet density reading.

11. Comparing IAS&T Samples and Tests and Acceptance Test Results

11.1. Compare in accordance with ALDOT-341 and pay special attention to Table #1.

ALDOT-223-71A
ESTABLISHING MOISTURE-DENSITY CONTROLS FOR SOILS AND/OR AGGREGATES WITH CHEMICAL ADDITIVES (EXCLUDING BITUMINOUS MATERIALS)

1. Scope

1.1. These methods of test are intended for determining the relation between the moisture content and density of soils compacted in a mold of a given size with a 5.5 lb (2.5 kg) rammer dropped from a height of 12 in (300 mm). Two alternate procedures are provided as follows:

1.1.1. Method A – 4 in. (100 mm mold): For material with 20% or less aggregate retained on the ¾ in. (19 mm sieve).

1.1.2. Method B - 6 in. (150 mm mold): For material with greater than 20% aggregate retained on the ¾ in, (19 mm sieve)

2. Equipment

2.1. Molds - the molds shall be cylindrical in shape, made of metal, and shall have the capacity and dimensions indicated in Method A or B. They shall have a detachable collar assembly approximately 2.5 in.(60 mm)in height, to permit preparation of compacted specimens of soil-water mixtures of the desired height and volume. The molds may be of the "split" type, consisting of two half-round sections, or a section of pipe split along one element, which can be securely locked in place to form a cylinder. The mold and collar assembly shall be so constructed that it can be fastened firmly to a detachable base plate. Capacity and dimensions of the molds shall be as follows:

2.1.1. 4 in. (100 mm) mold having a capacity of 1/30 ± 0.0003 ft^3 (0.000943 m3 ±0.000008 m^3) with an internal diameter of 4 in. (102 mm) ± 0.2 in (0.407 mm) and a height of 4.58 in ± 0.005in (116.43 ± 0.127 mm) (see Note 1).

2.1.2. 6 in (150 mm) mold having a capacity of 1/13.33 ± 0.00075 ft^3 (0.002124 ±0.000021 m^3) with an internal diameter of 150 mm ± 0.6604 mm and a height of 116.43 ± 0.1270 mm (see Note 1).

2.2. Rammer - A rammer of 2.0 ± 0.005 in (50.8 ± 0.127 mm) diameter having a flat circular face and weighing 5.5 ± 0.02 lb (2.495 ± 0.009 kg). The rammer shall be equipped with a suitable arrangement to control the height of drop to a free fall of 12.00 ± 0.06 in (300 ± 2 mm) above the elevation of the soil.

2.3. Sample Extruder (optional) - A jack, lever, frame, or other device adapted for the purpose of extruding compacted specimens from the mold.

2.4. Balances and Scales - A balance or scale of at least 31.75 kg sensitive to 0.009 kg and a balance of at least 2500 g capacity sensitive to 0.1 g.

2.5. Stove or Oven - For drying moisture samples.

2.6. Straightedge - A steel straightedge 12 in (300 mm) in length and having one beveled edge.

2.7. Sieves – ¾ in (19 mm) and No. 4 (4.75 mm) sieves conforming to the requirements of the Specifications for Sieves for Testing Purposes (AASHTO Designation: M-92).

2.8. Mixing Tools - Miscellaneous tools such as mixing pans, spoon, trowel, spatula, etc., or a suitable mechanical device for thoroughly mixing the sample of soil with increments of water.

Note 1: Molds shall comply with dimension requirements set forth in AASHTO T-99. (Figure 1 and 2)

3. Sample Preparation

3.1. From the completed mixture, obtain from the immediate area of the in-place density test the proper weight of material listed below: (Note 2)

3.1.1. Method A - 13.62 kg

3.1.2. Method B - 31.75 kg

Note 2: Sample should be taken immediately after final mixing, or spreading, and before rolling begins.

3.2. Divide material by quartering into approximately four equal samples.

3.3. Place the individual portions into separate pans marked A, B, C, and D.

3.4. Place pans A, C, and D so that they will receive the same atmospheric exposure as the completed mixture on the roadway.

4. Procedure And Preparation Of Samples

4.1. Method A - Three (3) layers in 4 in (100 mm) mold 25 blows per layer with all soil particles passing No. 4 (4.75 mm) sieve and all aggregate particles broken up to pass a ¾ in (19 mm) sieve.

4.2. Method B - Three (3) layers in 6 in (150 mm) mold 56 blows per layer with all soil particles passing No. 4 (4.75 mm) sieve and all aggregate particles broken up to pass a ¾ in (19 mm) sieve.

4.3. From pan B prepare a specimen, using the appropriate method. During compaction, the mold shall rest on a uniform, rigid foundation, such as provided by a cube of concrete weighing not less than 90 kg. Following compaction, remove the extension collar and carefully trim the top and bottom of the compacted soil even with the mold by means of a straightedge. (Note 3)

4.4. Weigh and record the molded weight. (Note 4)

Note 3: During the straightedge operation, high metal content samples will leave voids due to loss of metal. Sieve some of the struck-off material over the 4 in (100 mm) sieve and from the passing 4 in (100 mm) portion fill the void space and lightly tamp with the flat side of the straightedge. Then strike off the material flush with mold again.

Note 4: A tare weigh should be provided for each mold, in order that only the wet weight of the material will be recorded.

4.5. Remove the material from the mold and slice vertically through the center. Take a representative moisture sample from one of the cut faces, weigh immediately and record.

4.6. Place moisture sample in stove or oven for drying. (Note 5)

Note 5: Moisture samples shall be dried until the loss is less than 0.5 of one percent.

4.7. To pan C, add enough water to increase the moisture content by approximately two (2) percent. Mix water and material thoroughly and repeat Steps 4.3 through 4.6.

4.8. To pan D, add enough water to increase the moisture content by approximately four (4) percent. Mix water and material thoroughly and repeat Steps 4.3 through 4.6.

4.9. Thoroughly mix the material in pan A and repeat Steps 4.3 through 4.6. (Note 6)

Note 6: At least 1 1/2 hours should have elapsed since mixing before beginning this point.

5. Calculations

5.1. Calculate the moisture content as percent and the dry weight of the soil as compacted for each trial, as follows:

$$P = \frac{A - B}{B - C} \times 100$$

and

$$W = \frac{w_1}{P + 100} \times 100$$

Where:
P = percentage of moisture in the specimen, based on oven dry weight of soil.
A = weight of container and wet soil in kg.
B = weight of container and dry soil in kg.
C = weight of container in kg.
W = dry weight in kg/m^3 of compacted soil.
w_1 = wet weight, in kg/m^3 of compacted soil.

6. Moisture-Density Relationship

6.1. The calculations in Step 5.1 shall be made to determine the moisture content and corresponding oven-dry weight (density) for each of the compacted soil samples. The oven-dry weights per cubic foot (densities) of the soil shall be plotted as ordinates and corresponding moisture contents as abscissas.

7. Optimum Moisture Content

7.1. When the densities and corresponding moisture contents for the soil have been determined and plotted as indicated in Step 6.1, it will be found that by connecting the plotted points with a smooth line, a curve is produced. The moisture content corresponding to the peak of the curve shall be termed the "optimum moisture content" of the soil under the above compaction.

8. Maximum Density

8.1. The oven-dry weight per kg/m^3 of the soil at optimum moisture content shall be termed "maximum density" under the above compaction.

9. Reporting

9.1. The report shall include the following:

9.1.1. The method used (Method A or B).

9.1.2. The optimum moisture content.

9.1.3. The maximum density.

ALDOT-224-71A
CONSTRUCTION OF DENSITY CONTROL STRIPS FOR BITUMINOUS MIXTURES

1. Scope

1.1. For use in conjunction with nondestructive in-place density test methods contained in ALDOT-222.

2. Location

2.1. Each control strip shall be constructed on a normal tangent section of the project and on an underlying surface approved by the Engineer.

Note 1: When a 500 ft. (150 m) length tangent section is not available, a curved section may be used.

3. Materials

3.1. The materials used in constructing control strips for each of the respective courses shall conform to the specified requirements for the material to be used in such courses. Further, the material used in each control strip shall be furnished from the same source, shall be of the same type, and manufactured from the same job mix formula, as the material to be used in the test sections whose density requirements are to be established by that control strip.

4. Equipment

4.1. Equipment proposed by the Contractor for use in the construction of control strips shall be subject to the approval of the Engineer prior to use. The type and weight of the compaction equipment shall be such that uniform density shall be obtained throughout the depth of the layer of material being compacted. A steel wheel breakdown roller capable of applying a total applied force (sum of static and dynamic forces) of a minimum of 400 lbs/in (71.6 kg/cm) of roller width, a multi-wheel pneumatic tired intermediate roller having a weight of not less than 12 T.(10.9 t) and a tandem steel wheel finish roller having a weight of not less than 10 T (9 t)shall be provided. On thin layers (those of 150 lbs/yd^2 (81.5 kg/m^2) or less) and for leveling, a pneumatic tired roller may be used both as the breakdown and compactive or intermediate roller as long as acceptable results are achieved. On thick layers (those of 500 lbs/yd^2 (271.8 kg/m^2) or more, a self-propelled, multi-wheel pneumatic tired roller having a weight not less than 25 T (22.7 t) shall be provided.

5. Temperature

5.1. The placement temperature of the mixture shall be within ± 20°F (11°C) of the temperature specified in writing by the Engineer.

6. Procedure

6.1. The spreader speed shall be controlled to the extent that the breakdown roller will never be more than 100 ft. (30 m) behind the spreader, and rolling shall begin immediately after placement for hot mixes. The rolling shall begin at the pavement edge and in passes parallel to the edge progress inward to the center of the pavement. A test point within the control section shall be selected, and each coverage of this point shall be checked by the non-destructive test device. Complete roller coverage of the control strip layer being tested shall continue until no significant increase in density is measured by the nondestructive test device at the test point.

Note 2: When a control strip is constructed on a curved section, rolling shall begin at the lower edge and, in passes parallel to the lower edge, progress to the high side.

Note 3: If the mixture has a tendency to stick to the roller wheels, a nonfoaming detergent shall be added to the water in an amount sufficient to reduce or eliminate the sticking.

6.2 After completion of the breakdown and intermediate rolling, the finish rolling with the tandem steel wheel roller shall begin. Finish rolling shall be in the same sequence as the breakdown and intermediate rolling and shall continue until no significant increase in density is recorded by the nondestructive test device, all breakdown roller marks are eliminated, and the surface requirements are in compliance with the specifications for the applicable layer.

6.3 After completion of the finish rolling, ten (10) test points within the control strip shall be selected. These will be selected by use of a random number table for both longitudinal and transverse location.

6.4 After selection of test sites, two individual readings will be taken at each test point.

6.5 Determine the mean reading for the twenty tests; if individual test points vary more than ± 5 percent of the mean, the control strip will be disregarded but may remain in place as a test section provided 95 percent of the standard design density (91.2% of the theoretical maximum density) has been obtained, or if it meets the requirements of ALDOT Specifications, Section 306, control strip method on a subsequently established control strip. After evaluation of equipment, a new control strip shall be constructed.

6.6 Convert the mean reading into in-place density, expressed in lbs/ft^3 (kg/m^3) from calibration data supplied with the nondestructive test device.

ALDOT-225-83
CONSTRUCTION OF MOISTURE-DENSITY CONTROL STRIPS FOR SOIL AND/OR AGGREGATE BASE LAYERS

1. Scope

1.1. This method is for use in conjunction with non-destructive in-place moisture-density test devices on soil and/or aggregate base layers with or without chemical additives. (Excluding bituminous materials.)

2. Applicable Documents

2.1. Alabama Department of Transportation Specifications, Section 306.

2.2. ALDOT 105.

2.3. ALDOT 222.

2.4. ALDOT 253.

3. Location

3.1. Each control strip shall be constructed on a normal tangent section of the project and on an underlying surface approved by the Engineer.

Note 1: When a 500 ft. (150 m)length tangent section does not exist, a control strip may be constructed on a curved section.

3.2. An in-place density test will be taken on the underlying layer to assure that it meets specifications as to density requirements.

4. Materials

4.1. The materials used in constructing control strips for each of the respective courses shall conform to the specified requirements for the material to be used in such courses.

4.2. Sufficient material shall be dumped and spread in order to obtain the minimum required compacted thickness for the required widths.

4.3. After the material has been placed and processed, a sample for analysis will be obtained and split with one-half going to the Division Laboratory and the other half going to the Central Laboratory. The same shall apply for a Laboratory Density sample.

4.3.1. In conjunction with the above, a moisture sample will be picked up and dried in the field laboratory.

5. Equipment

5.1. Equipment proposed by the Contractor for use in construction of control strips shall be subject to the approval of the Engineer prior to use. The type and weight of the compaction equipment shall be such that uniform density shall be obtained throughout the depth of the layer of material being compacted, and in addition thereto, the following shall be provided:

5.1.1. For base layers containing fine-grained slightly cohesive soil binders, a roller with staggered contact points (sheeps foot type) or a self-propelled pneumatic-tired roller and/or a grid roller. The loaded roller weight shall not be less than 15 T (13.6 t).

5.1.2. For base layers composed of all crushed aggregates or aggregate bases with coarse-grained friable binders, a three-wheel steel roller weighing not less than 15 T (13.6 t) loaded or a vibratory steel wheel roller with a dead weight of not less than 5 T (4.5 t) and an impact load of at least 15 T (13.6 t) shall be provided.

5.1.3. Finish rollers may be either tandem steel wheel or self-propelled pneumatic-tired rollers weighing not less than 12 T (10.9 t).

6. Lift Thickness

6.1. Control strips shall not be constructed in lifts greater than 6 in. (150 mm) in compacted thickness.

6.1.1. If, during the initial rolling, testing indicates that uniform density is not being obtained for the full thickness of the lift, the following procedure will apply: With a motor patrol, shift approximately one-half (1/2) of the material in one travelway onto the adjacent travelway (Note 2) and proceed with initial rolling on the travelway from which the material was removed.

Note 2: On shoulder layers that are constructed separate from the main travelway, the material removed may be shifted onto the main travelway, in order that roller coverage may be obtained for full width of the shoulder layer.

6.1.2. After completion of the initial rolling on the travelway referred to in Step 6.1.1, shift approximately one-half (1/2) of the material from the adjacent travelway onto this completed travelway.

6.1.3. Proceed with initial rolling on the travelway from which the material was removed in Step 6.1.2.

6.1.4. After completion of the initial rolling in the travelway referred to in Step 6.1.3, distribute the remaining loose material over the entire width and proceed with initial rolling.

7. Moisture Control

7.1.1. Water from an approved source shall be uniformly distributed throughout the loose mass until the content is above the optimum content established during laboratory moisture-density tests. Moisture content of the target optimum moisture should be determined as directed by the Materials and Tests Engineer.

8. Procedure

8.1 Rolling shall begin immediately after the final mixing or spreading operations. The rolling shall begin at the edge of each layer and with overlapping coverage parallel to the edges progress into the center.

Note 3: When a control strip is constructed on a curved section, rolling shall begin at the lower edge and, in successive passes parallel to edge, progress to the high side.

Note 4: A test point within the control strip shall be selected and each roller coverage over this point shall be checked by the non-destructive test device. Complete roller coverage over the entire control strip.

Note 5: The entire strip shall have the same number of passes as at the test point.

Note 6: On base layers not placed full width, it may be necessary to place a berm of loose material adjacent to the edge of the material being compacted.

Note 7: When sheepsfoot type rollers are being used, occasional light blading by motor patrol will be required and may be required when using other aforementioned type rollers.

Note 8: Sheepsfoot type rollers shall not be operated at speeds exceeding that recommended by the manufacturer.

Note 9: During hot and dry climatic conditions, additional watering will be required.

8.2 After completion of the initial rolling, finish rolling shall begin.

8.3 Finish rolling and light blading shall continue until all breakdown roller marks are eliminated and the surface requirements are in compliance for the applicable layer. (Note 9)

8.4 After completion of the finish rolling, ten test points within the control strip shall be selected. Test points will be selected by use of a random number table for both longitudinal and transverse location.

8.5 At each test point, obtain gauge response for both moisture and density. Rotate gauge at least 90° over the same center point and obtain equal time readings for both moisture and density. All twenty moisture and density readings must be obtained on the same day that the control strip was constructed. Delays due to rain showers or equipment malfunction will void the control strip; also, delays due to rain showers which increase the moisture content by more than one (1) percent will void the control strip.

8.6 Convert the mean readings into lbs/ft^3 (kg/m^3) for both moisture and density from calibration supplied with the testing device.

8.7 Convert to dry density and percent moisture. (Note 10)

Note 10: Calculations for dry density and percent moisture are located in test method ALDOT-222.

ALDOT-227-92
QUALITY CONTROL OF PORTLAND AND BLENDED HYDRAULIC CEMENTS

1. Scope

1.1. The control of the quality of all portland and blended hydraulic cements used on Federal Aid and State Highway projects is the responsibility of the Testing Division of the Bureau of Materials and Tests. The basic principles of the testing program shall be as follows:

1.1.1. All materials used must be from approved sources as listed in the “Department's Materials, Sources, and Devices with Special Acceptance Requirements” manual.

1.1.2. In order to be listed in the “Materials, Sources, and Devices with Special Acceptance Requirements” List I-2, a producer must meet certain minimum criteria specified by the Alabama Department of Transportation.

1.1.3. All sources listed in the Approved Sources List will be visited and materials sampled by Alabama Department of Transportation personnel on an annual basis.

1.1.4. Samples for the Independent Assurance Samples & Tests (IAS&T) Program will be taken from material delivered to projects.

1.1.5. The only blended hydraulic cement acceptable is type 1P conforming to Section 815 of the Department's Standard Specifications.

2. Requirements for Approved Sources

2.1. Approved cement producers must have an effective Quality Control Plan. The Quality Control Program shall be sufficient to insure that the finished product possesses uniform characteristics fully within the specifications. The Quality Assurance Program shall provide test results showing bona fide characteristics of materials produced.

2.2. The Quality Control and Quality Assurance Programs shall be reviewed and approved by the Alabama Department of Transportation. The Quality Assurance Program shall include but not be limited to the following:

2.2.1. Sampling

2.2.1.1. Cement samples should be taken every two hours for analysis. The sample may be secured by either the grab or the continuous method.

2.2.1.2. Every 24 hours the samples taken every 2 hours should be composited for complete analysis.

2.2.2. Analysis of Sample

2.2.2.1. Before testing, samples shall be passed through a No. 20 Sieve (850 µm sieve) in order to mix the sample, break up lumps, and remove foreign materials.

Foreign materials and hardened lumps that do not break up on sieving or brushing shall be discarded. The cement shall be stored in airtight, moisture-proof containers to prevent aeration or absorption of moisture prior to testing.

2.2.2.2. All tests should be performed according to AASHTO M-85 Specifications for Low Alkali Cement.

2.2.2.3. Every two hours run a Blaine Fineness Test on the cement sample.

2.2.2.4. Every four hours run a Blaine Fineness Test and Oxide Test on the cement sample.

2.2.2.5. Every 24 hours run a complete physical and chemical analysis on the composited cement sample.

2.2.3. A complete physical analysis consists of the following tests: Normal Consistency, Autoclave Expansion, Vicat or Gillmore Setting Time, Air Content of Mortar, C-109 Cubes for one, three, and seven day compressive strength, and Blaine Fineness.

2.2.4. A complete chemical analysis consists of the following tests: Silicon Dioxide, Aluminum Oxide, Ferric Oxide, Calcium Oxide, Magnesium Oxide, Sulfur Trioxide, Loss on Ignition, Insoluble Residue, Sodium Oxide, Potassium Oxide, Tricalcium Silicate, Tricalcium Aluminate, Dicalcium Silicate, and Total Alkali as Sodium Oxide.

2.2.5. Composite test samples for the physical and chemical tests shall be prepared by arranging all individual samples in a group. Each group shall represent no more than the number of barrels of that type cement produced in a 24-hour period. From each of the individual samples in a group, equal portions, sufficient in amount to form a composite sample large enough to permit making the required mill physical and chemical analysis and a 20 pound (9kg.) companion sample shall be taken. The composite test samples thus prepared shall be thoroughly mixed before separation of the mill test sample and the Alabama Department of Transportation companion sample. The test sample and companion sample thus prepared shall be identified with the date secured.

3. Certification and Standardization

3.1. Every year balances shall be checked and verified.

3.2. Every year the compression machine shall be calibrated.

3.3. Every two years the laboratory should be inspected by the Cement and Concrete Reference Laboratory.

3.4. All Cement Mill laboratories shall participate in the CCRL Proficiency Samples Program.

4. Quantity Represented By Test Samples

4.1. The quantity represented by the test sample and the companion sample shall be all of that type cement produced in no more than one 24-hour period or any produced in a portion of this period.

5. Amount of Testing

5.1. Portland Cement

5.1.1. All chemical and physical tests required by "Specifications for Portland Cement", AASHTO Designation M-85 for Low Alkali Cement shall be conducted on every test sample and shall include the alkali content and Insoluble Residue Test. Deletion of specific tests or a reduction in the testing rate for a specific test must be approved by the Materials and Tests Engineer.

5.2. Type 1P (fly ash only) Cement

5.2.1. All chemical and physical tests required by the Standard Specifications for Blended Hydraulic Cements, ASTM C-595 (as modified by this document) for Type 1P cement shall be conducted on every test sample and in addition the alkali content. Deletion of specific tests or a reduction in the testing rate for a specific test must be approved by the Materials and Tests Engineer.

5.3. Fly Ash

5.3.1. All tests, except shrinkage, required by Section 806, Fly Ash, Alabama Department of Transportation Specifications, will be conducted on a monthly basis when fly ash is obtained from the same source, unless the type of coal (chemical composition) has radically changed at which time tests will be performed at a frequency specified by the materials and tests engineer.

5.3.2. Tests will be conducted on a new source of fly ash before it is used in the production of 1P cement.

5.4. Cement producers must provide cement samples representative of their production to the Central Laboratory.

5.4.1. Each week, one 10 lbs (5 kg) portion of one of the companion samples of cement prepared in accordance with the above paragraph will be delivered to the Department's Central Laboratory. This mill sample shall be selected from the preceding seven-day period by an approved method of random selection devised by the manufacturer.

5.4.2. The samples should not be selected by a fixed predetermined day of the week.

5.4.3. At least a 10 lbs (5 kg) portion of the remaining companion samples must be retained at the mill laboratory for 90 days. Fly ash samples will be submitted monthly to the

Central Laboratory and also when the chemical composition or source changes as outlined in Section 5.3.

5.5. Identification cards or tags must accompany each sample and contain the following information:

5.5.1. Cement producer

5.5.2. Mill location

5.5.3. Type of cement or fly ash

5.5.4. Date of production represented by sample of cement or date fly ash was sampled

5.5.5. Sample identification number

5.5.6. Source of fly ash, if applicable

5.5.7. Samples will be shipped "Prepaid" to:
Alabama Department of Transportation
Bureau of Materials and Tests
3704 Fairground Road
Montgomery AL 36110

5.5.8. If there is no cement of the specified type produced during a seven day period, notification should be provided to the Central Laboratory by mail.

5.6. Approved cement producers shall have facilities where all materials and production records can be reviewed by the Department periodically.

5.7. Records of all test values shall be maintained at the mill laboratory and available for inspection by representatives of the Alabama Department of Transportation, Bureau of Materials and Tests.

5.8. Approved cement producers shall furnish certain data to the Department.

5.8.1. Each month a list of the dates of production of the type of cement to be furnished with the corresponding test results for each of the composite test samples will be delivered to the Materials and Tests Engineer.

5.8.2. The test values must be a tabulation of individual values and not averaging values. If the producer statistically analyzes any of the test values, these parameters would be of interest to the Department.

5.8.3. The required test values and any available statistical analysis should be forwarded to:
Alabama Department of Transportation
Materials and Tests Engineer
Attention: Concrete Section

3704 Fairground Road
Montgomery AL 36110

5.9. Approved producers shall have an acceptable record of comparison between mill sample test results, record sample test results, and producer test results. All results shall meet "Specifications for Portland Cement", AASHTO Designation M-85 for Low Alkali Cement.

5.10. Cement producers must warrant that the cement furnished and used in Department projects will meet the Department specifications for the type cement furnished.

5.11. Approved cement producers must have an acceptable record of production of material exhibiting uniform characteristics within the specifications.

5.12. Upon request, the cement producer will be required to submit to the Materials and Tests Engineer a current list of those ready mix plants and locations which have been furnished bulk cement that is acceptable for use and may be used in Alabama Department of Transportation projects.

5.13. Approved producers shall have a testing laboratory properly equipped to perform all required tests and shall further participate in the Cement and Concrete Reference Laboratory (CCRL) Proficiency Sampling Program.

6. Use of Material

6.1. Approved Sources

6.1.1. Project Engineers may allow use of material from approved sources without further testing provided they ensure that such shipments are from sources shown on the Approved Sources List. If material used on this basis later fails mill or IAS&T tests, notification will be given to the Project Engineer by the Materials and Tests Engineer and he/she shall discontinue use of this material until further notice.

6.1.2. If the Project Engineer, for any reason, suspects non-uniform or non-specification material he/she may, at his/her option, submit samples to the Central Laboratory for tests and not use the material until it has been determined whether or not the material meets the specification requirements.

7. Documentation

7.1. Approved Sources

7.1.1. The cement producer shall complete part 1 of the Form BMT-114 for each shipment of cement. The Certified Concrete Batcher/Technician shall complete part 2 of the Form BMT-114 ensuring the source of the cement is clearly identified.

7.1.2. A copy of the BMT-114 will be retained by the Division Materials Engineer, who will be responsible for the documentation of all field records.

7.1.3. A copy of the BMT-114 will be forwarded for verification to the Testing Engineer, Bureau of Materials and Tests. No verified copies will be returned to the field. Unless otherwise notified by the Materials and Tests Engineer, the material represented by this test report may be accepted for full payment. In the event failure of IAS&T samples or mill samples occurs to the extent that an adjustment is necessary, notice will be given to the Division Engineer by the Materials and Tests Engineer.

7.1.4. All projects served by the concrete plant should be listed on every BMT-114.

7.1.5. In case of conflict of documentation, central file records will govern.

8. Approved Sources List

8.1. General

8.1.1. The Bureau of Materials and Tests will publish and maintain an approved list of sources of cement producers in the Department's "Materials, Sources, and Devices with Special Acceptance Requirements" manual. As sources are added or taken from the list, notice will be given by letter. The list will designate the name of the company, location of the approved mill and terminals, and any other data considered pertinent.

8.2. New Sources

8.2.1. These sources of cement desiring to be added to the Approved Sources List should make application in writing to the Materials and Tests Engineer. The request should include the following items:

8.2.1.1. A manufacturer's guarantee stating that all material furnished for use in Alabama Department of Transportation projects is warranted to meet the specifications. This guarantee shall be signed by a responsible officer of the company with authority to bind the company to contract and shall be notarized. An example of such a guarantee is as follows:
The undersigned certifies that all the cement to be furnished by (cement producer) from (mill location) for use on Highway projects in the Alabama Department of Transportation has been manufactured under strict quality control and will meet "Specifications for Portland Cement", AASHTO Designation: M-85 for Low Alkali Cement or Standard Specifications for Blended Hydraulic Cements, ASTM C-595 (as modified by ALDOT 227), depending on the type of cement shipped and that all tests are performed in accordance with the latest AASHTO or ASTM standard methods. (Cement producer) agrees to have the mill and mill laboratory checked at regular intervals by a representative of the Alabama Department of Transportation, Bureau of Materials and Tests. (Cement producer) will comply with ALDOT 227, "Quality Control of Portland and Blended Hydraulic Cements", for

cement mills listed as "Approved Sources of Portland and Blended Hydraulic (Type 1P) cements".

8.2.1.2. An outline of the producer's quality control sampling and testing procedures and of the Quality Assurance Sampling and Testing Program.

8.2.1.3. A brief discussion of materials to be marketed and their sources. This need not be detailed but should state where the material is manufactured and where stored or terminated.

8.2.2. Upon receipt of such a request an inspection of the plant will be scheduled by the Testing Division. At the time of the inspection, the facilities of the plant including the testing and quality control facilities will be reviewed and samples of materials will be taken. If the inspection of their facilities and testing procedures indicates the ability to consistently furnish material of uniform characteristics conforming to the specifications, the source will be added to the list.

8.3. Removal from the Approved Sources List

8.3.1. The Department reserves the right to remove any source from the Approved Sources List at any time confidence is lost in a producer's ability or intention to produce material of uniform characteristics complying with the specifications.

8.4. Reinstatement to the Approved Sources List

8.4.1. Once removed from the Approved Sources List, a source may gain reinstatement in the following manner: Supplier should make a written request to the Materials and Tests Engineer asking to be reinstated to the Approved Sources List. The request should detail the causes and solution to the problem areas which caused removal from the Approved Sources List. In addition, the supplier should state measures taken to prevent reoccurrence of problems.

8.4.2. If, after review of the request for reinstatement, it is evident that all problems have been solved, an inspection of facilities will be made and all material in stock will be sampled.

8.4.3. If, after examination of data gained from subparagraph 1 and 2 above, the Materials and Tests Engineer feels it advisable, the supplier may be reinstated to the Approved Sources List. In some cases, extenuating circumstances may warrant conditional reinstatement.

9. Inspections

9.1. Unscheduled visits will be made to all producers periodically by inspectors from the Alabama Department of Transportation. The producer's testing, Quality Assurance and Quality Control Programs will be reviewed and materials being produced or stored will be sampled.

10. Travel Costs and Expenses

10.1. All out of state producers whose mills are located more than eight hours travel by automobile or cannot be accessed by automobile from the Department's Central Laboratory will be required to pay for the Department's per diem and transportation. This will apply for initial inspections, annual inspections or at anytime deemed necessary by the Department. Cost shall include meals, lodging, air fare, and vehicle rental cost if required, and for mileage rates if a Department vehicle is used. Should multiple sources be evaluated/inspected on the same trip, all costs will be proportionally divided.

10.2. All costs as mentioned above shall be borne by the producer(s). Payment for expenses shall be made by check, payable to the Alabama Department of Transportation prior to any visit or inspection.

10.3. Checks shall be submitted to:
Materials and Tests Engineer
3700 Fairground Road
Montgomery AL 36110

11. Alabama Department of Transportation Testing

11.1. Sample types

11.1.1. Independent Assurance Samples and Tests (IAS&T) - These are samples taken by the IAS&T-D personnel from the Divisions from each of the project sites on a monthly basis when concrete operations are in progress.

11.1.2. Companion Mill Samples - These are samples submitted by the mill or facility to the Central Laboratory as outlined previously in Section 5.4.

11.1.3. Stock samples - These samples will be taken by inspectors from the Alabama Department of Transportation on periodic visits to the mills or terminals.

11.2. The degree of testing for each sample taken by or submitted to the Central Laboratory will be dependent on several factors and will be left to the discretion of the Testing Engineer. In the absence of other instructions from him, a guide for testing shall be as follows:

11.2.1. Independent Assurance Samples and Tests (IAS&T) - These monthly samples which will arrive at the Central Laboratory throughout the month will be assembled by source (cement mill) on a weekly basis. At least one sample will be randomly selected from each source and a complete analysis will be conducted on that sample.

11.2.2. Companion Mill Samples - A complete analysis will be performed on samples from each approved source biweekly except that fly ash samples will be tested monthly.

11.2.3. Stock Samples - Instructions for testing stock samples will be shown on the sample card submitted with the sample.

12. Distribution Points

12.1. Storage terminals shall be considered as an extension of the mill storage facilities. Material from approved or non-approved sources stored at distant terminals will not be mixed or placed in the same cement storage compartment with different brands of cement, or the same brand of cement, but from different mills.

12.2. Cement producers must submit to the Materials and Tests Engineer the names of current employees who are responsible weighmen of the company at all bulk loading facilities that deliver cement for use on Alabama Department of Transportation projects.

12.3. For soil-cement construction and cement stabilized graded aggregate construction:

12.3.1. Each portland or blended hydraulic (Type 1P) cement shipment shall be supported by a validated delivery ticket which must be signed by "a responsible employee of the plant or producer". The following statement must be placed on each ticket by the cement producer:

12.3.1.1. (Name of cement manufacturer) certifies that the weights shown on this ticket are correct.

Signed ____
(Signature of cement manufacturer employee responsible for weighing)

12.3.2. An Alabama Department of Transportation seal shall be placed on the discharge cap of each unit by the cement producer after the unit is weighed. This seal shall be intact and in place upon arrival to the project. The seals shall be retained by the Project Engineer until completion of the final audit.

12.3.3. The project number and county shall be shown on the delivery ticket.

12.4. Cement producers shall show on the delivery ticket or invoice the mill source of each shipment of portland or blended hydraulic (Type 1P) cement.

ALDOT-231-73
TESTING TECHNIQUES FOR PNEUMATICALLY APPLIED CONCRETE

1. Responsibilities

1.1. The Alabama Department of Transportation will provide the cylinder molds upright and concentric during casting.

1.1.1. The 6 in (150 mm) x 12 in (300 mm) cylinder molds shall be fabricated from ½” (13 mm) mesh hardware cloth in accordance with the design shown in Appendix A.

1.1.2. The device or restraining frame for holding the mold-cylinder shall be constructed in accordance with the design criteria depicted in Appendix B.

1.2. The contractor will place the concrete in the molds. Project personnel will cut and screed the cylinders at the appropriate time.

2. Frequency Of Testing

2.1. Three 28 day cylinders will be made every other day and at other times deemed necessary by the project engineer.

3. Consistency

3.1. Air pressure will remain the same in cylinder production as in the actual work.

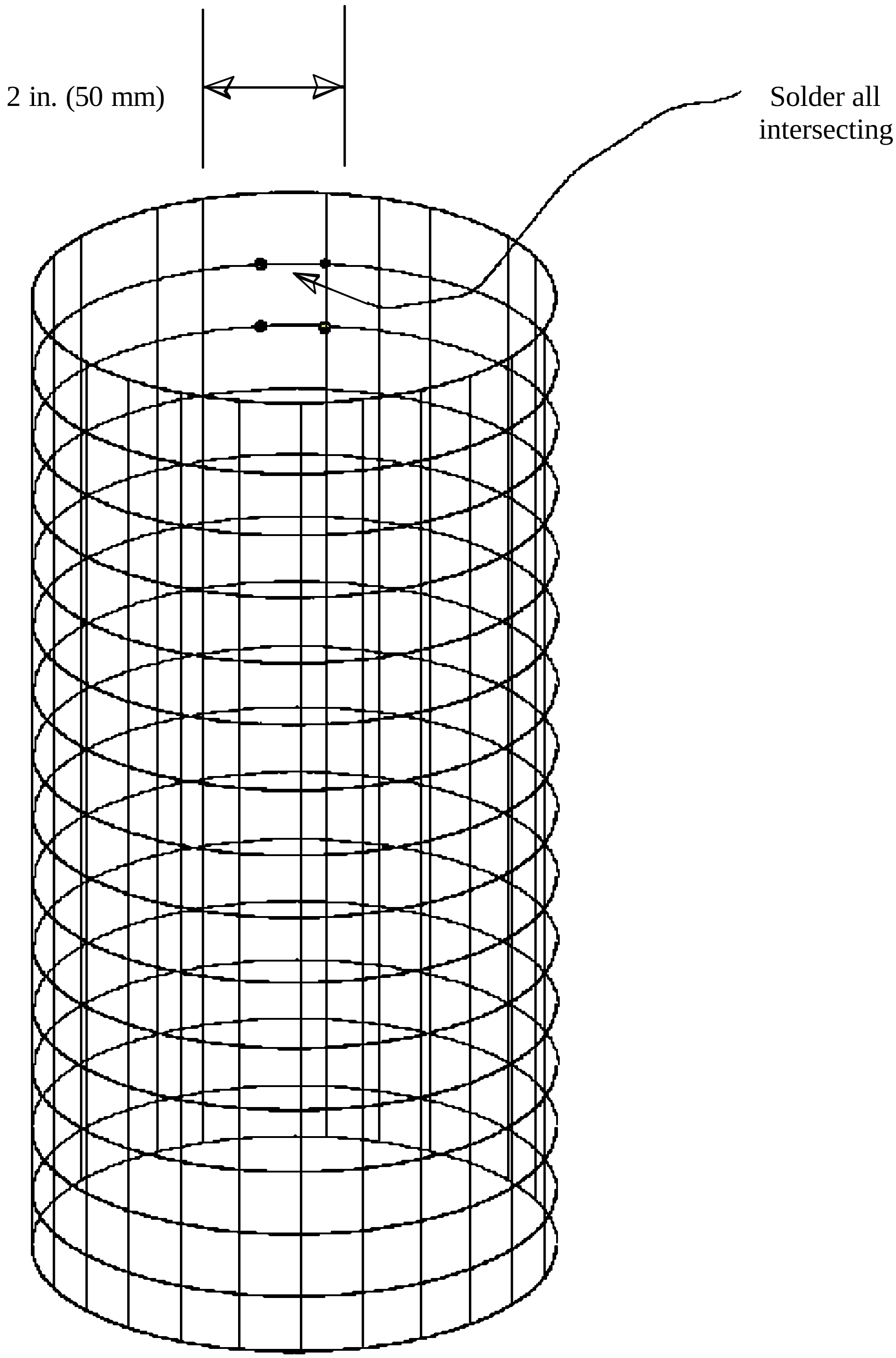
3.2. Test cylinders will be cast by the same technique throughout the entire job unless changes are ordered in writing by the engineer.

4. Handling

4.1. Cylinders shall be carefully cut and screeded using a trowel after initial set, normally about two hours.

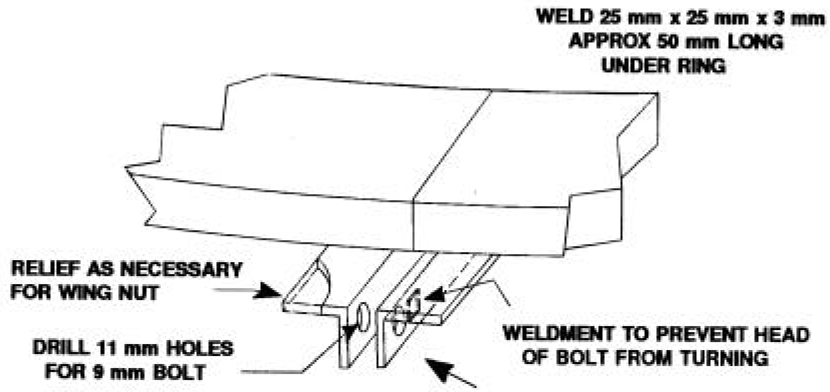
4.2. After cutting and screeding, the cylinders shall be cured under polyethylene sheeting until time for stripping.

4.3. After 24 ± hours, the cylinders will be placed on a sand cushion and the wire mesh stripped, taking precautions not to damage the cylinders. Cylinders will be shipped to the Division or Central Laboratory for moist curing.

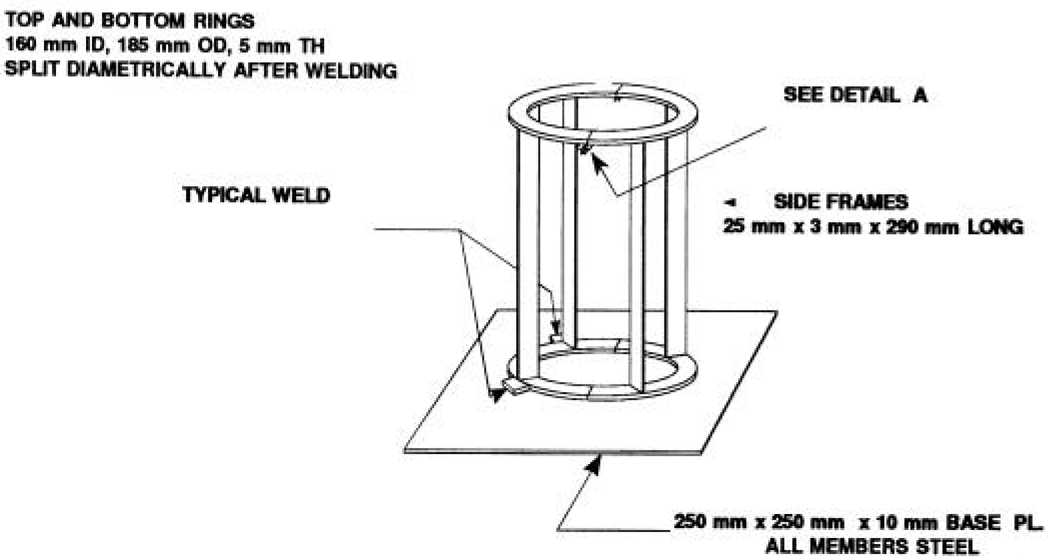


6 in. (150 mm) ID X 12 in. (300 mm) Height
1/2 in. (13 mm) Hardware Cloth Cylinder
Edges Overlapped 2 in. (50 mm) & Securely Soldered

Appendix A



DETAIL A--CLAMPING EARS



PNEUMATICALLY APPLIED CONCRETE
CYLINDER RESTRAINING FRAME

Appendix B

ALDOT-232-74A
MODIFICATION OF AASHTO T-89

1. Scope

1.1. The purpose of this test is to modify the AASHTO T89 test procedure to conform to particular characteristics inherent in base and subbase type soils and fine aggregate proposed for use in bituminous plant mixes which have a plasticity index of 10 or less. Therefore, in order to accommodate the testing of these low plasticity index materials, the following verbiage shall replace Note 4 in its entirety, which immediately follows Section 5.3 in the Method A Procedure portion of T89:

Some soils tend to slide on the surface of the cup instead of flowing. If this occurs, more water should be added to the sample and remixed, then place the soil water mixture in the cup. Then cut a groove with a grooving tool and repeat Section 5.2, Method A, T-89 is repeated. If, after several trials at successively higher water contents, the soil continues to slide in the cup or if the number of blows required to close the groove is always less than 25, (i.e., repeated attempts made to obtain the range of shocks as outlined in 5.6 have not been successful) the following procedure will be utilized. The first point determined shall be the dry side point and shall not be less than ten (10) blows. The wet point shall not be less than two (2) blows. If possible, there shall be three (3) points in which the number of blows is determined to extrapolate for the LL. There shall be a minimum space of at least three (3) blows between points where three (3) points are determined and a minimum of six (6) blows when only two (2) points are determined. The moisture in the dry side point may be adjusted at the beginning of the test by adding dry material or water as needed to prevent sliding in the cup at ten (10) or more blows. If the sample continues to slide at ten (10) or more blows after the moisture adjustment, report the soil as non-plastic without performing the plastic limit test.

ALDOT-239
METHOD OF SAMPLING AND TESTING RIPRAP STONE
(CLASSES 1- 5)

1. Scope

1.1. This test method covers the procedure for determining the specified percent of various sizes of riprap stone.

2. Applicable Documents

2.1. Alabama Department of Transportation Standard Specifications.

3. Apparatus

3.1. Dump truck with body in good condition.

3.2. Scales capable of weighing the loaded truck being used.

3.3. Approved portable platform scales with a capacity of 1000 lbs, (500 kg).

4. Sampling

4.1. A representative sample consisting of a truckload of stone shall be obtained.

5. Procedure

5.1. Select a truckload at random.

5.2. Weigh and record the truck loaded.

5.3. Dump the truckload of stone on a clean area. Physically separate the pieces of stone so that the various sizes to be checked may be easily recognized.

5.4. By trial weights, select and sort into three (3) separate piles, the following size pieces:

5.4.1. Pieces that weigh less than 10 lbs. (5 kg).

5.4.2. Pieces that weigh more than 80 lbs (40kg) but less than 200 lbs. (100 kg).

5.4.3. Pieces that weigh more than 200 lbs (100 kg).

5.5. Obtain the tare weight of the empty truck and record.

5.6. Place in the truck those pieces that weigh less than 10 lbs. Weigh and record. (Total wt. minus the tare wt.)

5.7. Place in the truck those pieces that weigh more than 80 lbs. (40 kg) but less than 200 lbs. (100 kg) Weigh and record. (Total wt. minus the tare wt.)

5.8. Place in the truck those pieces that weigh more than 200 lbs. (100kg). Weigh and record. (Total wt. minus the tare wt.)

6. Calculations

6.1. Calculate the percent of specified sizes where:

6.1.1. "A" = Total weight of those pieces weighing less than 10 lbs. (5 kg).

6.1.2. "B" = Total weight of those pieces weighing more than 80 lbs. (40 kg) but less than 200 lbs. (100 kg.)

6.1.3. "C" = Total weight of those pieces weighing more than 200 lbs. (100 kg.)

6.1.4. "D" = Total weight of the sample being tested.

6.1.5. Percent of sample weighing less than 10 lbs. (5kg.)

$$\frac{A}{D} X\ 100$$

6.1.6. Percent of sample weighing more than 80 lbs. (40 kg) but less than 200 lbs. (100 kg.)

$$\frac{B}{D} X\ 100$$

6.1.7. Percent of sample weighing more than 200 lbs. (100 kg.)

$$\frac{C}{D} X\ 100$$

7. Reporting

7.1. Report the test results on form BMT-16.

ALDOT-240-74
DETERMINATION OF MOISTURE CONTENT IN MULCHING MATERIALS

1. Scope

1.1. This method of test establishes a procedure for determining the moisture content of mulching materials such as hay, straw, grass, sawdust, wood chips, peanut hulls, pecan hulls and similar materials.

2. Apparatus

2.1. The testing apparatus shall consist of the following:

2.1.1. Balance - The balance or scales shall have a capacity of at least 1000 g, readable to 0.1 g and with an accuracy of at least ± 0.2 g.

2.1.2. Oven - A vented, thermostatically controlled, adjustable electric oven with a maximum of 284°F (140°C) accurate within ± 5°F (3°C) large enough to contain a 8 in. x 10 in. x 2 in. (200 mm x 250 mm x 50 mm) pan.

2.1.3. Pan - A drying pan with dimensions 8 in. x 10 in. x 2 in. (200 mm x 250 mm x 50 mm).

Note: Other size pans will be permissible provided they may be contained in the drying oven.

3. Size of Sample

3.1. The size of sample shall be governed by the maximum size of particles shown in the following table:

Table 1
Size of Sample

Nominal maximum size of particles passing sieve Inch (mm)	Minimum weight of sample for moisture test g
3 in. (75 mm)	1000
2 in. (50 mm)	750
1 in. (25 mm)	500
½ in. (12.5 mm)	350
3/8 in. (9.5 mm)	300
No. 4 (4.75 mm)	250
No. 8 (2.36 mm)	200

4. Sample Preparation

4.1. Reduce sample as received to the size required in Step 3.1.

4.2. This may be done by using a Riffle or by quartering using AASHTO T-248.

5. Procedure

5.1. Weigh and record the wet weight of the prepared sample. Place sample in pan and then into oven. Open the vents on the oven approximately 25% and set the oven for 248° F (120°C). Allow sample to remain in oven for at least 12 hours.

5.2. Remove sample from oven, weigh and record.

5.3. Return sample to oven and allow to remain at 248°F (120°C) for two hours.

5.4. Remove sample from oven and weigh. If the weights of the dried sample in Steps 5.3 and 5.2 are the same, then the test is complete. If the weight in Step 5.3 is less than that obtained in Step 5.2, the sample must be re-turned to the 248°F (120°C) oven setting and allowed to remain for two hours. Repeat steps 5.2 and 5.3 until a constant weight is obtained.

6. Calculations

6.1. Moisture Content = $\frac{A-B}{B} \times 100$

Where
A = wet weight of sample in grams
B = dry weight of sample in grams

7. Reporting

7.1. Report test results on Form BMT-16.

ALDOT-243-84
ACCEPTANCE PROGRAM FOR ASPHALT MATERIALS

1. Scope

1.1. The purpose of this procedure is to establish a uniform set of guidelines for the acceptance by the Department and quality control by a supplier of asphalt materials and establish guidelines for training and certification of both technicians and laboratories involved with the testing of these materials. The procedure outlines accepted methods to be followed by the Project Engineer, Prime Contractor and Supplier. This procedure applies to all suppliers of asphalt materials for projects in Alabama. Participation in the AMRL Proficiency Sampling Program with periodic inspection by ALDOT personnel is required and will enhance a laboratory's ability to meet those requirements described herein.

2. Definitions

2.1. Asphalt Materials - Pertains to performance graded asphalt binders, asphalt cements, cutback asphalts, and asphalt emulsions. Modified asphalt products where additives, polymers, and related products are added at the supplier's facility will also be considered under this term.

2.2. Liquid Asphalt Binder -Performance Graded Asphalt Binders.

2.3. Department - Alabama Department of Transportation (ALDOT).

2.4. Bureau - Bureau of Materials and Tests.

2.5. Materials and Tests Engineer - The Chief of the Bureau of Materials and Tests.

2.6. Supplier - This term includes individual refineries and terminals supplying asphalt materials for Department projects. Each facility will be treated as a separate entity even when owned by the same parent company. There are two levels of supplier: (1) Refinery (or Manufacturer) and (2) Terminal (a storage/shipping and/or pass through point). It is possible for a single supplier to be both a refinery and a terminal as defined in paragraph 2.7 and 2.8.

2.7. Refinery - An industrial facility that refines asphalt petroleum crudes to produce liquid asphalt binders, or for the purposes of this procedure, a facility that manufactures a product (i.e. asphalt emulsions, asphalt cutbacks) by blending or milling of liquid asphalt binder will be considered a refinery. A facility that modifies asphalt products (liquid asphalt binders, cut-backs, emulsions) by the addition of polymers, or other additives other than liquid anti-strip, or creates a third liquid asphalt binder by blending two (2) other liquid asphalt binders, is included as this level of supplier.

2.8. Terminal - A facility that is used primarily for the storage of and shipping point for asphalt materials. The addition of an anti-stripping agent is the only modification allowed at a terminal. Terminals owned by an approved parent company or refinery are considered subsidiary laboratories.

2.9. BMT -164 - "Participation Agreement" form. Executed between the Department and suppliers of asphalt materials. Supplier agrees to abide by Departmental requirements and the Department in-turn allows the supplier to sell products for Department projects.

2.10. BMT -146 - "Asphalt Material Certificate of Compliance" form. Supplier executes form with each shipment slated for Department projects verifying compliance with Department specifications and procedures. This form serves as project acceptance certificate.

2.11. BMT -168 - "Notification to Suspend Shipment of Asphalt Material." The Department will execute this form when asphalt materials fail to meet Department specifications and/or supplier fails to follow Department specifications and/or procedures.

2.12. IAS&T-D - Independent Assurance Sampling and Testing-Division function. It is an internal, independent check on the Department's sampling, testing, and acceptance programs.

2.13. AMRL - AASHTO's Materials Reference Laboratory (AMRL) proficiency testing program allows individual laboratories to compare their results to a national average to determine if potential problems exist in their operation.

2.14. AASHTO R18 - Procedure for Establishing and Implementing a Quality System for Construction Materials Testing Laboratories.

2.15. BBR - Bending Beam Rheometer - Determines the flexural creep stiffness of asphalt binders.

2.16. DSR - Dynamic Shear Rheometer - Determines the linear viscoelastic properties of asphalt binders.

2.17. PAV - Pressure Aging Vessel - Accelerates aging of asphalt binders.

2.18. DT - Direct Tension- Determines fracture properties of asphalt binders.

2.19. RTFO - Rolling Thin Film Oven - Measures the effect of heat and air on a moving film of semi-solid asphaltic material.

2.20. FTIR – Fourier Transform Infrared Spectrophotometer

2.21. Central Laboratory - The liquid asphalt laboratory of the Bureau of Materials and Tests located at 3704 Fairground Road, Montgomery, AL 36110.

2.22. Subsidiary Laboratory - A laboratory located at a terminal owned by an approved parent company or refinery.

2.23. Category "B" Technician - A certified technician who performs tests on cutback asphalts as required by Table I, Cutback Asphalts.

2.24. Category "C" Technician - A certified technician who performs tests on emulsified asphalts as required by Table I, Cationic Emulsions.

2.25. Performance Graded Asphalt Binder (PGAB) Technician Level I - A certified technician who performs tests on performance graded asphalt binders at refineries as required by Table I, Performance Graded Asphalt Binders.

2.26. Performance Graded Asphalt Binder (PGAB) Technician Level II - A certified technician who performs high temperature tests on performance graded asphalt binders at a terminal as required by Table I, Performance Graded Asphalt Binders.

Table I

METHODS OF TESTS		
Material	**Test**	**Method to Use**
Performance Graded Asphalt Binder	Flash Point, (COC), °F°C	AASHTO T48
	Viscosity, (Brookfield)	AASHTO TP48
	Dynamic Shear Rheometer (DSR)	AASHTO TP5
	Rolling Thin Film Oven (RTFO)	AASHTO T240
	Loss on Heating, %	AASHTO T47
	Flexural Creep Stiffness (BBR)	AASHTO TP1
	Accelerated Aging Using Pressure Aging Vessel (PAV)	AASHTO PP1
	Direct Tension Test (DTT) **	AASHTO TP 3
	Polymer Content (FTIR) *	ALDOT 408-01

* FTIR results will be submitted on all Polymer Modified Binders quarterly or upon request of the Department.

** DTT results will be submitted on all Polymer Modified Binders quarterly or upon request of the Department.

Table I (continued)

METHODS OF TESTS		
Material	**Test**	**Method to Use**
CATIONIC	Viscosity, Saybolt Furol at 25°C, s	AASHTO T59
EMULSION	Viscosity, Saybolt Furol at 50°C, s	AASHTO T59
	Storage Stability Test, 24-hr, %	AASHTO T59
AASHTO	Demulsibility, 35 ml 0.8%	AASHTO T59
T59	Sodium Dioctyl Sulfosucinate, %	AASHTO T59
(ASTM	Classification Test	AASHTO T59
D2444)	Particle Charge Test	AASHTO T59
	Sieve Test, %	AASHTO T59
	Distillation:	
	Oil Distillate, by Volume of Emulsion, %	AASHTO T59
	Residue, %	
	Tests on Residue from Distillation Test:	
	Penetration 25°C, 100 g, 5 s	AASHTO T49
	Ductility, 25°C, 5 cm/min, cm	AASHTO T51
	Solubility in Trichlorethylene, %	AASHTO T59
CUTBACK	Kinematic Viscosity at 60°C	AASHTO T201
ASPHALT	Flash point (Tag, open-cup), °C	AASHTO T79
	Water, %	AASHTO T55
AASHTO	Specific Gravity	AASHTO T82
M-81	Distillation Test:	AASHTO T78
(RAPID	Distillate, Percentage by Volume of Total Distillate to	
CURING)	360°C, %	AASHTO T78
	Residue from Distillation to 360°C, Volume	
AASHTO	Percentage of Sample by Difference, %	
M-82	Tests on Residue from Distillation:	
(MEDIUM	Absolute Viscosity at 60°C, Poises	AASHTO T202
CURING)	Ductility, 5 cm./min. at 25°C, cm	AASHTO T51
	Solubility in Trichlorethylene, %	AASHTO T44

Note 1: Other tests may be required at the discretion of the Materials and Tests Engineer.

Note 2: All samples forwarded to the Department will be accompanied by a Certificate of Analysis if from a manufacturing facility on the appropriate BMT Form.

Note 3: All testing and equipment will be in compliance with the methods listed in Table 1.

3. Qualification Program for Supplier

3.1. The Department will establish and maintain a list (I-4, "Materials, Sources, and Devices with Special Acceptance Requirements" manual) of suppliers presently complying with this procedure. Suppliers must be on this list in order to sell their product for Department projects.

3.2. Suppliers desiring to be placed on this list must submit a request along with any applicable fees, as out-lined in the "Materials, Sources, and Devices with Special Acceptance Requirements" manual. The Department will make an initial inspection of the facility to determine compliance with the minimum standards as outlined in Department specifications and those listed in this procedure.

3.3. Suppliers must comply with the following in order to sell to Department projects.

3.3.1. Each supplier shall execute a "Participation Agreement" form (BMT -164). This agreement must be executed by an officer of the company who has responsibility for the overall operation of the facility and/or selling of the product for Department projects.

3.3.2. Each supplier must furnish, equip, and staff a laboratory meeting the requirements of Section 9 capable of testing, within precision statement tolerances as defined in applicable ASTM or AASHTO test procedures, all the required parameters listed in Table I for each different type of material supplied (i.e. performance graded asphalt binders, asphalt cements, asphalt emulsions, or cut-back asphalt) and furnish the Department with a written Quality Control Plan. An acceptable Quality Control Plan should include what steps will be taken in case of equipment problems, loss of certified technician, etc. Exceptions may be allowed, with approval of the Materials and Tests Engineer for research, experimental projects, equipment problems, FTIR testing, personnel problems, etc., on a project-by-project basis.

3.3.3. All testing by the supplier must be performed by technicians that have been certified by the Department as described in Section 10 or by technicians under the direct supervision of a Department certified technician. In addition, all testing must be done in a laboratory certified by the Department. The laboratory shall be located at site of the facility. However, with written approval of the Materials and Tests Engineer, the testing laboratory may be located at a site other than the facility site.

Note! All suppliers of asphalt materials that are participating in this program and not addressed in Section 3.4 must participate in the AMRL Proficiency Sampling Program with periodic inspection of the facilities by Bureau personnel.

3.3.4. The supplier shall furnish the following documents and materials to the Department:

3.3.4.1. The supplier shall furnish an original white copy of the BMT -146 to the Testing Engineer on a weekly basis for each load of asphalt materials shipped.

3.3.4.2. All shipments of asphalt materials to the project or contractor's plant shall be accompanied by a BMT -146 (yellow copy).

3.3.4.3. A current full analysis (all required parameters), for each grade of asphalt materials shipped, shall be furnished to the Department's Central Laboratory each week.

3.3.4.4. A full FTIR analysis shall be performed on all Polymer Modified Binders quarterly or upon request of the department in accordance with ALDOT 408.

3.3.4.5. When a supplier ships to Department projects, one verification sample per grade, per week, shall be shipped to the Department Central Laboratory. These samples are to be obtained from the supplier's storage tank (See Table II).

3.3.4.6. Supplier laboratories will submit a copy of all AMRL proficiency reports to the Bureau for review.

3.3.5. All testing shall be in accordance with the current ASTM, AASHTO, or ALDOT procedures, as specified in the Department Specifications.

3.4. Special Exceptions for Terminal Suppliers

3.4.1. Any terminal receiving performance graded asphalt binder from an approved refinery shall perform high temperature tests which includes DSR, RTFO, Brookfield Viscometer and Cleveland Open Cup Flash Tests. Low and intermediate temperature testing which includes DSR, PAV, and BBR tests are also required; but may be performed at an off-site location.

3.4.2. Any terminal receiving asphalt materials from a refinery that is not approved by the Department, shall meet all refinery testing requirements.

3.5. The inspection by the supplier of transporting vehicles, tank cars, etc., shall be required as stated in the BMT -146. This inspection shall include all vehicles, tank cars, etc., whether owned by the suppliers, contractor, or common carrier.

3.6. Periodic and unannounced inspections will be made at the supplier's facility by Department inspectors. The supplier will allow the inspector free access to all test records, production, storage, testing facilities, and shipping documents showing quantities of asphalt and additives loaded on transports.

Table II

SAMPLES AND TESTS PROVIDED TO ALDOT BY EACH SUPPLIER UNDER NORMAL CONTROL						
	Manufacturer or Refinery (Complete Analysis)			Shipping Facility (Terminal) (Surveillance)		
	Forward sample and attach certificate of its analysis as given below.			Forward sample with its test results on appropriate BMT form. Results are to be placed in REMARKS area of form.		
Material	Tests	Size of Sample	Frequency	Tests	Size of Sample	Frequency
Performance Graded Asphalt Binder	Flash Point, (COC) °C Viscosity (Brookfield Thermosel Apparatus) Dynamic Shear Rheometer (original binder) RTFO Dynamic Shear Rheometer (RTFO aged binder) PAV Dynamic Shear Rheometer (PAV aged binder) Flexural Creep Stiffness (BBR) Loss on Heating Direct Tension	Submit 1 liter (1qt.) Submit BMT-7 (Analysis)	One per week repre-senting each grade of material shipped	Flash Point, (COC) °C Dynamic Shear Rheometer (original binder) RTFO Dynamic Shear Rheometer (RTFO aged binder) Loss on Heating * Any binder material not received from an approved source must be tested same as a refinery. Low temperature testing (DSR and BBR on PAV aged material) shall be performed monthly.	Submit 1 liter (1qt.) Submit BMT-7	One per week representing each grade of material shipped

Table II (Continued)

SAMPLES AND TESTS PROVIDED TO ALDOT BY EACH SUPPLIER UNDER NORMAL CONTROL						
	Manufacturer or Refinery (Complete Analysis)			Shipping Facility (Terminal) (Surveillance)		
	Forward sample and attach certificate of its analysis as given below.			Forward sample with its test results on appropriate BMT form. Results are to be placed in REMARKS area of form.		
Material	Tests	Size of Sample	Frequency	Tests	Size of Sample	Frequency
Cationic Emulsion	Viscosity, Saybolt-Furol at 25°C, s Viscosity, Saybolt-Furol at 50°C, s Storage Stability Test, 24-hr, % Demulsibility, 35ml 0.8% Sodium Dioctyl Sulfosucinate, % Classification Test, % Particle Charge Test Sieve Test, % Distillation: Oil Distillate by Volume of Emulsion % Reside, % Tests on Residue from Distillation Test: Penetration, 25°C, 100g, 5 s, mm Ductility, 25°C 5cm/min. cm Solubility in Trichlorethylene, %	Submit 4 liters (1gaL.) Submit BMT-8 (Analysis)	One per week repre-senting each grade of material shipped			

Table II (Continued)

<table>
<tr><th colspan="7">SAMPLES AND TESTS PROVIDED TO ALDOT
BY EACH SUPPLIER UNDER NORMAL CONTROL</th></tr>
<tr><td rowspan="2"></td><td colspan="3">Manufacturer or Refinery (Complete Analysis)</td><td colspan="3">Shipping Facility (Terminal) (Surveillance)</td></tr>
<tr><td colspan="3">Forward sample and attach certificate of its analysis as given below.</td><td colspan="3">Forward sample with its test results on appropriate BMT form. Results are to be placed in REMARKS area of form.</td></tr>
<tr><td>Material</td><td>Tests</td><td>Size of Sample</td><td>Frequency</td><td>Tests</td><td>Size of Sample</td><td>Frequency</td></tr>
<tr><td rowspan="2">Cutback Asphalt</td><td rowspan="2">Kinematic Viscosity at 60°C Flash point (Tag, open-cup), °C
Water, Percent
Specific Gravity
Distillation Test:
Distillate, Percentage by Volume of Total Distillate to 360°C, %
Residue from Distillation to 360°C Volume Percentage of Sample by Difference, %
Tests on Residue from Distillation:
Absolute Viscosity at 60°C, Poises
Ductility, 5 cm./min. at 25°C, cm
Solubility Percent</td><td>Submit 1 Liter (1qt.)</td><td rowspan="2">One per week representing each grade of material shipped</td><td rowspan="2" colspan="3"></td></tr>
<tr><td>Submit BMT-31 (Analysis)</td></tr>
</table>

4. Field Sampling and Testing

4.1. The Project Engineer shall consult the Department's Testing Manual for current information concerning field sampling of asphalt materials.

4.1.1. The Project Engineer, Division Materials Engineer, or their representative, shall check shipments and verify that the materials are not contaminated and that they comply with the information shown on the BMT -146.

4.1.2. Any shipments that are contaminated, or suspect, should be sampled in accordance with 4.1.4. Such shipments should not be allowed to unload unless the Prime Contractor is willing to execute a Material Guaranty (BMT-73).

4.1.3. Shipments that obviously contain a product not shown on the accompanying BMT -146 shall be rejected.

4.1.4. Any field sampling of asphalt materials shall be done in accordance with AASHTO T-40. Samples shall be shipped to the Central Laboratory in the type container prescribed in the Testing Manual.

4.2. Independent assurance samples shall be taken by Division personnel at the frequency set forth in the Testing Manual. These samples shall be taken from the transporting vehicle only. Samples shall be taken in accordance with AASHTO T-40. Independent assurance samples will be tested at the Central Laboratory.

5. Acceptance and Final Certification of Asphalt Materials

5.1. Materials may be accepted on the job site when accompanied by the yellow copy or a signed duplicate issued by the Testing Engineer, of an "Asphalt Material Certificate of Compliance" (BMT -146), from an approved supplier. These compliance forms will be used in lieu of test reports.

6. Further Requirements of Suppliers

6.1. No supplier shall issue any "Asphalt Material Certificate of Compliance" (BMT -146) forms, unless the material is in full compliance with **all requirements of the Department**. Anti-Stripping Agents and other additives shall be added **only** at the rates prescribed by the Department.

7. Failing Verification Test Results

7.1. In the event that Department test results fail to verify those results reported by the supplier, the Department will initiate an investigation to determine cause as follows:

7.1.1. Department personnel will review the supplier's weekly test results.

7.1.2. Department personnel will review IAS&T-D test results.

7.1.3. If necessary, Department personnel will obtain samples from the contractor's storage tank, perform all required tests at the Central Laboratory and compare test results.

7.1.4. If test results from IAS&TD samples and/or contractor storage tank test results fail to verify the supplier's test results, samples will be obtained by Department personnel from the appropriate storage tank at the refinery and/or the terminal.

7.1.5. Evaluate all test results.

7.1.6. If the investigation indicates that a product fails to meet the appropriate specifications, the materials fall under paragraph 8 (noncompliance) of this procedure.

8. Noncompliance

8.1. Suppliers presently on List I-4, "Materials, Sources, and Devices with Special Acceptance Requirements" manual, who fail to comply with the above requirements, frequently fail to meet specifications, or fail to immediately correct faulty material in their tank, will be removed from said approved List I-4 for the grade and product type in question. Supplier will be notified of removal from List I-4 by BMT -168, "Notification to Suspend Shipments of Asphalt Materials on BMT -146." In addition, the Department may take action under the provisions of Section 105 of the ALDOT Standard Specifications. Reinstatement of authority to ship by certification will occur after investigation by the Department at the supplier's facility indicates noncompliance has been resolved.

9. Laboratory Certification

9.1. All suppliers of asphalt materials that wish to sell their products for use on state and federal projects that are not addressed in Section 3.4 must participate in the AMRL Proficiency Sampling Program with periodic inspections by ALDOT personnel. Copies of all AMRL proficiency reports must be submitted to the Bureau for review.

9.2. Asphalt testing laboratories are required to have all necessary equipment to perform required tests. All test equipment must be checked, verified, and/or calibrated at the frequency prescribed in AASHTO R18.

9.3. Bureau personnel will inspect and certify all asphalt materials laboratories, including subsidiary laboratories.

9.4. Supplier laboratories that have subsidiary laboratories are required to develop a program to qualify their subsidiary laboratories. As a minimum, the following must be addressed.

9.4.1. Proficiency sample testing must be performed quarterly between the supplier laboratory and the subsidiary laboratories. The results must be forwarded to the Bureau.

9.4.2. Develop a formal training program and training outlines for all new hires.

9.4.3. Develop a competency evaluation program for all technicians.

9.4.4. Develop equipment calibration/verification policies and procedures.

9.4.5. All documentation must be retained and updated for inspection by Bureau personnel.

9.5. A written plan to qualify subsidiary laboratories must be submitted to the Bureau for approval prior to implementation. Equipment in subsidiary laboratories will be checked by Bureau personnel at the time technicians are certified. Once approved, any changes made to the qualification plan must be approved by the Bureau.

9.6. A copy of the report of the subsidiary laboratory inspection shall be provided to the Bureau.

10. Certification for Performance Graded Asphalt Binder (PGAB) Technicians and Category B, C, Technicians

10.1. The company shall make requests for technician certification to the Bureau by letter. The request shall include specific information such as experience, length of training, subject matter, instructors, location of training, and category of certification being requested.

10.2. Bureau personnel will monitor and observe all "hands-on" tests performed by the applicant. The technician will be allowed to use any notes, checklists, or specifications to perform the required tests. It will be the subjective opinion of the Bureau technician that determines whether or not a technician demonstrated the level of competency required for certification.

10.3. A technician may be certified for more than one category, provided that all requirements have been met.

10.4. The company's quality control plan shall identify alternatives for testing in the event of equipment failure and/or the loss of their certified technician. Generally, the company will be allowed no more than 30 working days to overcome equipment and/or technician problems; however, the Materials and Tests Engineer has the discretion to consider special circumstances in enforcement of this provision.

10.5. Personnel meeting the requirements shall be certified by the Working Task Force and approved by the Certification Board. Certification is also contingent upon the technician signing a BMT -169, "Certified Technician Warrant."

10.6. A technician shall be certified for a period of three years. Recertification will require the submittal of a new request for technician certification as outlined in section 10.1.

10.7. To satisfy the terms of the certification program, at least one technician must be certified per establishment. Technicians who are not certified may perform tests provided they are working under the direct supervision of a certified technician.

10.8. Technician Training

10.8.1. Individual companies will be responsible to ensure their technicians are trained to perform all tests relating to asphalt materials (see attached tables). The required training may be accomplished in-house, through academia, or through private companies. Training can be arranged through the Asphalt Institute and the National Center for Asphalt Technology (NCAT) if necessary.

11. Decertification of Certified Laboratories and Technicians

11.1. The Working Task Force shall review laboratories and/or personnel who fail to comply with the above requirements as reported by a representative of the Bureau. Actions shall be implemented upon recommendations by the Working Task Force and approval by the Certification Board, and will range from a minimum 60 day suspension to permanent revocation.

12. Certification Board for Laboratories and Technicians

12.1. Membership of the Certification Board shall be comprised of the following:

12.1.1. Materials and Tests Engineer, (Position), Chairman

12.1.2. Assistant Chief Engineer, (Appointed by the Transportation Director)

12.1.3. Construction Engineer, (Position)

12.1.4. Division Engineer, (Appointed by the Transportation Director)

12.1.5. Industry Member, (Appointed by the Alabama Asphalt Pavement Association)

12.2. The Certification Board will meet on an as-needed basis to consider and/or act upon the recommendations of the Working Task Force.

13. Working Task Force

13.1. The membership of the Working Task Force shall be comprised of the following:

13.1.1. Testing Engineer, (Position)

13.1.2. Assistant Testing Engineer, (Position)

13.1.3. Assistant Roadway Construction Engineer, (Position)

13.1.4. Industry Association Member, (Appointed by the Alabama Asphalt Pavement Association)

13.2. The Working Task Force will meet on an as-needed basis to review laboratories and/or personnel who fail to comply with the above requirements.

ALDOT-245-83
PROCEDURES FOR SAMPLING AND INSPECTION OF ROADWAY SIGNS, AND OVERHEAD SIGN STRUCTURES

1. Scope

1.1. This procedure establishes the requirements of project and Central Laboratory personnel in relation to the inspection and sampling of roadway signs, and overhead sign structures.

1.2. All required certifications should be shipped to the Project Engineer, with the exception of overhead sign structures. Certifications for overhead sign structures should be shipped to the Bureau of Materials and Tests, Certification Engineer for approval. If samples are required, on projects with less than 200 ft^2 of sign material, the Project Engineer should select samples from the material delivered to the project. The Project Engineer will in turn process these items through the proper channels prior to authorizing payment for the item.

1.3. Signs and structures should not be installed until the engineer has a passing test report in hand. When samples are required, in addition to certified test reports, payment should not be authorized until sample testing is complete and certified test reports are approved by the Central Laboratory.

2. Job Sampling Requirements

2.1. Projects requiring 200 ft^2 (20 m^2) or less of standard sign panel may be accepted under ALDOT-195 without sampling. The Project Engineer should make a visual inspection of all materials in addition to this to assure items are correct. If any items look suspect, samples may be taken in the same manner as would be required for large projects.

2.2. On projects requiring over 200 ft^2 (20 m^2), the Project Engineer shall notify the Bureau of Materials and Tests, Certification Lab, of the arrival of sign materials on the job prior to installation. An inspector from the Certification Lab will make an inspection visit to the project to check all hardware such as nuts, bolts, washers, angles, channels, supports, and sign panels. The inspector along with project personnel will inspect these materials and select samples, in accordance with Section 710 of the Testing Manual. Due to the destructive nature of the testing no samples will be taken from large multi-panel signs unless material certifications are not correct for material specifications or material is suspect.

2.3. When tube and beam supports are used on ground mount signs, the producer may furnish certified test reports as outlined in ALDOT-195 or furnish an additional 39 in (1 m) length of each type with the shipment. This section shall be used as the sample in lieu of destroying a prefabricated support. Should this sample fail to meet the required specification, it will be necessary to sample a completed support.

2.4. High strength bolts, nuts, and washers for break-away signs shall be shipped to the project in sealed containers with lot numbers marked in accordance with Section 508 and 836 of the Specifications. Samples and certifications shall be furnished in accordance with Article 836.33 of the Specifications and Section 508 of the Testing Manual and submitted to the Central Laboratory for analysis. In addition, the contractor shall supply additional fasteners to compensate for five (5) sets of fasteners, per lot, selected by the Department Inspector for calibration of the contractor's torque wrench used for installation. All fasteners selected as samples will be randomly sampled from the sealed and marked containers. Project Engineers should contact the Bureau of Materials and Tests, Certification Laboratory, prior to installation to arrange for an inspector to come and calibrate the contractor's equipment.

2.5. A 3 in x 12 in (75 mm x 300 mm) sample shall be furnished by the producer for each run of porcelain-enameled signs. This sample shall be submitted to the Central Laboratory for testing. Samples of completed signs will not be required unless non-specification materials are suspected.

3. Overhead Sign Structures

3.1. Upon Department approval of shop drawings, the fabricator shall notify the Bridge Bureau of the intended time that fabrication is to begin. The Department may elect to send an inspector to visit the plant prior to fabrication or the Department may elect to allow the producer to begin without an inspection, depending on the history of the fabricator, size and type of structure, and availability of the inspector.

3.2. Upon completion of fabrication and prior to galvanization, the fabricator will contact the Department (Bridge Bureau Steel Inspector) for an inspection. The Department may elect to have a representative present at the coating process. This, again, is dependent on the factors listed in 3.1.

3.3. Should the Department elect not to have an inspector present at galvanization the fabricator may be allowed to furnish certified test reports covering the galvanization of the structure to the project engineer or attach two metal coupons made of the same material as the structure to each structure prior to galvanization. If coupons are used then they will remain in place during the coating process and the project engineer will remove the coupons and submit them to either Division or Central Laboratory for testing.

3.4. The Project Engineer shall notify the Bureau of Materials and Tests, Certification Lab, of the arrival of sign materials on the job prior to installation. An inspector from the Certification Lab will make an inspection visit to the project to check all hardware such as nuts, bolts, washers, angles, channels, supports, and sign panels. The inspector along with project personnel will inspect these materials and select samples, in accordance with Section 710 of the Testing Manual. Due to the destructive nature of the testing and the large size of the panels, no samples will be taken from them unless material certifications are not correct for material specifications or material is suspect.

3.5. High strength bolts, nuts, and washers for overhead sign structures shall be shipped to the project in sealed containers with lot numbers marked in accordance with Section 508 and 836 of the Specifications. Samples and certifications shall be furnished in accordance with 836 of the Specifications and Section 508 of the Testing Manual and submitted to the Central Laboratory for analysis. In addition, the contractor shall supply additional fasteners to compensate for five (5) sets of fasteners, per lot, selected by the Department Inspector for calibration of the contractor’s torque wrench used for installation. All fasteners selected as samples will be randomly sampled from the sealed and marked containers. Project Engineers should contact the Bureau of Materials and Tests, Certification Laboratory, prior to installation to arrange for an inspector to come and calibrate the contractor's equipment.

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2.5. A 3 in x 12 in (75 mm x 300 mm) sample shall be furnished by the producer for each run of porcelain-enameled signs. This sample shall be submitted to the Central Laboratory for testing. Samples of completed signs will not be required unless non-specification materials are suspected.

3. Overhead Sign Structures

3.1. Upon Department approval of shop drawings, the fabricator shall notify the Bridge Bureau of the intended time that fabrication is to begin. The Department may elect to send an inspector to visit the plant prior to fabrication or the Department may elect to allow the producer to begin without an inspection, depending on the history of the fabricator, size and type of structure, and availability of the inspector.

3.2. Upon completion of fabrication and prior to galvanization, the fabricator will contact the Department (Bridge Bureau Steel Inspector) for an inspection. The Department may elect to have a representative present at the coating process. This, again, is dependent on the factors listed in 3.1.

3.3. Should the Department elect not to have an inspector present at galvanization the fabricator may be allowed to furnish certified test reports covering the galvanization of the structure to the project engineer or attach two metal coupons made of the same material as the structure to each structure prior to galvanization. If coupons are used then they will remain in place during the coating process and the project engineer will remove the coupons and submit them to either Division or Central Laboratory for testing.

3.4. The Project Engineer shall notify the Bureau of Materials and Tests, Certification Lab, of the arrival of sign materials on the job prior to installation. An inspector from the Certification Lab will make an inspection visit to the project to check all hardware such as nuts, bolts, washers, angles, channels, supports, and sign panels. The inspector along with project personnel will inspect these materials and select samples, in accordance with Section 710 of the Testing Manual. Due to the destructive nature of the testing and the large size of the panels, no samples will be taken from them unless material certifications are not correct for material specifications or material is suspect.

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ALDOT-247-82
MARKING OF HIGH-STRENGTH BOLTS, NUTS, AND WASHERS FOR STRUCTURAL STEEL JOINTS

1. Scope

1.1. The purpose of this procedure is to set forth the method of identifying high-strength bolts, nuts, and washers by the manufacturer's markings.

2. General

2.1. Type 1. These bolts are made from medium-carbon steel, supplied in sizes M16 to M36, inclusive, in diameter. will have hex heads unless otherwise stipulated in appropriate drawings, plans, purchase orders or specifications.

2.2. Type 2. These bolts are made from what is described as low-carbon martensite steel, supplied in sizes M16 toM36, inclusive, in diameter. Bolts will have hex heads unless otherwise stipulated in appropriate drawings, plans, purchase orders or specifications.

2.3. Type 3. These bolts are made from steel having atmospheric corrosive resistance and weathering characteristics supplied in sizes M16 to M36, inclusive, in diameter. Bolts will have hex heads unless otherwise stipulated in appropriate drawings, plans, purchase orders or specifications.

2.4. Production Lot - for the purposes of assigning an identification number and from which test samples shall be selected, shall consist of all bolts processed essentially together through all operations to the shipping container that are of the same nominal size, the same nominal length, and produced from the same heat of steel.

3. Nuts

3.1. Nuts authorized for use with A 325M Bolts: Unless otherwise specified, nuts shall be heavy hex and the grade and surface finish of nut for each type of bolt shall be as follows:

Bolt Type	Nut Grade and Finish
Type 1 & 2, Plain (Noncoated)	8S, 8S3, Plain
Type 1 & 2, Zinc Coated	10S Zinc Coated
Type 3	8S3 Plain

4. Markings on Heavy Hex Bolt Head

4.1. All bolts, Type 1, 2 and 3, shall be marked A 325M and shall also be marked with a symbol identifying the manufacturer.

4.2. In addition to paragraph 4.1 above, Type 1 bolts shall be Marked 8S.

4.3. In addition to paragraph 4.1 above, Type 2 bolts shall be marked 8S with this marking underlined.

4.4. In addition to paragraph 4.1 above, Type 3 bolts shall be marked 8S3, and the manufacturer may add other distinguishing marks indicating that the bolt is atmospheric corrosion resistant and of a weathering type.

4.5. All markings shall be located on the top of the bolt head and may be either raised or depressed at the option of the manufacturer.

5. Markings on Heavy Hex Nuts

5.1. All nuts shall be marked with a symbol to identify the manufacturer.

5.2. In addition to the manufacturer's symbol, nuts of all classes shall be marked with property class designation (8S, 10S, 8S3, or 10S3) on the top or bearing surface, on the top of flange, or on one of the wrenching flats of the nut. Markings located on the top or bearing surface or on the top of the flange shall be positioned with the base of the numeral(s) oriented toward the nut periphery.

5.3. For Classes 8S3 and 10S3 nuts, the manufacturer may add other distinguishing marks to indicate the nut is atmospheric corrosion resistant and of a weathering grade of steel.

5.4. Marks on the above nuts may be raised or depressed at the option of the manufacturer. However, if markings are located on the bearing surface, they shall be depressed.

6. Markings on Circular Washers

6.1. All circular washers shall be marked with a symbol identifying the manufacturer. Markings shall be depressed on one face of the washer. Clip washers need not be marked.

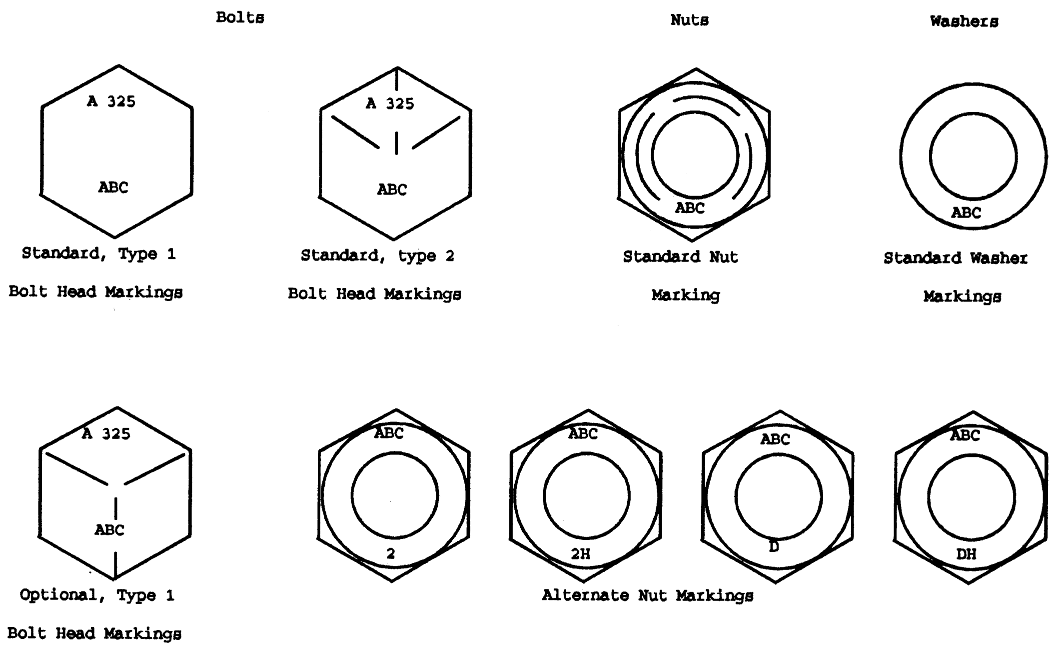
6.2. In addition to the manufacturer's mark, circular washers manufactured from steel having improved atmospheric corrosion resistance and of a weathering type shall be marked with the numeral 3.

6.3. Other identifying or distinguishing marks, or both, may be used by the manufacturer.

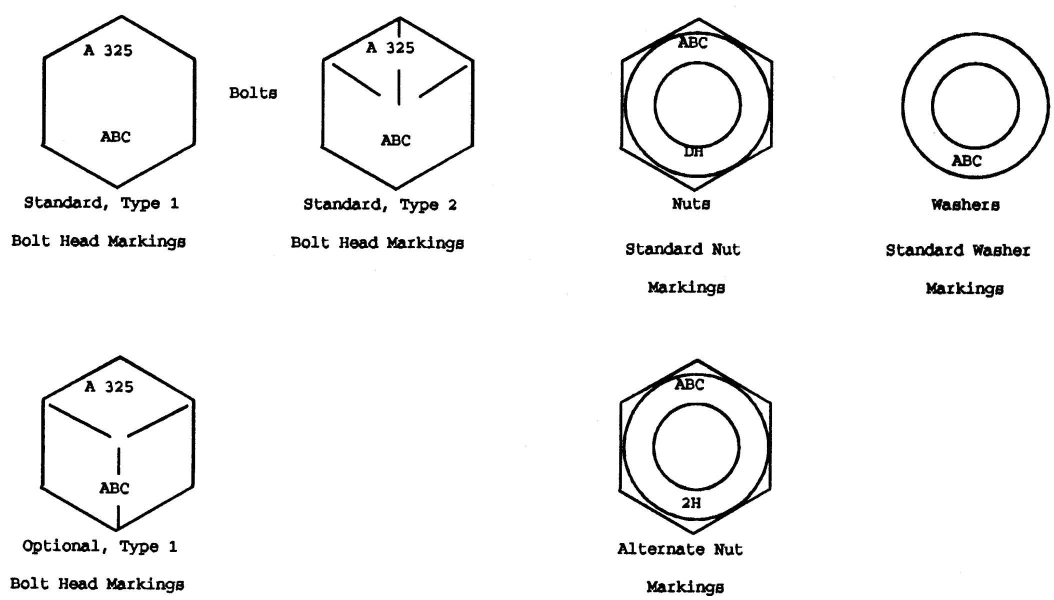
6.4. Additionally, washers shall be marked to identify their being metric size. Preferably, the metric marking shall be the symbol "M", but may be of other distinguishing design as determined by the manufacturer.

**MARKINGS FOR HIGH STRENGTH A325 BOLTS
AND AUTHORIZED NUTS AND WASHERS**

A. Plain (noncoated) Bolts with authorized plain nuts and washers



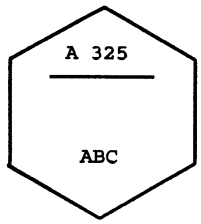
B. Galvanized (Coated) Bolts with authorized nuts and washers



Note: ABC indicates Bolt manufacturer, in this case American Bolt Co.

C. Weathering Type Bolts with authorized nuts and washers

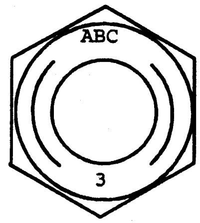
Bolts



Standard, Type 3

Bolt Markings

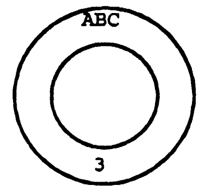
Nuts



Standard Nut

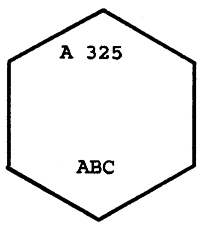
Marking

Washers



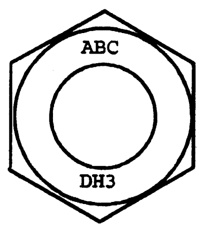
Standard Washer

Markings



Standard, Type 3

Bolt Markings



Alternate Nut Markings

ALDOT-248-76
METHOD OF TEST FOR MEASURING THE DEPTH OF GROOVES IN CONCRETE PAVEMENTS AND BRIDGE DECKS WITH A TIRE TREAD DEPTH GAGE

1. Scope

1.1. This method of test describes the procedure for sampling, preparing and measuring the depth of grooves in bridge decks, concrete pavements and ramps using a Tire Tread Depth Gage.

1.2. This method of test can measure the depth of grooves in concrete pavements produced by the following methods: Tine Finish, Broom Finish and Pavement Grooving.

2. Apparatus

2.1. Tire Tread Depth Gage - A gage, calibrated in increments of 1/32 in. (1 mm) and capable of measuring to a depth of

2.2. ½ in (13 mm) shall be used.

2.3. Miscellaneous Equipment - Hand broom or brush, 12 in (300 mm) ruler, 100 ft. (50 m) tape measure and notebook.

3. Sampling Procedure for Securing Test Area

3.1. The lot size for bridge decks shall be the lengths of the span by the width of the lane and lanes in one direction.

3.2. The lot size for concrete pavements shall be a minimum of 5000 yds^2 (4200 m^2) to a maximum of 10000 yds^2 (8400 m^2) in one direction. If the contractor's production is below the minimum, the lot size shall be the yd^2 (m^2) of pavement placed.

3.3. The lot size for ramps or separate lanes connecting with cross streets shall be the yd^2 (m^2) of pavement placed in one direction.

3.4. A lot shall consist of five approximately equal sublots. Within each sublot, one test area shall be randomly secured in accordance with ALDOT-210.

4. Preparing the Test Area

4.1. Brush all loose material from the area to be measured.

5. Measuring the Depth of the Grooves

5.1. Measure ten grooves in a straight line perpendicular to the grooves; starting with the point that was randomly secured in Section 3.5.

5.2. Place the Tire Tread Depth Gage on the groove to be measured and firmly seat it to the surface. Make sure that the needlepoint will fall in the middle of the groove.

5.3. Depress the needlepoint and determine the depth by reading the scale attached to the gage.

5.4. Repeat the procedures described in Sections 5.2 and 5.3 for the nine remaining grooves.

6. Calculations

6.1. Calculate the average groove depth for each of the five sublots

6.2. Calculate the average groove depth for the lot.

7. Report

7.1. The average groove depth for the lot shall be reported in increments of 1/32 in. (1 mm).

Illustrative Example Number 1

					→ 230 yd. (m) ←
Lot 2 10,000 yds^2 (8400 m^2)	SL5	SL4	SL3	SL2	SL1 2,000 yds^2 (1680 m^2)

Lot 3	Lot 4

Assume a contractor placed 40,000 yd. ^{2} (m^2) of separated highway consisting of reinforced concrete pavement 24 ft (7.5 m) wide on each side of a traffic separator.

In this case, the pavement can be divided into four lots. Each lot will have an area of 10,000 yds^2 (8400 m^2).

Each lot must then be divided into five approximately equal sublots. Each sublot will have an area of 2000 yds^2 (750 ft. x 24 ft.), 1680 m^2 (230 m by approximately 7.5 meters).

Assume beginning station is 30 + 48

Use Random Number Table in ALDOT-210 to obtain random decimal fractions. These values shall be multiplied by the length and width of the lanes of each sublot to obtain the coordinates of the sample location measured from the starting point of each sublot.

Sublot #1

Longitudinal Coordinate = 0.47 x 750 ft. (230) = 352.5 (108.1 m)

Transverse Coordinate = R 0.20 x 24 ft. (7.5)= 5.0 ft. (R 1.5 m)

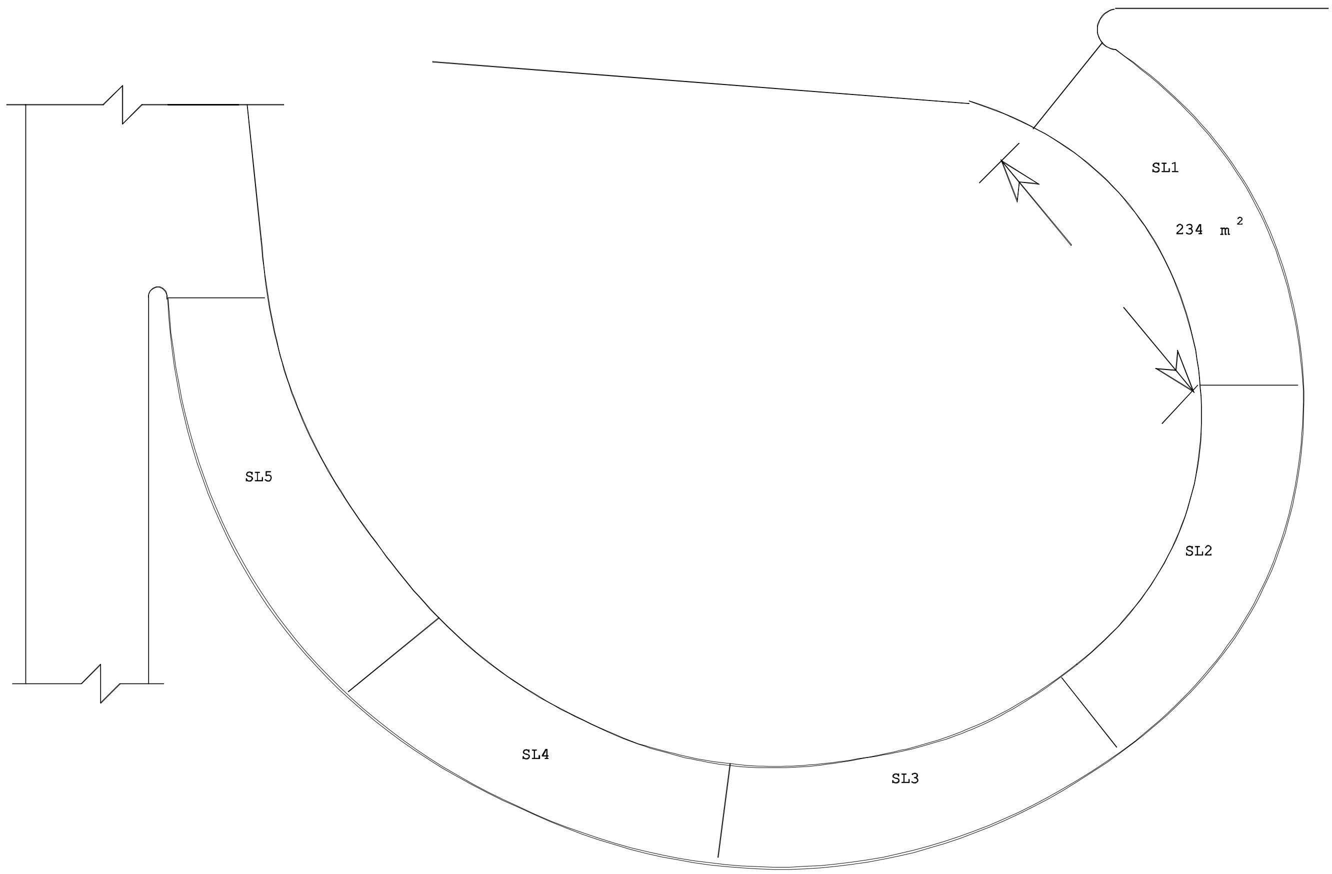
Sample Location = Sta. 30 + 48 plus 108.10 = Sta.31 + 56.1

Measure 5.0 ft. (1.5 m) from right edge of lane.

Calculate the coordinates for the remaining sublots.

Be sure to go through all numbers in the table before using the same numbers over.

Illustrative Example No. 2



Assume a contractor places a ramp having an area of 1400 yds^2 (1170 m^2).

In this case, the area of the ramp is the lot size. The lot shall begin where the uniform width starts and end at a point with a uniform width.

The lot must then be divided into five approximately equal sublots. Each sublot will have an area of 280 yds^2, 234 m^2 (58.5 m by 4 m).

Measurements for the sublots and coordinates shall be made along the inner edge.

The transverse coordinate shall be measured on a line perpendicular to the sides of the ramp at the longitudinal coordinate point.

See Illustrative Example No. 1 for example of how to obtain the coordinates of the sample location.

ALDOT-249
PROCEDURE FOR ACCEPTANCE OF FINE AND COARSE AGGREGATES

Table of Contents

Applicable Documents

BMT 10	Notice Stamp for Acceptance
BMT 18	Sample Card
BMT 29	Aggregate Source Inspection Checklist
BMT 29-A	Verification Test
BMT 91	Aggregate Test Report
BMT-116	Aggregate Plant Checklist
BMT 131	Request for Source Approval
BMT 141	Agreement to Participate in Aggregate Control Program

1. Scope

1.1. This procedure provides the requirements and procedures for obtaining and maintaining Department approval of developed and operational aggregate sources, including redistribution terminals, which are intended to be the source of construction aggregates for use on Department projects. This source approval recognizes the existence of suitable raw materials; processing facilities capable of producing specified aggregates meeting Department specification requirements; and an effective Quality Control Program assuring the continuing quality and uniformity of that production. Source approval for aggregates is the initial step in the Department's method of acceptance of aggregates for use on Department projects.

2. Purpose

2.1. This procedure sets out a standardized method for the Department to approve sources or aggregates through a producer Quality Control Program (QCP). The Department's procedures for source approval and quality assurance, at the source and/or at the point of use or project, comprise the Department's method of accepting aggregate for use on Department projects.

2.2. A Quality Control Program requires producers of construction materials to be responsible for the quality of their products; to establish, maintain, and implement their own individualized process control system; and to certify to the Department compliance of their product with applicable standard and contract specifications.

2.3. Approval of a source by the Department and implementation of a Quality Assurance Program by the Department does not relieve the producer of the responsibility for shipping aggregates which meet specifications. Contractors are also responsible for transporting and handling aggregates in a manner which will preclude significant variation in the properties of the aggregates. The Department reserves the right to test all aggregates at the source, point of use, or project site to determine acceptability for use according to contract specifications.

2.4. Nothing in this procedure is intended to prohibit the evaluation and approval of any operation not specifically covered herein that, in the opinion of the Department, complies with the criteria set forth in this procedure.

3. Referenced Documents

Referenced Documents

3.1. BMT 10	Certificate from producer that documents the source of the aggregate.
3.2. BMT 18	Sample card that is submitted with each sample for testing.
3.3. BMT 91	Aggregate Test Report
3.4. BMT 116	Aggregate Plant Check List
3.5. BMT 131	Request for Source Approval
3.6. BMT-136	Application for Certification and Recertification
3.7. BMT-138	Certified Technician Warrant
3.8. BMT-141	Agreement for Participation in Quality Control Program for Acceptance of Fine and Coarse Aggregates
3.9. ALDOT-175	Method of Stockpiling Coarse Aggregate for all Purposes
3.10. ALDOT-239	Method of Sampling and Testing Riprap Stone (Classes 1 through 5)
3.11. ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
3.12. ALDOT-321	Test for Glassy Particles in Crushed Slag
3.13. ALDOT-355	General Information Concerning Materials, Sources, and Devices with Special Acceptance Requirements
3.14. ALDOT-376	Certification Program for Aggregate Technicians
3.15. AASHTO T-2	Sampling Aggregates
3.16. AASHTO T-11	Materials Finer Than 75µm Sieve in Mineral Aggregates by Washing
3.17. AASHTO T-19	Unit Weight and Voids in Aggregate
3.18. AASHTO T-27	Sieve Analysis of Fine and Coarse Aggregate
3.19. AASHTO M-92	Wire-Cloth Sieves for Testing Purposes
3.20. AASHTO M-231	Weighing Devices Used in the Testing of Materials
3.21. AASHTO T-248	Reducing Field Samples of Aggregate to Testing Size

4. Definitions

4.1. The following words or phrases as used in this document shall have the following meaning, except where the context clearly indicates a different meaning.

4.2. "Aggregate" (coarse) - a granular mineral material such as crushed/uncrushed gravel, crushed stone (limestone, granite, sandstone) or crushed slag having hard strong durable pieces free from adherent coating, used as a component in mortar mixes, concrete or hot mix asphalt, or alone as a base or subbase course, or used loose for drainage, foundation, scour protection, water barrier, etc., meeting the requirements of Section 801 of the Department's specifications.

4.3. "Aggregate" (fine) - a natural or manufactured sand having hard, clean, durable, uncoated particles used as a component in mortar mixes, concrete, hot mix asphalt, or used loose for drainage, etc., meeting the requirements of Section 802 of the Department's specifications.

4.4. "Approved Sources List" means the Department's Manual entitled "Material, Sources, and Devices with Special Acceptance Requirements".

4.5. "Central Laboratory" means the Aggregate Laboratory of the Bureau of Materials and Tests located in Montgomery, Alabama.

4.6. "Certified Aggregate Technician" means a person who has been tested by the Department and has successfully passed both the written and practical examinations and certified by the Department or a person who has been certified in another state under a similar aggregate quality control program who has submitted the necessary documentation satisfying the Department's requirements for certification. See ALDOT Procedure 376, "Certification Program for Aggregate Technicians", for additional information.

4.7. "Comparison tests" means the quarterly gradation analysis (AASHTO T-27) performed by the producer's certified aggregate technician on each size aggregate shipped during that quarter.

4.8. "Department" means the Alabama Department of Transportation.

4.9. "Independent Assurance Samples and Tests" or "IAS&T" means samples and tests performed by Department personnel who do not normally have direct responsibilities for Quality Assurance sampling and testing. They are used for the purpose of making independent checks on the reliability of the QC/QA Program, and are not used for determining the quality and acceptability of aggregate.

4.10. "Point of production" means the physical location (excluding redistribution terminals) where the material is removed from the earth and/or processed for use as aggregate.

4.11. "Point of use" means the physical location where the aggregate is incorporated into the project (i.e., project site, asphalt plant or concrete plant).

4.12. "Producer" means any business or individual supplying or seeking to supply aggregate for use on Department projects.

4.13. "Quality assurance" or "QA" means the Department's management method of evaluating the effectiveness of the producers Quality Control Program including the use of comparison tests, verification tests, annual source approval tests and on-site inspections to monitor the quality, uniformity and acceptability of aggregate.

4.14. "Quality control" or "QC" means the producer's management method of controlling and making adjustments to processing techniques, including the use of QC samples, control charts, tests, and other available information to establish and maintain the specified quality and uniformity of a product.

4.15. "Quality Control Program" or "QCP" means the overall system implemented by the producer to ensure compliance with Department Specifications.

4.16. "Redistribution Terminal" means the physical location where aggregates are received from approved sources for use on Department projects and stockpiled according to Department Specifications.

4.17. "Source" means the physical location (excluding redistribution terminals) where the aggregate material is removed from the earth and/or processed for use as an aggregate.

4.18. "The Testing Manual" means the Department's Manual of standardized methods of sampling and testing of aggregates.

4.19. “Verification Tests" means gradation analysis (AASHTO T-27) and material finer than the 75µm Sieve (AASHTO T-11) performed by the Department's technician at the producer's source or redistribution terminal monthly when shipping.

4.20. "Weighmaster" means a person employed by the producer or a public weighmaster who has been qualified by the Alabama Department of Agriculture for the purpose of certifying weight tickets or certified in another state.

5. Source Approval Requirements

5.1. In order for a producer to qualify his aggregate for use on Department projects, the following requirements must be satisfied:

5.1.1. A completed BMT-131 "Request for Source Approval" shall be submitted to the Materials and Tests Engineer.

5.1.2. The producer shall submit a quality control program and same shall be individualized for each source based on deposit characteristics, to include processing and handling techniques. The "QCP" shall be submitted to the Materials & Tests Engineer.

5.1.3. A completed and signed BMT-141, "Agreement for Participation in the Aggregate Quality Control Program" shall be submitted to the Materials & Tests Engineer.

5.1.4. Request Division personnel to sample and submit same to the Central Laboratory for initial testing and approval. Sample sizes shall be as per AASHTO T-2, Table 1.

5.1.5. Submit a check as outlined in ALDOT-355, "General Information Concerning Materials, Sources, and Devices with Special Acceptance Requirements" made payable to the ALABAMA DEPARTMENT OF TRANSPORTATION.

5.1.6. The producer shall employ a "Certified Aggregate Technician" who has been certified and/or approved by the Department.

5.1.7. The producer shall employ a certified weighmaster or use a public weighmaster when shipping materials measured by weight for a direct pay item by the Department as per Department specifications.

5.1.8. All sources must pass the initial on-site inspection conducted by the Department and subsequent monitoring and inspections necessary to verify compliance with this document and applicable Department specifications. Material must meet DOT Specifications, Section 801 or 802.

5.2. After all the above items have been satisfactorily met, the Central Laboratory will recommend approval of the source to the Product Evaluation Board, requesting the source be placed on List I-1, Approved Sources List. The Product Evaluation Board normally meets during the first week in each month. The producer will be notified of any item not meeting the Department's requirements.

5.3. It shall be the responsibility of the producer to ensure that all operations are in compliance with their Quality Control Program. Continuing approval is contingent upon the effectiveness of the producer's Quality Control Program as evidenced by the quality and uniformity of the aggregate.

5.4. Submit all required items to:

Materials and Tests Engineer
3700 Fairground Road
Montgomery, Al 36110

5.5. If a source is relocated or extended beyond the boundaries shown on the sketch of the original source approval, even though it is in the same general area, a new inspection will be required. Early notification to the Department of any relocation/extension will result in a mutual benefit to both parties.

5.6. A new inspection will be required if there are any significant changes in the engineering properties of the materials.

5.7. The producer is required to notify the Department of any pending changes in ownership and/or personnel. If the approved source is indeed, sold, the new owner is required to submit an updated Quality Control Plan.

6. Quality Control Program

6.1. The Quality Control Program, as developed, implemented and submitted for each individual source, shall contain, as a minimum, the following items:

6.1.1. Name, address and telephone number of the source; names of company officers, i.e., Owner, President, Vice President, etc.;

6.1.2. Names of key personnel, i.e., Superintendent, General Manager, Quality Control Manager, Certified Aggregate Technician, Production Foreman, etc.;

6.1.3. A pinpoint location of the source, i.e., section, township, range, distances from any known landmarks such as highway intersections, etc., in order to find the location by automobile, and a sketch with dimensions of the boundaries.

6.1.4. Statements to the effect that stockpiles will be constructed in accordance with ALDOT-175, "Method of Stockpiling Aggregate for All Purposes", so as to minimize segregation and prevent contamination with foreign materials;

6.1.5. Loading and shipping controls including a detailed description of the methods by which the aggregate is to be loaded and shipped for use on Department projects and safeguards against contamination, degradation and segregation of the aggregate;

6.1.6. A detailed description of the material being produced, i.e., limestone, granite, sandstone, to include any geological information;

6.1.7. A list of all major production equipment to include brand name, size, capacity, etc.;

6.1.8. Source of water;

6.1.9. Location and size of aggregate testing facility;

6.1.10. Duties of the Certified Aggregate Technician;

6.1.11. Methods by which statistical data will be computed and plotted.

6.2. The producer shall furnish a fully equipped laboratory at the production site or redistribution terminal. The Department may allow a producer to use one centrally located testing laboratory to serve more than one (1) source, provided testing can be performed as per the frequency guide within a reasonable amount of time. The laboratory shall be furnished with the necessary testing equipment and supplies for performing producer quality control sampling and testing. To assure accuracy, the testing equipment shall be checked periodically as directed by the Bureau of Materials and Tests in accordance with applicable standards. Minimum requirements are as follows:

6.2.1. Weighing devices meeting the requirements of AASHTO M-231;

6.2.2. Mechanical shakers for fine and coarse aggregate;

6.2.3. Mechanical splitter as per AASHTO T-248;

6.2.4. Hand sieves 8 in or 12 in (200 mm and/or 300 mm) meeting the requirements of AASHTO M-92;

6.2.5. Unit weight measures meeting the requirements of AASHTO T-19;

6.2.6. Drying apparatus;

6.2.7. Water supply;

6.2.8. Miscellaneous utensils such as buckets, pans, stirring spoons, etc.;

6.2.9. Copies of the most current testing methods.

6.3. It shall be the producer's responsibility to ensure that all testing equipment is checked, verified, and/or calibrated at the required frequency and documentation for same shall be maintained at the source. The Department may require actual demonstration of the accuracy of the testing equipment.

6.4. Required frequencies for checking, verifying and/or calibrating aggregate test equipment is as follows:

Unit Weight Measures	12 mo	AASHTO T-19
Mechanical Shakers	12 mo	AASHTO T-27
General Purpose Balances	12 mo	AASHTO M-231
Hand Sieves (Visual inspections)	6 mo	AASHTO M-92
Drying Apparatus (Hot plate, electric or gas) ALDOT-253		

6.4.1. If producers are using drying ovens to dry aggregates, temperature settings shall be verified every four months as per AASHTO T-27.

6.5. All documentation (work sheets) shall be maintained to verify that all testing equipment has been checked, verified and/or calibrated at the required frequency.

6.6. The Department will furnish procedures and work sheets for checking, verifying and/or calibrating the above equipment if requested.

7. Approval Levels

7.1. Upon successful application for source approval, each source shall be assigned the appropriate approval level by the Department. No source shall he approved unless the source has at least one approved aggregate.

7.2. Full Approval. When a source or redistribution terminal is fully approved, the producer may ship and certify aggregate for Department usage without additional Department acceptance testing prior to usage. However, the Department reserves the right to reject defective material at any time.

7.3. Conditional Approval. When a source is placed on conditional approval status, the producer may ship aggregate for Department use, and must certify each shipment, but the material will be accepted based on results of the Department’s quality assurance samples. A source placed on conditional approval status will be subject to increased sampling frequency; pre-testing of material prior to shipment; restriction on production of aggregate for Department usage from specific layers, pits or location; and other controls or tests as deemed necessary by the Department. The

Department will place all new sources on conditional approval to determine if the source can maintain consistent production of aggregate meeting Department specifications.

7.4. Time Limits. A source will be kept on conditional approval status for only as long as it is deemed necessary, but not to exceed six months. Should the source not gain full approval during this time frame, it shall be revoked.

7.5. Revocation - when a source is revoked, the producer is restricted from shipping aggregates for use on Department projects. Source approval will be revoked by the Department if the producers Quality Control Program proves ineffective in controlling the production of aggregates which comply with Department specifications and standards.

7.6. A source shall be revoked when one of the following occurs:

7.6.1. Failure of material to meet specification requirements;

7.6.2. The producer fails to maintain proper or timely records, or the producer fails to have test data available for themselves and for the Department;

7.6.3. The producer varies their procedures from the approved Quality Control Program without Department approval;

7.6.4. The producer fails to correct any deficiency related to any requirement of this procedure and/or the producers Quality Control Program, having received notice from the Department within a reasonable amount of time not to exceed 30 days;

7.6.5. The producer performs improper sampling and/or testing of aggregates;

7.6.6. The producer adds or mixes aggregates or materials not processed according to the Quality Control Program;

7.6.7. The producer fails to maintain aggregate testing equipment in compliance with the appropriate test method or fails to have the equipment checked;

7.6.8. Other conditions related to the quality of aggregate.

7.7. A source that has been revoked must remain revoked for a minimum period of 60 days. If the problems are corrected within this time frame, the source will be placed on conditional approval.

7.8. The Department will closely monitor the source for at least 30 days and will reinstate approval status provided the producer has again demonstrated the effectiveness of the Quality Control Program assuring the continued quality and uniformity of the aggregates.

7.9. A source's approval will automatically expire if it has not furnished material for use on Department projects for a period of one calendar year, unless an extension of approval is requested in writing, prior to the expiration date, by the producer to the Materials & Tests Engineer.

7.10. Extension of approval will be predicated on the continued operation of the source's quality control program during the previous calendar year and the source's continuing to meet all the requirements of this procedure. Approval will be extended only once for an additional calendar year. If, at the end of the extension, the source still has not furnished aggregate for Department use, source approval will again expire and reapproval is subject to reapplication.

7.11. Individual products from any source which have not been supplied for use on Department projects for a period of one calendar year will be removed from the Approved Sources List for that source, unless an extension is requested. This includes existing stockpiles of material made under a QC Program, meeting specifications, and for which identification and specific records and test data are available.

7.12. Denial of Source Approval. A producer's request for source approval will be denied when any one of the following occurs:

7.12.1. Incomplete or inadequate Quality Control Program.

7.12.2. Failure of material to meet specification requirements.

7.12.3. Results of the Department's inspection and testing do not agree with information and test results furnished by the producer.

7.12.4. Results of the Department's inspection indicate material properties or characteristics which may be a potential problem.

7.12.5. Falsification of any approval information submitted by the producer.

7.12.6. Inadequate testing facility and/or equipment.

7.13. The producer may reapply for source approval as per Section 4, "Source Approval Requirements", when documented evidence is presented to the Department identifying all corrective actions.

7.14. Annual Recertification. Recertification of all sources is required annually. Each Division will sample all sources within their jurisdiction and submit same to the Central Laboratory for testing and reevaluation. If the source meets all applicable DOT Specifications, the source will again be placed on the Approved Sources List (I-1). There is no fee charged for the annual reevaluation. The producer must also sign, notarize and submit BMT-141, Agreement for Participation in the Department's Aggregate Quality Control Program.

8. Source Classifications

8.1. These classifications are based on the Department's ability and resources. In circumstances that preclude the Department's ability to perform its QA function at the source, the Department reserves the right to change a source classification with a minimum of a months notice given to the producer.

8.2. Type I sources are those sources located within Alabama. These sources will be inspected monthly by the Department. The source may ship directly to Department projects or Redistribution Terminals, self certifying each shipment with a BMT-10.

8.3. Type II sources include out-of-state sources which are more than a oneway distance of a halfday's (250 miles) travel by automobile from the appropriate Division but are within a oneway distance of a day's (8 hours) travel by automobile from the appropriate Division. These sources will be inspected monthly by the Department. The source may ship directly to Department projects, or Redistribution Terminals, self certifying each shipment with a BMT-10. QA samples will be obtained at the point-of-use or redistribution terminal.

8.4. Type III sources include out-of-state (and out-of-country) sources which are more than a one-way distance of a day's (eight hours) travel by automobile or cannot be accessed by automobile from the Department's Central Laboratory. Shipments may only be made to redistribution terminals self certifying each shipment. The source will be monitored at the redistribution terminal. These sources must provide their source numbers, material identifications and QC test data for each shipment to a terminal. These sources will be inspected annually by the Department. The producer shall pay all per diem and travel costs for the Department's Inspectors.

8.5. Type IV sources are those sources located within the state and which produce aggregate solely for their own use. Testing shall be performed as per the frequency guide, e.g., concrete plant and HMA plant.

8.6. Redistribution terminals may only be located in-state. Approval of the terminal and the quality control program at the terminal will be required, and the Department will assign a terminal number. Material certification by the source will be accepted; however, additional quality control tests for those aggregate characteristics subject to change due to handling, shipping, stockpiling, or other actions affecting aggregate characteristics, will be required at the time of reshipment from the terminal. Certification by the terminal of materials for Department usage will require both source and terminal numbers. These terminals will be inspected monthly by the appropriate Division.

8.7. The owner/operator of the redistribution terminal shall employ a full time Certified Aggregate Technician who will perform duties as listed.

9. Fees and Costs

9.1. All producers for proposed Type III sources of aggregate whose source locations are located more than eight hours travel by automobile or cannot be accessed by automobile from the Department's Central laboratory will be required to pay for the Department's per diem and transportation. This will apply for initial inspections, annual inspections, or at anytime deemed necessary by the Department. Costs shall include meals, lodging, air fare and vehicle rental cost if required, and/or mileage rates if a Department vehicle is used. Should multiple sources be evaluated/ inspected on the same trip, all costs will be proportionally divided.

9.2. All costs as mentioned above shall be borne by the producer(s). Payment for expenses shall be made by check, payable to the Alabama Department of Transportation prior to any visit or inspection.

9.3. Checks shall be submitted to:

Materials and Tests Engineer
3700 Fairground Road
Montgomery, Al 36110

10. Control Charts (Analysis and Recording of Data)

10.1. All test results of conforming and nonconforming aggregates shall be recorded on approved forms and charts which shall be kept up to date and complete, and shall be available at all times to the Department.

10.2. Aggregate quality during the production process can be effectively monitored by the control chart method of analysis. A control chart is simply a graphical record of the quality of a particular characteristic of the aggregate. Example control charts will be furnished by the Department. Computer generated control charts or control charts different from the examples provided by the Department must be approved by the Department.

10.3. The use of control charts by the aggregate producer serves the following purposes:

10.3.1. To provide early detection of trouble before rejections occur;

10.3.2. To decrease aggregate variability and provide information for quality improvement.

10.4. All test results of conforming and nonconforming aggregates shall be recorded on approved forms and charts which shall be kept up to date and complete, and shall be available at all times to the Department.

10.5. The producer must have the necessary equipment (i.e., calculator, and/or computer, etc.) to perform statistical analysis such as "mean and standard deviation" and maintain adequate records of all samples, tests and other data to substantiate aggregate compliance to Department specifications. Control charts shall be maintained and visibly displayed by the producer at the source and/or redistribution terminal on those aggregate characteristics designated by the Department.

10.6. A copy of the Quality Control Plan as well as current copies of the appropriate test methods (AASHTO/ASTM), ALDOT Procedures, Department specifications, and current test data shall be available and on-hand at all times.

10.7. The producer shall submit copies of all control charts to the Central Laboratory or appropriate Division each month while shipping.

10.8. Where there is an indication that the process is not being adequately controlled, the producer must immediately take the necessary actions to adjust the process.

10.9. The producer is required to compute the mean and standard deviation for each sieve size for both coarse and fine aggregate each time gradation analysis is required by the Frequency Guide. The mean and standard deviation is also required for unit weight and fineness modulus. If there is not a gradation analysis required by the Frequency Guide, as a minimum, the producer shall perform one (1) gradation analysis per shipping day for coarse and fine aggregate, determine unit weight and compute the fineness modulus (FM). The means and standard deviations shall be computed, plotted, displayed on control charts and submitted to the Central Laboratory and appropriate Division each month while shipping.

11. Comparison/Verification Test, Test Reports and Shipping

11.1. Comparison Tests - To ensure uniformity and compliance with prescribed test procedures, all producers are required to sample and perform at least one (1) comparison test per quarter, per size aggregate shipped that quarter. Comparison tests will be performed by the producer's Certified Aggregate Technician at their facility. When the technician is finished, he/she will prepare sample cards (BMT-18) for each sample tested and maintain the identical samples until picked up by a DOT Inspector, who will, in turn, send same to the Central Laboratory in Montgomery for comparison testing. The Central Laboratory will compare gradation analysis to ensure a + 5 percent tolerance for each sieve size. Samples found to be out of tolerance will be resampled, retested and compared. Copies of comparison sample test results will be distributed by the Central Laboratory, Aggregate Control Section to the Division Materials Engineer, and to the Certified Aggregate Technician.

11.1.1. If a producer does not ship any material during the quarter, no comparison tests are required.

11.2. All BMT-18s submitted with comparison samples will have the following information written on the card:

Front Side:

11.2.1. DOT size number and type; such as #57 crushed slag;

11.2.2. Producer's name, and source number;

11.2.3. Date, name and number of technician who took sample;

11.2.4. The word "comparison" written in large letters across the top of the card;

Back Side:

11.2.5. Put gradation analysis, i.e., sieve size, percent passing each sieve, and total weight.

11.3. Shipping Control - Each producer's shipping unit and Quality Control Technician will be responsible for loading the specified sized or non-sized materials with special attention to the use intended for the ordered material, i.e., whether there is specification requirements applicable to Portland cement concrete, bituminous treatment layers or bituminous plant mix materials, etc.

11.4. Test Reports - A stamped (BMT-10) is REQUIRED with each load of aggregate shipped from a Source. A BMT-91 (Aggregate Test Report) is required as per the Frequency guide if the pay item for which the aggregate is to be used requires gradation analysis, otherwise a BMT-91 is not required. A list of all pay item numbers along with the sampling and testing frequencies for gradation and unit weight are shown on the last page for ready reference. BMT-91s will be checked, initialed and dated by the DOT inspector during his monthly verification visits. The DOT Inspector will keep copies of all BMT-91s on file in the Division Materials office.

11.5. Verification Sampling and Testing - Division personnel will visit each source or redistribution terminal located in their respective area at least monthly to perform verification testing. Division personnel will sample, from approved stockpiles, each size material being shipped during that period at each site and perform all verification tests at the producers facility. It is important that verification tests be performed at the producer's facility. In the event problems are encountered, a resample can be taken, equipment can be checked and a more timely resolution to the problem can be found. When all verification tests are completed, the responsible DOT Division inspector will forward a copy of all verification test results to the Central Laboratory in Montgomery. If stockpiles have been exhausted, trucks or railroad cars that have been approved by the technician may be sampled. All samples shall be taken as per AASHTO T-2. During each verification visit, DOT personnel will check BMT-91s as per Section 11.4. Gradation and decantation tests will be performed on all verification tests. Stockpiles or individual shipments that have not been approved by the Certified Aggregate Technician will not be sampled. If samples taken from stockpiles or shipments, either at the plant or on the project, are of questionable quality, they should be promptly submitted to the Central Laboratory with cards and bags marked RUSH, to prevent incorporation of possible failing material into the construction. These samples will be given top priority in testing. Failing results will initiate an immediate investigation by the Aggregate Control Section of the Central Laboratory. All testing will be performed in strict compliance with the appropriate AASHTO, ASTM or ALDOT Procedures prescribed in the Specifications.

11.5.1. If the producer does not ship any material during the month, no verification tests are required. The appropriate Division should document same.

11.6. Sample Size - The appropriate sample size taken shall be as per AASHTO T-2.

11.7. Monitoring - The Aggregate Control Section of the Central Laboratory is assigned the responsibility of monitoring all aggregate test results. The bulk of these results will be collected from the verification sampling program. Records showing the current properties of each aggregate source will be maintained, and all significant changes in these properties will be investigated and promptly reported to the aggregate user laboratories in the Central Laboratory, e.g., Bituminous Concrete Laboratory, Concrete Section, etc. All failing test results will be investigated by the Aggregate Control Section of the Central Laboratory, and if, after evaluation, it is judged that the material would jeopardize the quality of construction, it will be reported to project and producer personnel in time to prevent further use of the material in question.

12. Responsibilities

12.1. The Department, in conjunction with the Academia, will administer a viable training program to train Quality Control Technicians as per ALDOT Procedure 376, "Certification Program for Aggregate Technicians."

12.2. The Certified Aggregate Technician must be capable of performing all applicable tests and must demonstrate proficiency to the Department and be certified by the Department for test procedures as applicable. Aggregate technicians shall be certified and/or recertified in accordance with ALDOT Procedure 376, "Certification Program for Aggregate Technicians".

12.3. The Certified Aggregate Technicians will:

12.3.1. Be responsible for the overall Aggregate Quality Control Program;

12.3.2. Take aggregate samples as per AASHTO T2, ALDOT-150 and ALDOT-239;

12.3.3. Ensure stockpiles are constructed as per ALDOT-175;

12.3.4. Perform gradations (AASHTO T-27) when required by the specifications and determine the amount of material finer than the No.200 (75 µm sieve); (AASHTO T-11) (Document on BMT-91);

12.3.5. Determine loose unit weight (AASHTO T-19, Shoveling Procedure) as required by the pay item of the material;

12.3.6. Determine flat and elongated pieces in coarse aggregates as per ASTM D4791, if a visual inspection indicates the need;

12.3.7. Determine glassy particles content if used in bituminous wearing surface layers as per ALDOT-321, if a visual inspection indicates the need;

12.3.8. Provide a signed BMT-10 with each load of aggregate shipped from each source;

12.3.9. Provide a BMT-91 as per the frequency guide if gradation is required;

12.3.10. Perform comparison tests;

12.3.11. Assist DOT personnel with verification tests;

12.3.12. Ensure all aggregate testing equipment is maintained as per the appropriate specification;

12.3.13. Maintain a copy of the most current testing specifications;

12.3.14. Display and maintain current control charts.

12.3.15. Ensure that weighing scales are checked every four (4) months as per Department specifications.

12.4. The Contractor will:

12.4.1. Maintain and make available to Department personnel upon request all BMT-10s that will clearly document the tonnage and identify the source of all aggregates used or proposed to be used;

12.4.2. Construct and maintain aggregate stockpiles as per ALDOT-175.

12.5. DOT Division Personnel will:

12.5.1. Visit each source twice per month;

12.5.2. Check BMT-10s;

12.5.3. Sample aggregate stockpiles at the source/ contractor's site each year and submit same to the Central Laboratory in Montgomery for annual reevaluation;

12.5.4. Notify the central laboratory of any problems;

12.5.5. Perform verification tests monthly;

12.5.6. Check, date and initial producer's BMT-91s and maintain files in Division Materials section;

12.5.7. Pick up "comparison" samples in a timely manner and ship to Central Laboratory in Montgomery;

12.5.8. Perform annual inspections to all sources to include a visual inspection of plant operations, laboratory space and all test equipment as per the Aggregate Plant Check List, BMT-116.

12.5.9. Conduct at least one (1) unannounced independent weight check as per DOT Specifications if the producer is shipping aggregates that are measured by weight for a direct pay item by the Department.

12.5.10. Review control charts.

12.5.11. Ensure that the producer's equipment is checked, verified and/or calibrated as per Section 6.4.

12.6. Central Laboratory, Aggregate Control Section will:

12.6.1. Administer the Aggregate Control Program and monitor effectiveness of same;

12.6.2. Assist the Academia with classroom and practical laboratory training as required;

12.6.3. Perform all initial on-site inspections for all potential sources.

12.6.4. Provide classroom and laboratory space for training as required;

12.6.5. Test and certify aggregate technicians;

12.6.6. Perform annual reevaluation testing for all sources;

12.6.7. Perform comparison tests;

12.6.8. Review verification test results;

12.6.9. Maintain files for all approved sources. Files will include evaluation reports, geological assessments, annual reevaluation test results and other data necessary to ensure aggregate source and quality;

12.6.10. Approve new sources;

12.6.11. Ensure oversight responsibilities by visiting all Divisions on a yearly basis. The visits will include a trip to one (1) of the approved sources located in the particular Division with a Division representative; Central Laboratory will generate a written report to document the visit;

12.6.12. Be the focal point for any aggregate problem;

12.6.13. Generate the required recommendations to the Product Evaluation Board when it appears necessary to remove a source from the Approved Sources Lists;

12.6.14. Conduct at least one (1) unannounced independent weight check as per DOT Specifications if the producer is shipping aggregates that are measured by weight for a direct pay item by the Department;

12.6.15. Review and maintain copies of producer control charts.

13. Tests and Frequency of Sampling Material for Quality Control Program, ALDOT-249

Section	Gradation Frequency* AASHTO T-27 & T-11	Shoveling Method AASHTO T-19 Unit Weight
210	1 per day (Visual)	Not Required
214	1 per 500 T (450 t)	Not Required
215	1 per 500 T (450 t)	Not Required
219	1 per 500 T (450 t)	Not Required
224	1 per 500 T (450 t)	Not Required
231	1 per 500 T (450 t)	Not Required
301 Crushed Aggregate Base	1 per 1200 T (1000 t)	Not Required
315	1 per 500 T (450 t)/1 per day	Not Required
327	No Set Frequency	Not Required
401	1 per 250 T (225 t)	1 per month
402	1 per 250 T (225 t)	1 per month
414	No Set Frequency	Not Required
416	No Set Frequency	Not Required
417	No Set Frequency	Not Required
420	No Set Frequency	Not Required
430	1 per 500 T (450 t)	Not Required
450 Sand	1 per 250 T (225 t)	Not Required
450 Coarse Aggregate	1 per 250 T (225 t)	Not Required
501 Sand	1 per 225 T (t)	Not Required
501 Coarse Aggregate	1 per 500 T (450 t)	Not Required
503	1 per 500 T (450 t)	Not Required
524	1 per 500 T (450 t)	Not Required
525	1 per 500 T (450 t)	Not Required
526	1 per 500 T (450 t)	Not Required
530	1 per 500 T (450 t)	Not Required
531	1 per 500 T (450 t)	Not Required
533	1 per 500 T (450 t)	Not Required
536	1 per 500 T (450 t)	Not Required
605	1 per 500 T (450 t)	Not Required
606	1 per 500 T (450 t)	Not Required
609	1 per 500 T (450 t)	Not Required
610 Filter Blanket	1 per 500 T (450 t)	Not Required
610 Riprap	1 per 2000 T (1800 t) (Visual)	Not Required
612	1 per 250 T (225 t)	Not Required
623	1 per 500 T (450 t)	Not Required
629	1 per 500 T (450 t)	Not Required

*Minimum of one (1) per day while shipping.

Note: t = metric tons
T = English Tons

ALDOT-253-83

RAPID DRYING OF SOIL AND AGGREGATE SAMPLES FOR FIELD TESTS

1. Scope

1.1. The purpose of this test procedure is to permit rapid drying of soil, coarse and fine aggregate samples when performed at job site or producer laboratories.

2. Equipment

2.1. AASHTO Test Method requirements for uniform temperature ovens are waived for field testing purposes. Hot plate (electric or gas) will be permitted.

3. Procedure

3.1. Frequent stirring will be required.

3.1.1. Sample will be dried, allowed to cool, reheated, and cooled until the mass has reached a constant weight.

ALDOT-255-83
FIELD METHOD FOR DETERMINING THE EFFECT OF AN ANTI-STRIPPING AGENT IN BITUMINOUS MIXTURES

1. Scope

1.1. This method covers the procedure to be used by asphalt plant inspectors to determine whether an anti-stripping agent is present in samples of plant mix produced by an asphalt plant, when the use of an anti-stripping agent is required.

2. Apparatus

2.1. Balances (accurate to 0.1 g)

2.2. Pans

2.3. Spatulas

2.4. Beakers (approx. 1000 ml)

2.5. Hot plate or gas burner (for heating water in beakers)

2.6. Timer

2.7. Asbestos shields

3. Procedure

3.1. Obtain a 300-g sample of the bituminous mixture.

3.2. Place the sample in slow boiling water and let simmer for ten (10) minutes. An asbestos shield, the double boiler method or some other suitable means should be used to distribute the heat evenly under the container.

3.3. Drain the water from the mixture and place the mixture on a paper towel.

3.4. Visually inspect the mixture and determine the amount of stripping. (This should be done with a minimum amount of disturbance to the sample.)

3.5. If the mixture appears to be borderline, the sample should then be allowed to dry before making a final evaluation.

4. Reporting

4.1. Mixtures that fail to retain at least 95% coating, after testing, will not be acceptable. Report as failing or passing.

ALDOT-258-82
MECHANICAL ANALYSIS OF EXTRACTED AGGREGATE

1. Scope

1.1. This method of test covers a procedure for the determination of the particle size distribution of fine and coarse aggregate extracted from bituminous mixtures, using sieves with square openings. The method described is a modification of AASHTO T-30 to allow its adaptation to a field procedure.

2. Apparatus

2.1. The apparatus shall consist of the following:

2.1.1. Balance - A balance shall conform to AASHTO M-231, Class D for samples less than 5000 g, Class E for samples 5000 g or more.

2.1.2. Sieves - The sieves with square opening shall be mounted on substantial frames constructed in a manner will prevent loss of material during sieving. Suitable sieve sizes shall be selected to furnish the information required by the specifications covering the material to be tested. The woven wire cloth sieves shall conform to the requirements of AASHTO M-92.

3. Sample

3.1. The sample shall consist of the entire lot or sample or aggregate determined according to ALDOT-319 for Rapid Method to determine the Bitumen Content In Bituminous Paving Mixtures from which the bituminous material has been extracted.

4. Procedure

4.1. The sample shall be dried until further drying at 230 +/-5°F (110° +/- 5°C) does not alter the mass 0.1 percent. The total mass of aggregate in the bituminous mixture being tested is the sum of the masses of the dried aggregates and the mineral matter contained in the extracted bitumen. The latter is to be taken as the sum of the mass of ash in the extract and the increase in mass of the filter element as determined in ALDOT-319.

4.2. After drying, record the mass of the test sample and place the sample in a container and cover it with water. Add sufficient amount of wetting agent to assure a thorough separation of the material finer than the No. 200 (75 µm) sieve from the coarser particles. The con-tents of the container shall be agitated vigorously and the washwater immediately poured over a No. 8 (2.36 mm) sieve superimposed on a No. 200 (75 µm) sieve. The use of a large spoon to stir and agitate the aggregate in the wash water has been found satisfactory.

Note: Wetting agents may include any dispersing agent such as Calgon, Joy, or other detergent, or a soap, which will promote the separation of fine material.

4.3. The agitation shall be sufficiently vigorous to result in the complete separation from the coarse particles of all particles finer than the No. 200 (75 µm) sieve and bring them into suspension in order that they may be removed by decantation of the washwater. Care shall be taken to avoid, as much as possible, the decantation of the coarse particles of the sample. The operation shall be repeated until the washwater is clear.

4.4. All material retained on the nested sieves shall be returned to the container. The washed aggregate in the container shall be dried to a constant mass at a temperature of 230 +/-5°F (110° ± 5°C) and weighed to the nearest 0.1 percent. The aggregate shall then be sieved over sieves of the various sizes required by specification covering the mixture. The weight of material passing each sieve and retained on the next shall be recorded. The summation of these various weights must check with the dried weight after washing within 0.2 percent of the total weight. The weights of fractions retained on the various sieves and the total passing the No. 200 (75 µm) sieve shall be converted to percentage by dividing each by the total weight of aggregate in the bituminous mixture from 4.1.

Note: For further explanation see AASHTO T-30.

5. Reporting

5.1. The results of the sieve analysis shall be reported as total percentages passing each sieve. Percentages shall be reported to the nearest whole number except for the percentage passing the No. 200 (75 µm) sieve which shall be reported to the nearest 0.1 percent.

ALDOT-259-97
OPEN-GRADED ASPHALT CONCRETE FRICTION COURSE DESIGN METHOD

1. Scope

1.1. This is the laboratory procedure approved by the Department of Transportation for designing open-graded asphalt concrete friction courses containing a fiber stabilizer.

2. Referenced Documents

2.1. Alabama Department of Transportation Specifications for Highway Construction

2.2. AASHTO T 209, Maximum Specific Gravity of Bituminous Paving Mixtures

2.3. ALDOT-361, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage

2.4. ALDOT-384, Mix Design Procedure for Superpave Level I

2.5. ALDOT-386, Determination of Drain Down Characteristics in Uncompacted Bituminous Mixtures

3. Test Procedure

3.1. Check the coarse and fine aggregate along with the mineral filler for specification compliance. Test for gradation, absorption, bulk dry specific gravity, and apparent specific gravity.

3.2. Separate from the combined aggregate blend, material passing the 3/8 in,.(9.5 mm)sieve and retained on the No. 4 (4.75 mm)sieve. (This is usually the predominate aggregate portion of the blend.) Quarter out 105 grams (± 2 grams) of this aggregate and dry in an oven at 230 ± 9°F (110 ± 5^{o}C) to a constant mass. Then allow the sample to cool to room temperature.

3.3. Place approximately 100 grams of the a sample into a metal funnel measuring 4.5 in. (115 mm)in height, with a top diameter of 3.5 in. (90 mm)and a bottom diameter of ½ in. (15 mm). Cover the bottom orifice with wire mesh from a No. 10 (2.00 mm) sieve. Immerse the funnel containing the sample into a container filled with S.A.E. No. 10 lubricating oil until the aggregate is completely covered. If the aggregate has less than 2 percent absorption, let it soak for five minutes. If the aggregate has an absorption greater than 2 percent, let it soak for 30 minutes.

3.4. Let the funnel and its contents drain for approximately two minutes at room temperature. Then pace in a n oven at 140 ± 5°F (60 ± 3^{o}C) and let it drain an additional 15 minutes. Empty contents of the funnel into a tarred pan and let cool to room temperature. Record the mass of the sample to the nearest 0.1 gram.

3.5. Calculate the percent oil retained (POR) in the surface of the aggregate using the following equation:

POR = Gsa / 2.65 * (B-A) / A * 100

Where:

Gsa = apparent specific gravity of sample aggregate
A = dry weight of sample (paragraph 3.3)
B = coated weight of sample (paragraph 3.4)

3.6. If the aggregate has less than 2 percent absorption move to paragraph 3.10.

3.7. If the aggregate has more than 2 percent absorption, go on to paragraph 3.8.

3.8. If the aggregate has more than 2 percent absorption, after completing paragraph 3.4, pour the aggregate onto a clean absorptive cloth and obtain a saturated surface dry condition.

3.9. Obtain the mass of the S. S. D. sample, to the nearest 0.1 gram, and calculate the percent oil absorbed (POA) using the following equation:

POA = (SSD - A) / A * 100

Where:

SSD = saturated surface dry mass (paragraph 3.8)
A = dry weight of sample (paragraph 3.3)

3.10. Determine the percent free oil (PFO) using the following equation:

PFO = POR - POA

Where:

POA = percent oil absorbed (paragraph 3.8)
POR = percent oil retained (paragraph 3.5)

3.11. For aggregate with less than 2 percent absorption, calculate the surface constant value using the following equation:

SC = 0.1 + 0.4 * POR

3.12. For aggregate with more than 2 percent absorption, calculate the surface constant value using the following equation:

SC = 0.1 + 0.4 * PFO

3.13. For aggregate with less than 2 percent absorption the asphalt content, percent binder (Pb), is computed using the following equation:

Pb = (2 * SC + 4) * 2.65 / Gsa

3.14. For aggregate with more than 2 percent absorption the effective asphalt content, percent binder effective (Pbe), is computed using the following equation:

Pbe = (2 * SC + 4) * 2.65 / Gsa

3.15. Complete section 4 and 5 of this procedure, then prepare at least one batch using at least 0.2 percent mineral fiber, (size based upon nominal maximum aggregate size from AASHTO T 209, Maximum Specific Gravity of Bituminous Paving Mixtures), of this gradation. Estimate the amount of asphalt binder that will be absorbed (ALDOT-384 contains an equation to help with this estimate). Mix and age this batch according to ALDOT-384 using an asphalt content equal to or slightly higher than the sum of the effective and (estimated) absorbed asphalt content. Run the AASHTO T 209 test on the sample and use the equations in ALDOT-384 to calculate the percent of binder that is actually absorbed (Pba). The total amount of asphalt cement needed for aggregates with more than 2 percent absorption is calculated by the following equation:

Pb = Pbe + Pba

4. Void Capacity of Coarse Aggregate

4.1. Determine the unit weight (unit mass) of the coarse aggregate fraction of the proposed gradation by either of the following methods.

4.1.1. Apparatus

4.1.1.1. Compaction Mold: A solid wall metal cylinder, approximately 6 in. (150 mm) nominal diameter, with a detachable metal base plate. A detachable metal guide-reference bar as shown in figure 2 is required for the first method.

4.1.1.2. Timer: A stopwatch or equivalent timing device accurate to ± one second per two minutes. A circuit breaker connected to the clock is allowed.

4.1.1.3. Dial Indicator (or other measuring device): Indicator shall be accurate to a least 0.001in. (0.025 mm) with a range of at least 3 in. (75 mm).

4.1.1.4. Vibratory Compactor, First Method:

4.1.1.4.1. Rammer: A portable electromagnetic vibrating rammer as shown in figure 3, having a frequency of 3,600 cycles per minute. The rammer shall have a tamper and extension as shown in figure 4.

4.1.1.4.2. Wooden Base: A plywood disc approximately 15 in. (380 mm) in diameter, 2 in. (50 mm) thick, with a cushion (rubber hose) attached to the bottom. This base shall be constructed so that it can be firmly attached to the base plate of the compaction mold.

4.1.1.5. Vibratory Compactor, Second Method:

4.1.1.5.1. Vibrating Table: A vibratory table capable of inducing vibratory compaction at 3,600 cycles per minute with an amplitude of 0.013 ± 0.002 in.(0.33 ± 0.05 mm) (i.e. Soiltest CN-166).

4.1.1.5.2. Confining Load: A circular steel disc with a mass of approximately 27 kg and a diameter 2/16 to 3/16 in. (3 to 4 mm) smaller than the compaction mold (i.e. Soiltest CN-167).

4.2. Quarter out a sample from the coarse aggregate of the proposed blend. The sample size shall be approximately 2,270 grams. For light weight aggregate (bulk specific gravity less than 2.0), reduce the sample size to 1,590 grams.

Note: Most light weight aggregate will be crushed when subject to field compaction and will not make a suitable open graded mix.

4.3. Tare the compaction mold and place the sample into the mold. Record the sample mass to the nearest gram.

4.4. First Method:

4.4.1. Place the tamper foot on the sample. Place the guide/reference bar over the shaft of the tamper foot and secure the bar to the mold with the thumb screws.

4.4.2. Place the vibratory rammer on the shaft of the tamper foot and vibrate for 15 seconds. During vibration exert just enough pressure on the rammer to maintain contact between the sample and the tamper foot.

4.4.3. Remove the vibratory rammer from the shaft of the tamper foot and brush any fines from the top of the tamper foot.

4.4.4. Measure the thickness (t) of the compacted material to the nearest 0.01 in. (1/4 millimeter).

4.5. Second Method:

4.5.1. Place the surcharge base plate on the sample and place the sample onto the vibrating table.

4.5.2. Lower the confining load onto the base plate and vibrate the assembly for two minutes.

4.5.3. Remove the confining load and brush any fines from the top of the surcharge base plate. Measure the thickness (t) of the compacted material to the nearest 0.01 in. (1/4 millimeter).

4.6. Calculations:

4.6.1. Calculate the vibrated unit weight lbs. per cubic ft. as follows:

$$Mv = m * 6912 / (t * d^2 * 3.1416)$$

Where:

Mv = vibrated unit weight in pcf
m = mass of sample in pounds
d = diameter of compaction mold in inches
t = thickness of sample in inches

4.6.2. Calculate the void capacity of the sample, percent based on volume, as follows:

$$VCA = (1 - Mv / Mc) * 100$$

Where:

Mc = bulk dry solid unit weight of coarse aggregate in pcf
VCA = void capacity of coarse aggregate as a percent of total volume

5. Optimum Content Of Fine Aggregate

5.1. Calculate the unit weight of the asphalt binder in pounds per cubic yard as follows:

$$Mb = Gb * 62.4 \text{ pcf}$$

Where:

Gb = specific gravity of binder (approximately 1.03)
Mb = unit weight of binder

5.2. Calculate the optimum fine aggregate content, by mass of total aggregate, as follows:

$$Pf = ([VCA – Va] – [Pb * Mv / Mb]) / ([\{VCA - Va\} / 100] + Mv / Mf)$$

Where:

Pf = percent of fine aggregate by mass of total aggregate
VCA = void capacity of coarse aggregate
Va = design air voids (15 to 20 percent)
Pb = percent binder (for aggregates with more than 2 percent absorption use Pbe,

effective binder content)

Mv = vibrated unit weight in pounds per cubic yard
Mb = unit weight of binder
Mf = bulk dry solid unit weight of fine aggregate

5.3. Compare the optimum fine aggregate content (Pf) at both 15 and 20 percent design air voids to the amount passing the No. 8 (2.36 mm) sieve of the job mix formula (JMF). If the JMF is outside the optimum range by more than 1 percent recompute the proportions of coarse and fine aggregates to meet the optimum fine aggregate content. If this changes the coarse aggregate portion of the JMF by more than 5 percent the design procedure shall be repeated.

5.4. After completing sections 4 and 5, prepare at least one batch to determine the maximum specific gravity of the bituminous paving mixture. Add at least 0.2 per-cent fiber to the aggregate and mix thoroughly before adding the liquid asphalt binder. The size of sample should be based upon the nominal maximum aggregate size from AASHTO T 209. Estimate the amount of asphalt binder that will be absorbed. (Use the equation found in ALDOT-384 to help with this estimation.) Mix and age this batch according to ALDOT-384 using an asphalt content equal to or slightly higher than the sum of the effective and estimated absorbed asphalt con-tent. Determine the maximum specific gravity of the bituminous paving mixture in accordance with AASHTO T 209. Use the equation in ALDOT-384 to calculate the percent of binder that is actually absorbed (Pba).

Pb = Pbe + Pba

6. Drain Down

6.1. In general, the mixing temperature is the temperature where the liquid asphalt binder has a viscosity of 170 ± 20cSt; however, when the liquid asphalt binder contains polymer the mixing temperature may be different, so the manufacturer's recommendation and guidelines should be followed to determine mixing temperature.

6.2. Prepare a sample and test it by ALDOT-386, Determination of Drain Down Characteristics in Uncompacted Bituminous Mixtures, using the mixing temperature as the anticipated plant production temperature. If the drain down exceeds 0.3 per-cent when the temperature is 27°F (15°C) higher than the anticipated plant production temperature then the O.G.F.C. shall be redesigned with a higher fiber content. Include the amount of drain down in the mix design report.

7. Resistance to Moisture Damage

7.1. At the mixing temperature prepare at least six specimens according to ALDOT-384, using 100 gyrations.

7.2. Use the height versus gyration data to estimate each specimen's bulk specific gravity. Separate the specimens into two groups with equal, or as close to equal as possible, bulk specific gravity averages.

7.3. Immerse one group in 140°F (60°C) water for 24 hours (as in ALDOT-361). Store the other group in air at room temperature. Place both groups into a 77°F (25 ± 1°C) water bath for a minimum of one hour (both groups must be at the same temperature for testing).

7.4. Determine the tensile strength for both groups and calculate the ratio of conditioned at 140°F (60°C) strength to stored at room temperature strength. If this ratio is not 80 percent or higher anti-strip or other additives shall be added until the 80 percent ratio is met when performing this procedure.

8. Reporting

8.1. The contractor shall submit to Materials and Tests the job mix formula for review. The contractor shall include all the data this procedure requires including the data required to complete the HMA OGFC Design Work Sheet, included in this procedure.

HMA OGFC Design
Work Sheet

Producer: Laboratory: F. G. R. 20

Designer: Project:

Date: Division:

Job Mix Formula
Aggregate Sources:

Sieve Size					Job Mix	Percent Oil
¾ in. (19.0 mm)	______	______	______	______	______	
½ in. (12.5 mm)	______	______	______	______	______	Percent Oil Absorbed:
3/8 in. (9.5 mm)	______	______	______	______	______	
No. 4 (4.75 mm)	______	______	______	______	______	Percent Free Oil:
No. 8 (2.36 mm)	______	______	______	______	______	
No. 200 (.075 mm)	______	______	______	______	______	Surface Capacity:

Specific Gravity and Unit Weight (mass)

Mv = ______ Mc = ______ VCA = ______ Effective Binder:

Va = 15 - 20 %

Mb = ______ Mf = ______ Pbe = ______ *

Pf = ______ to ______ % Absorbed Binder:

Optimum Mixing Temperature

Binder (A.C.) Grade and Source: ______ Percent Binder (JMF)

Additives (fiber/polymer):

Mixing Temperature Range ______ to ______ °F °C Percent Drain Down = ______ %

Resistance to Moisture Damage

Conditioned Strength = ______

Unconditioned Strength = ______

Strength Ratio = ______ %

* Percent binder is equal to effective binder for nonabsorptive aggregates

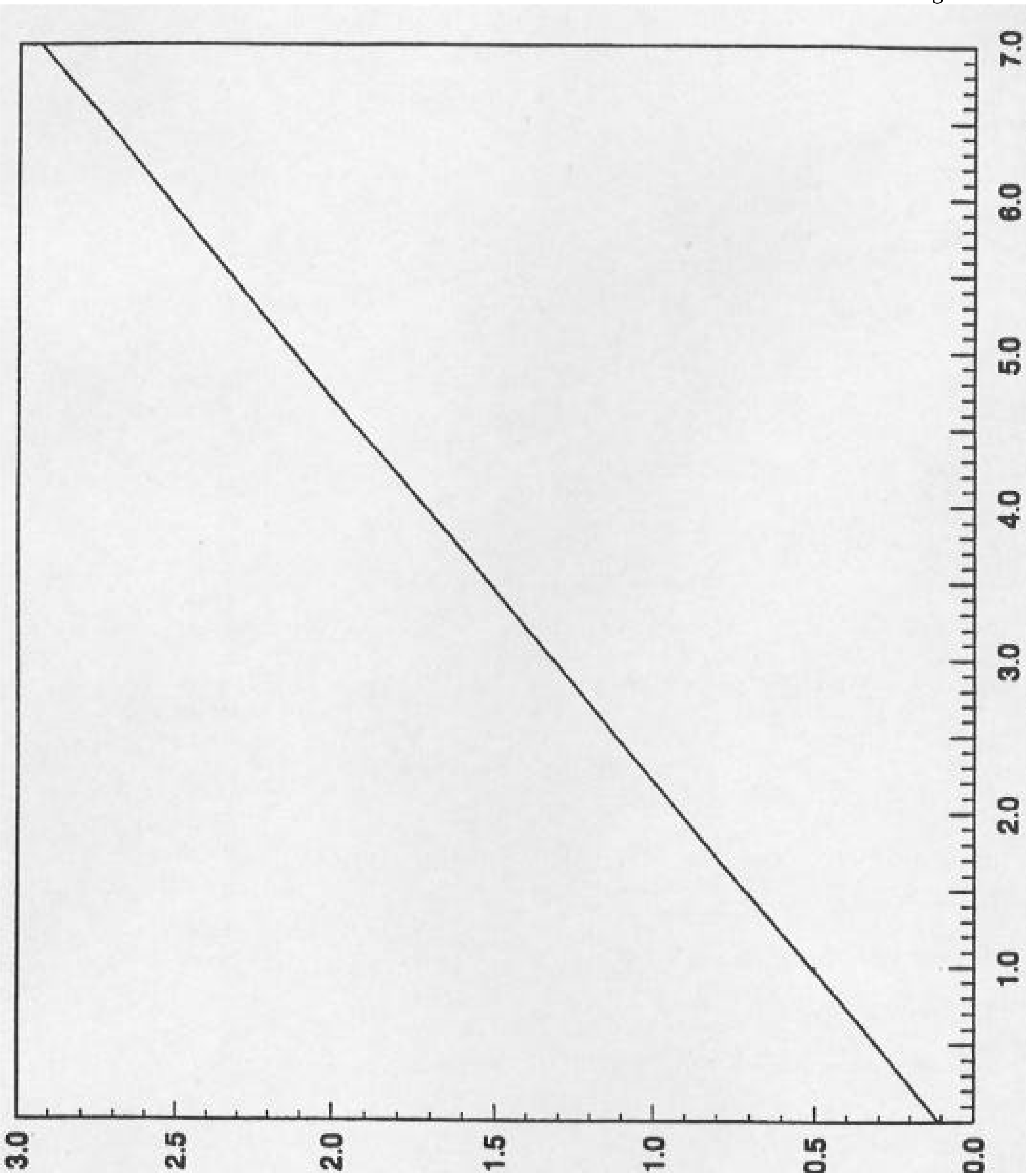


Figure 1 - Surface Constant (SC)

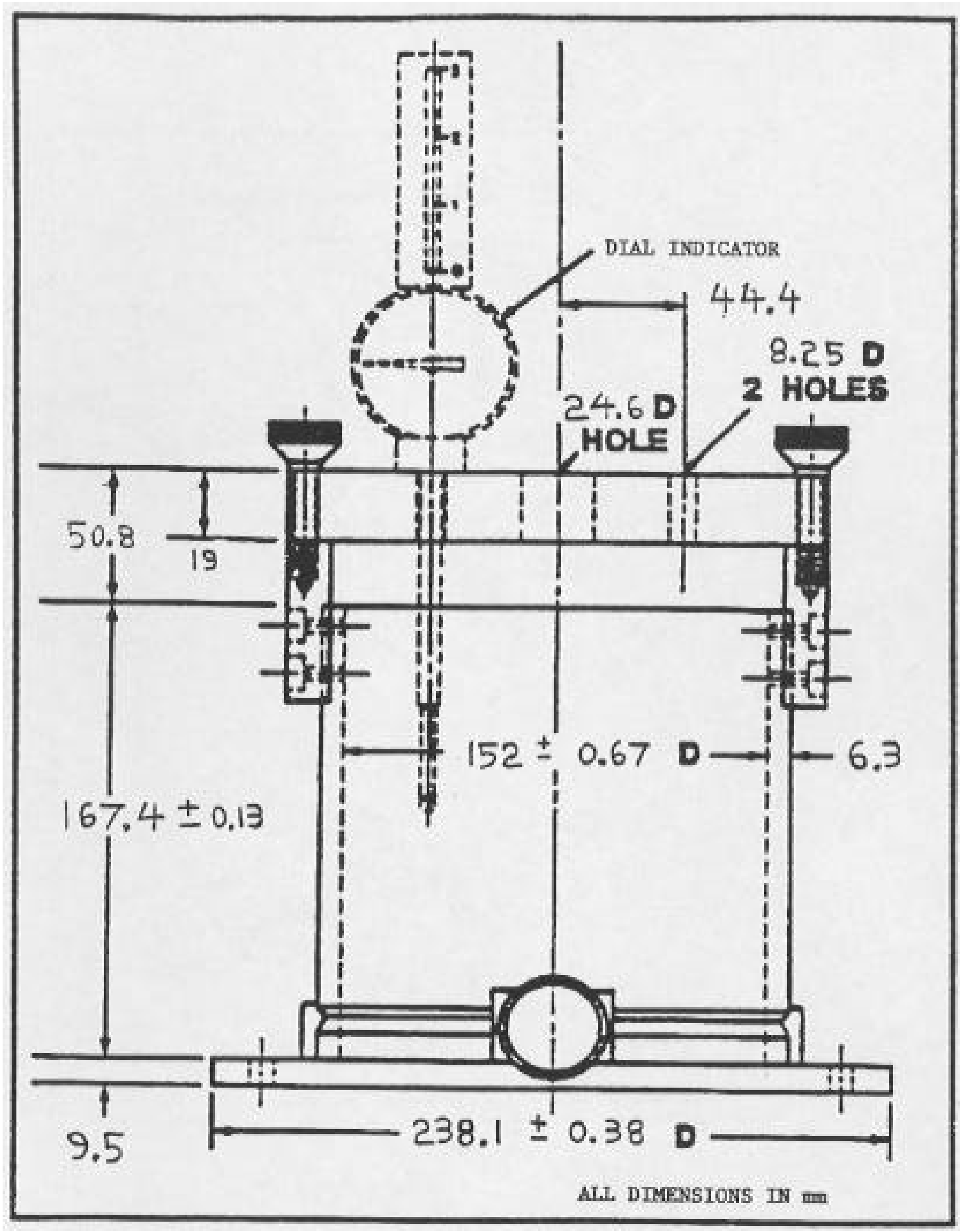


Figure 2 - Compaction Mold

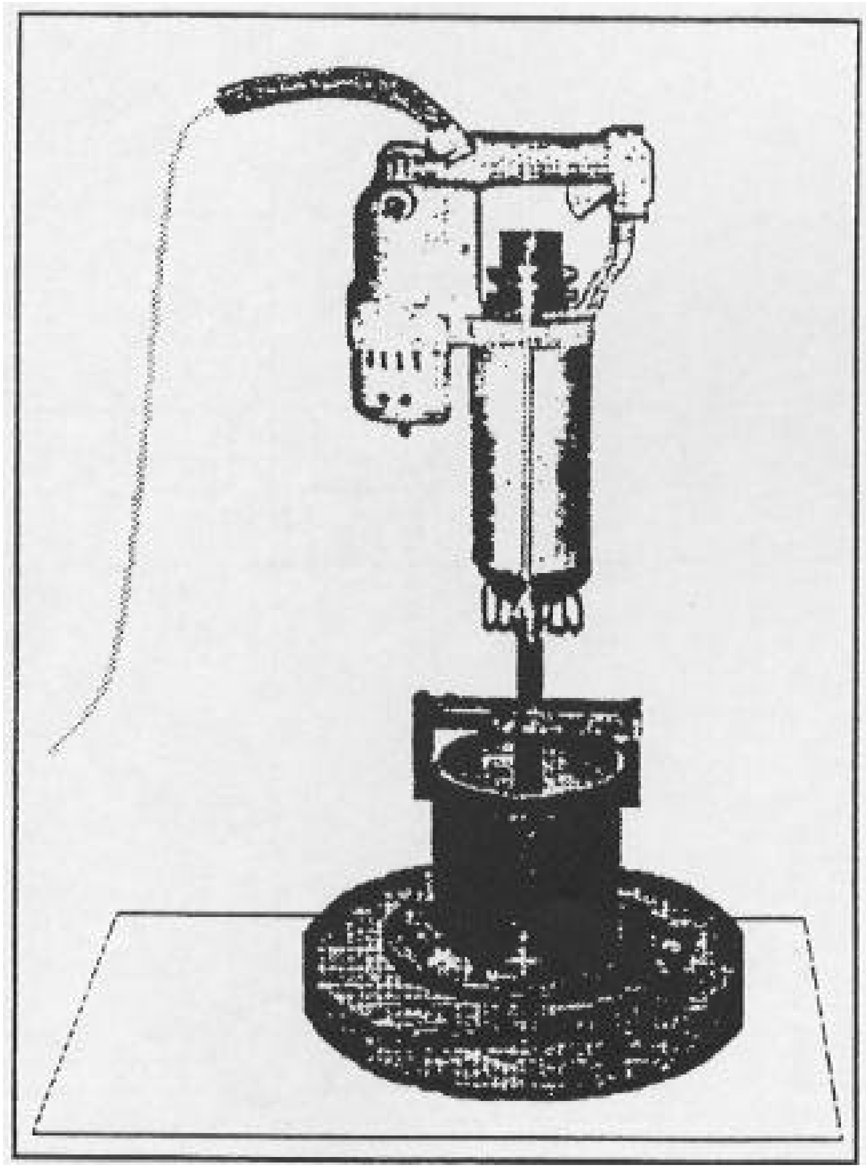


Figure 3 - Vibratory Compaction Assembly

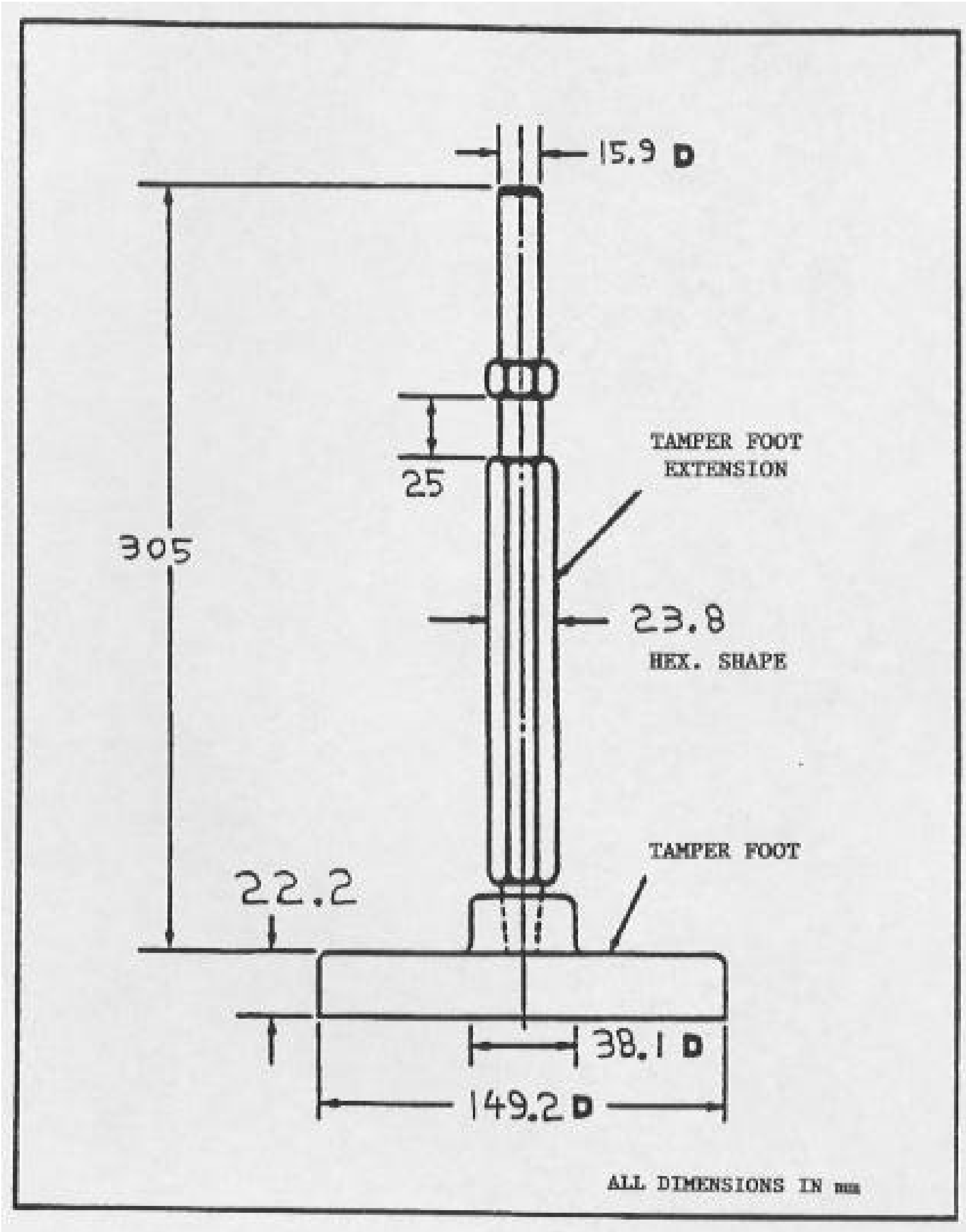
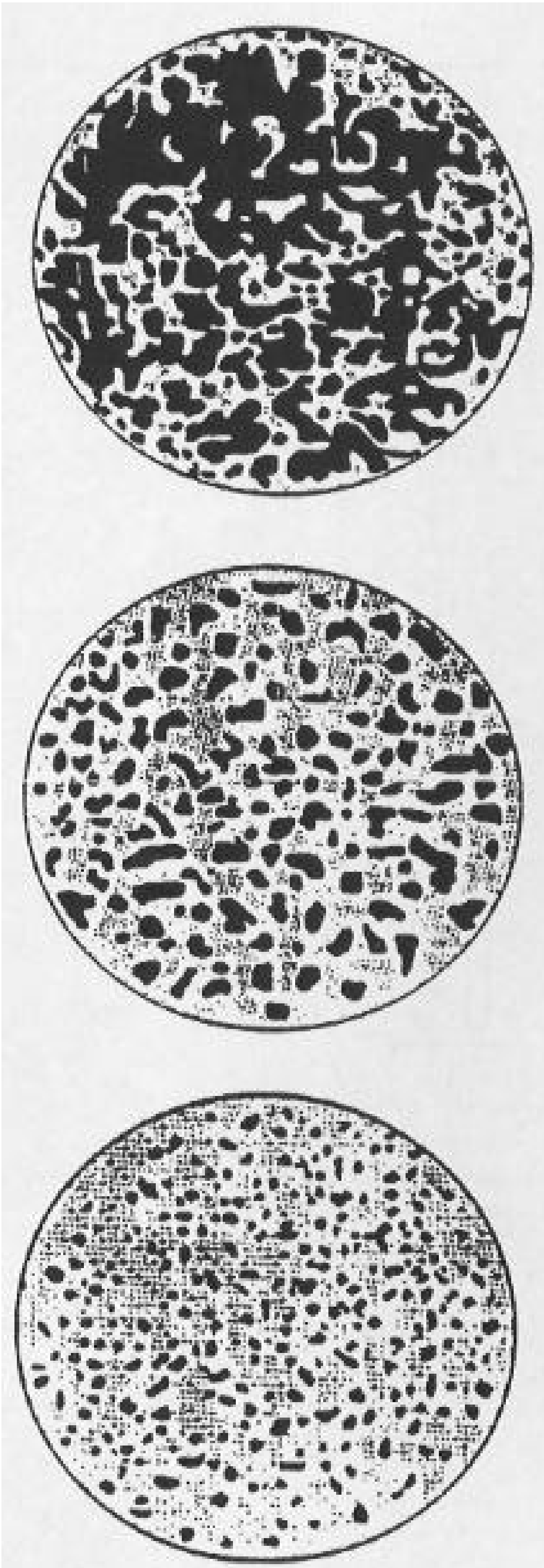


Figure 4 - Tamper Foot



No Drain Down

Increase Mixing Temperature

Desired Drain Down

Optimum Mixing Temperature

Excessive Drain Down

Decrease Mixing Temperature

Figure 5 – Drain Down Characteristics

ALDOT-283-82
METHOD OF TEST FOR SIEVE ANALYSIS OF AGRICULTURAL LIMESTONE

1. Scope

1.1. This test is used to determine the size gradation of crushed limestone or marl.

2. Equipment

2.1. Sieve No. 10 (2.00 mm) mesh

2.2. Sieve No. 60 (250 µm) mesh

3. Procedure

3.1. Reduce sample size to approximately 300g by rifling or quartering per AASHTO T-248.

3.2. Dry to constant weight in an oven at 230°F(110°C).

3.3. Weigh out 150g of sample and place in No.10 (2.00 mm) mesh sieve. Sieve sample through No. 10 (2.00 mm) mesh and No. 60 (250 µm) mesh sieves by lateral motions.

3.4. Weigh portion of material retained on each sieve and calculate % of total weight of sample.

3.5. Report as passing percent on each sieve.

ALDOT-307-83
DESIGN METHOD FOR SELECTING OPTIMUM ASPHALT CEMENT CONTENT OF BITUMINOUS MIXTURE BY MEANS OF THE MARSHALL APPARATUS

1. Scope

1.1. This procedure covers the Department's method of designing bituminous paving mixtures using the Marshall Stability Apparatus for the measurement of the resistance to plastic flow of cylindrical specimens of bituminous paving mixtures loaded on the lateral surface. This method is for use with mixtures containing aggregate up to 1 in. (25 mm) maximum particle size.

2. Applicable Documents

2.1. AASHTO T 84, Specific Gravity and Absorption of Fine Aggregates

2.2. AASHTO T 85, Specific Gravity and Absorption of Coarse Aggregates

2.3. AASHTO T 166, Bulk Specific Gravity of Compacted Bituminous Mixtures

2.4. AASHTO T 209, Maximum Specific Gravity of Bituminous Paving Mixtures

2.5. AASHTO T 245, Resistance to Plastic Flow of Bituminous Mixtures using the Marshall Apparatus

2.6. AASHTO T 269, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures

2.7. The Asphalt Institute Manual, Series No. 2 (MS-2), Current Edition

3. Test Procedures

3.1. Stability and Flow

3.1.1. AASHTO T 245 shall apply except where amended as follows:

Paragraph 3.4, 1st sentence, shall be amended to include the following formula for adjusting the amount of aggregate to obtain the required 63-mm specimen thickness:

International System of Unit (SI)

$$\text{Adjusted Wt. (Agg)} = \frac{63 \text{ X mass of Agg. (g)}}{\text{Measured Specimen Hgt. (mm)}}$$

3.1.2. Age the specimens (samples for compaction, samples for maximum specific gravity) in a forced draft oven at compaction temperature for 45 minutes.

3.2. Bulk Specific Gravity of Compacted Bituminous Mixtures

3.2.1. AASHTO T 166, Method A, shall apply.

3.2.2. Prior to testing for stability and flow, the Bulk Specific Gravity shall be determined on the compacted specimen prepared in accordance with AAHSTO T 245 as amended.

3.2.3. Average the Bulk Specific Gravities for all compacted specimens of a given asphalt content. Values obviously in error shall not be included in average. Values shall be carried out to three decimal places.

3.3. Maximum Specific Gravity of Bituminous Paving Mixtures

3.3.1. AASHTO T 209 shall apply.

3.3.2. Determine the Maximum Specific Gravity of the bituminous mix for at least two asphalt contents, preferable on mixes at or near the optimum asphalt content and compute average. The Maximum Specific Gravity of the mixes with other asphalt contents can be computed as described in paragraph 4.4.

4. Density and Voids Analysis

4.1. Nomenclature

4.1.1. The following nomenclature will be used in the section:

Gb	=	Specific Gravity of Asphalt
Gmb	=	Bulk Specific Gravity of Compacted Mixture
Gmm	=	Maximum Specific Gravity of Bituminous Mixture at a particular asphalt content
Gsa	=	Apparent Specific Gravity of the combined coarse and fine aggregates
Gsb	=	Bulk Specific Gravity of the combined coarse and fine aggregates
Gse	=	Effective Specific Gravity of Aggregate
Pa	=	Percent Air Voids by total volume in compacted mixture
Pb	=	Percent Binder by total mass of mixture
Pba	=	Percent Absorbed Binder by mass of aggregate
Pbe	=	Percent Effective Binder Content by total mass of mixture
Ps	=	Percent Aggregate by total mass of mixture
VF	=	Percent of Total Voids filled
VMA	=	Percent Voids, by volume of compacted mix, in mineral aggregate

4.2. Bulk and Apparent Specific Gravity of Coarse and Fine Aggregates

4.2.1. Calculate the Bulk and Apparent Specific Gravity of Coarse Aggregate in accordance with AASHTO T 85. (See Note 1)

4.2.2. Calculate the Bulk and Apparent Specific Gravity of Fine Aggregate in accordance with AASHTO T 84 on the material retained on the No. 200 (75 µm) sieve after the materials passing the No. 200 (75 µm) sieve has been re-moved by washing. (Assume that the No. 200 (75 µm) material washed from the sample has the same specific gravity as the material retained on the No. 200 (75 µm). (See Note 1, 2)

4.2.3. Calculate the Bulk Specific Gravity (Gsb) of the total combined mineral aggregate as follows: (See Note 1)

$$Gsb = \frac{100}{\dfrac{\text{Percent Agg. 1}}{\text{Gsb Agg. 1}} + \dfrac{\text{Percent Agg. 2}}{\text{Gsb Agg. 2}} + \dfrac{\text{Percent Agg. n}}{\text{Gsb Agg. n}}}$$

4.2.4. Calculate the Apparent Specific Gravity (Gsa) of the total combined mineral aggregate as shown in paragraph 4.2.3 by substituting the Apparent Specific Gravity of the aggregate in the formula for the Bulk Specific Gravity (Gsb). (See Note 1)

Note 1: Test results shall be carried out to three decimal places.

Note 2: The Bulk Specific Gravity of mineral filler is difficult to determine. However, if the Apparent Specific Gravity of mineral filler is used instead, the error is usually negligible.

4.3. Effective Specific Gravity of Aggregate (Gse)

4.3.1. Calculate the Effective Specific Gravity of aggregate using average Gmm as determined in paragraph 3.3.2.

$$Gsb = \frac{100 - Pb}{\dfrac{100}{Gmm} - \dfrac{Pb}{Gb}}$$

Note: The asphalt content (Pb) should be the asphalt content at which Gmm was determined in paragraph 3.3.2.

4.4. Maximum Specific Gravity of Bituminous Mixture with other Asphalt Contents. (Gmm)

4.4.1. Compute Maximum Specific Gravity of bituminous mixtures at other asphalt contents as follows:

$$Gmm = \frac{100}{\dfrac{Ps}{Gse} + \dfrac{Pb}{Gb}}$$

4.5. Percent Voids in Mineral Aggregate (VMA)

4.5.1. Compute Percent Voids in Mineral Aggregate of the compacted bituminous mixture for each asphalt content as follows:

$$VMA = 100 - \frac{(Gmb)\ (Ps)}{Gsb}$$

4.6. Percent Air Voids in Compacted Mixture (Pa)

4.6.1. Compute percent Air Voids of the compacted bituminous mixture for each asphalt content as follows:

$$Pa = 100\ \frac{Gmm - Gmb}{Gmm}$$

4.7. Percent Voids filled in compacted mixture (VF)

4.7.1. Compute Voids filled in the compacted bituminous mixture for each asphalt content as follows:

$$VF = 100\ \frac{VMA - Pa}{VMA}$$

4.8. Other Parameters

4.8.1. Asphalt Absorption (Pba) - Compute the percent of asphalt absorption as follows:

$$Pba = 100\ \frac{(Gse - Gsb)}{(Gsb)\ (Gse)}\ Gb$$

4.8.2. Effective Asphalt Content (Pbe) - Compute the effective asphalt content for bituminous mix as follows:

$$Pbe = Pb\ \frac{Pba}{100}\ \ Ps$$

5. Selecting Optimum Asphalt Content

5.1. Measure stability values for a given asphalt content and average results. Values that are obviously in error should not be included in average.

5.2. Compute the average density for each asphalt content by multiplying the average bulk specific gravity value as determined in paragraph 3.2.3 by 62.4 lb/ft^3 (1000 kg/m^3) and by 0.997 to correct for the density of water at 77°F (25°C).

5.3. Plot a separate graph for the following values:

Stability vs. Asphalt Content
Density vs. Asphalt Content
Percent Air Voids vs. Asphalt Content
Percent Voids Filled vs. Asphalt Content
Percent VMA vs. AC

Note: In each graph connect the plotted values with a smooth curve that is the "best fit" for all values.

5.4. Optimum Asphalt Content

5.4.1. The optimum asphalt content of the mix is the percent asphalt cement that yields the required percent air voids as specified for a particular mix.

5.4.2. Adjustments should be made in the bituminous mix if all the design criteria are not met by the optimum asphalt content.

5.4.3. Determine from density curve the Laboratory Density of the mix at the Optimum Asphalt Content. This density will be reported for use in adjustment of material thickness along within place density determinations.

Note: Refer to ALDOT-153 for typical Work Sheet and Report Form.

ALDOT-310
METHOD OF DETERMINING PERCENT OF FRACTURED PARTICLES IN COARSE AGGREGATE

1. Scope

1.1. This method of test is for the determination of the percent of crushed particles in coarse aggregate.

2. Definitions and Standards

2.1. A fully fractured face is defined as an angular, rough or broken surface of an aggregate particle created by crushing, by other artificial means, or by nature. A face is considered fractured only if it has a projected area at least as large as one-quarter of the maximum projected area (maximum cross-sectional area) of the particle and also has sharp and well-defined edges.

3. Apparatus

3.1. Balances (Accurate to 0.1 g).

3.2. Oven (Capable of maintaining the temperature at 230 ± 10°F (110 ± 5°C).

3.3. No. 4 (75 mm) Sieve.

3.4. Pans.

4. Procedure

4.1. Determine sample size based on Nominal Maximum Aggregate size as per AASHTO T-27.

4.2. Thoroughly mix and then reduce the field sample for testing in accordance with AASHTO T-248.

4.3. Wash the sample thoroughly over the No. 4 (4.75 mm) sieve.

4.4. Dry the sample at 230 ± 10 °F (110 ± 5°C) and record total mass of sample.

4.5. Separate the aggregate particles into three groups: (1) one crushed face, (2) two or more crushed faces, and (3) what remains with no crushed faces. To check this criterion (as defined in 2.1), hold each aggregate particle so that the face is viewed directly. See Figure 1 showing a schematic of a fractured particle with one fractured face.

4.6. Record the mass of each of these groups and the total sample mass to the nearest 0.1g.

4.7. Check total sample mass after the test with the mass recorded in 4.4. If different by more than 0.1g repeat test.

5. Calculations

5.1. Percent particles with two or more crushed faces.

5.2. Where: Mc2 is the mass of particles with two or more crushed faces, and M is the mass of the total sample.

5.3. Percent of particles with one or more crushed faces.

5.4. Where: Mc1 is the mass of particles with one or more crushed faces.

Note: Because % Mc1 is percentage of particles with one or more crushed faces, Mc1 will be the sum mass of all particles with one crushed face plus all particles with two or more crushed faces.

6. Reporting

6.1. Results should be reported to the nearest percent of crushed aggregate.

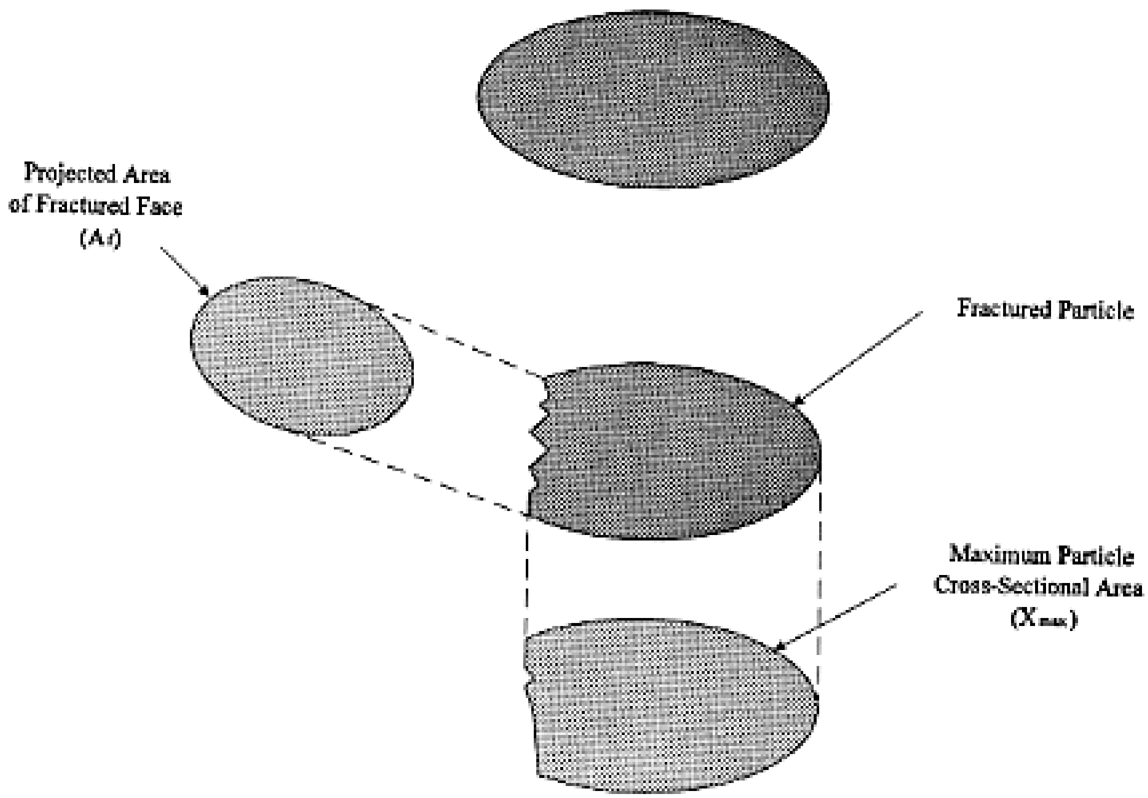


Figure 1
Schematic of a Fractured Particle with One Fractured Face

ALDOT-319-82
RAPID METHOD TO DETERMINE THE BITUMEN CONTENT IN BITUMINOUS PAVING MIXTURES

1. Scope

1.1. This is a rapid test method to be used in routinely determining the bitumen content in hot mixed paving mixtures. The method described is a modification of AASHTO T-164, Method A.

2. Apparatus

2.1. Rotorex (Electric or Manual)

2.2. Beaker (200-500 ml capacity)

2.3. Pans (Approximately 18 x 12 in (450 x 300 mm))

2.4. Filter Rings (Appropriate size)

2.5. Hot Plate (Electric or Gas)

2.6. Balance (Conforming to the requirements of AASHTO M-231 Class G2)

2.7. Spatula

2.8. 2 in Paint Brush

3. Reagents

3.1. Trichloroethylene, Technical Grade, Type I, Federal Specification 0-T-634, latest revision.

3.2. 1,1,1, Trichloroethane, Conforming to Federal Specification 0-T-620, (Interim Amendment 3).

Note 1: The Solvents should be used only under a hood in a well ventilated area.

4. Determination of Water in Mineral Aggregate

4.1. Obtain sample and test in accordance with ALDOT-130.

5. Procedure

5.1. Secure a representative sample of the Bituminous Mixture in accordance to AASHTO T-168.

5.2. Quarter the sample to the size required (in AASHTO T-164, Table I) by AASHTO T-248. For samples containing aggregate greater than 1 in. (25 mm) in diameter, a sample of a least

1.5 to 2 kg. may be used. However, before any material can be rejected, the requirements for sample size shown in Table I of AASHTO T-164 must be complied with.

5.3. Weigh filter rings after drying to a constant weight over hot plate or heater fan. Record the mass.

5.4. Weigh sample and record weight.

5.5. Place sample in the rotor bowl, cover the sample in the bowl with solvent and allow sufficient time for the solvent to disintegrate the sample (not over one hour, usually 5 to 10 minutes).

5.6. Start rotorex bowl revolving slowly and gradually increase the speed to a maximum of 3600 rpm or until solvent ceases to flow from the drain. Allow the machine to stop, add 200 ml of solvent and repeat the procedure. Use sufficient 200 ml solvent additions (not less than three) so that the extract is clear and not darker than a light straw color. Collect the extracted solvent in a suitable graduate.

5.7. Remove bowl from rotorex. Place in pan so as no edges will protrude over side of pan. Remove funnel screw, take approximately 50 mm paintbrush and clean bowl lid. Next, brush any adhering particles of filter pad off into the pan, then remove material from the bowl into pan by using a brush.

5.8. Dry the sample slowly on a hot plate and agitate aggregates repeatedly with spatula until no odor from the solvent can be detected.

5.9. Dry filter rings until no odor can be detected. Weigh and record weight gain in the filter rings.

5.10. Weigh extracted aggregate and record mass.

6. Calculations

6.1. Calculate the percentage of bitumen in sample as follows:

Percent Bitumen content based on total sample

$$\frac{(W_1 - W_2) - (W_3 + W_4 + W_5)}{W_1 - W_2} \text{ X } 100$$

Where:
W_1 = original mass of sample
W_2 = mass of water in sample
W_3 = mass of extracted mineral matter
W_4 = mass of mineral matter in extract, based on ash correction factor (See Note 4 and 5)
W_5 = increase of mass of filter rings

Note 3: The ash correction factor can be obtained by placing all of the effluent from the extraction test (Article 5.5 and 5.6) in a sealed water tight container and submitting it along with the total mass of the mineral water to the Division or Central Laboratory.

Note 4: If the Asphalt Laboratory at the plant site is equipped to determine the ash test in accordance with AASHTO T-164, it shall be used instead of the ash correction factor.

ALDOT-320-79
IN-LINE BLENDING OF ANTI-STRIP AGENT AT BITUMINOUS PLANT MIX MANUFACTURING SITE

1. Scope

1.1. This procedure establishes the method and control of in-line blending of asphalt cement and anti-strip agent when the additive is introduced during the manufacture of bituminous plant mix.

2. Apparatus

2.1. Balance - The balance shall have a capacity of 5 kg or more and conform to AASHTO M-231, Class F.

2.2. Stop Watch - Graduated in seconds and accurate to ± 0.1 percent when checked over a 15 minute period.

2.3. Sample Container - Any open top, leak proof container with a minimum capacity of 2 gal (8 L).

3. In-Line Blending System

3.1. The position for the introduction of the anti-strip agent to the asphalt cement may be at any accessible point between A-A' shown in Figure I.

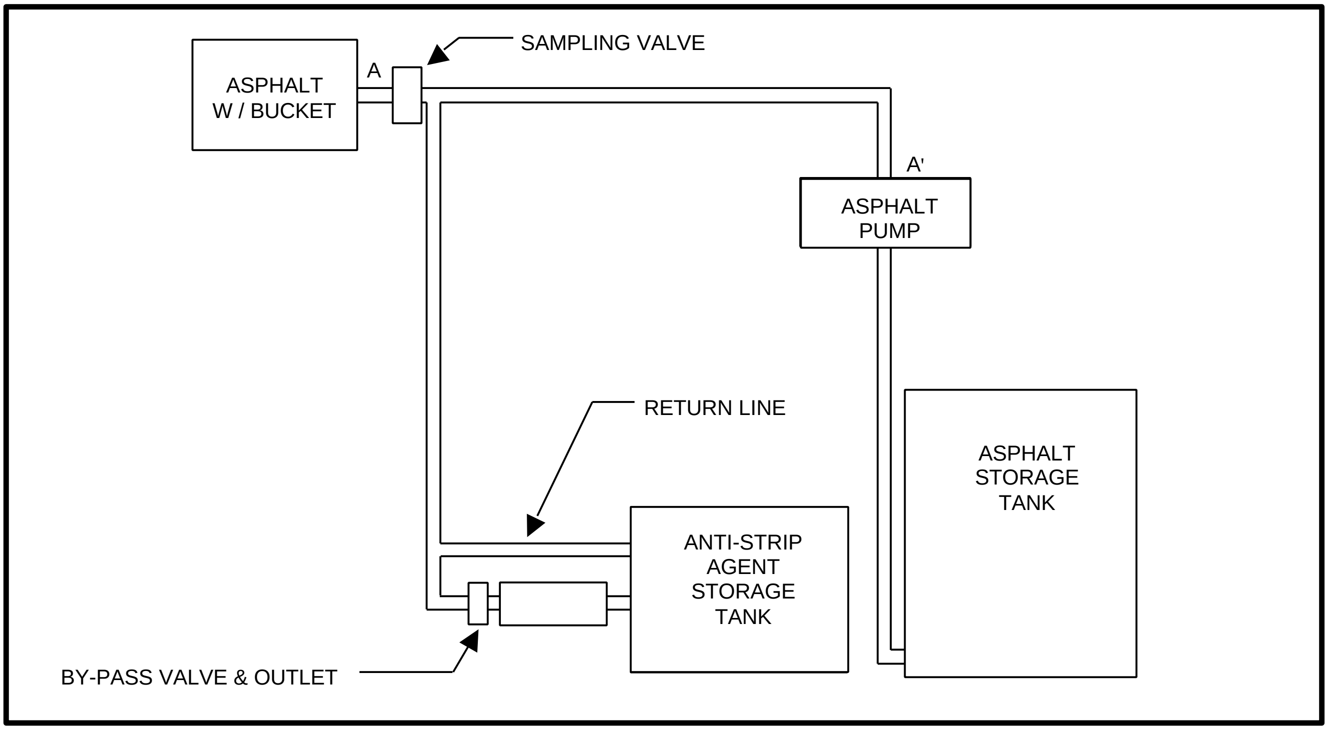


Figure I

Note 1: It may be advisable to install a check valve at the discharge end of the anti-strip agent line to prevent clogging of the line with asphalt cement when antistrip agent is not used in certain mixes.

3.2. The anti-strip agent pump must be interlocked with the asphalt cement controls in such manner that both start discharge simultaneously.

Note 2: For batch plants, the anti-strip agent must discharge at least 80 percent of the asphalt cement draw down operation time, but will not exceed the asphalt cement draw down time. For dryer drum and continuous mix plants, the anti-strip agent pump must be completely synchronized with the asphalt pump.

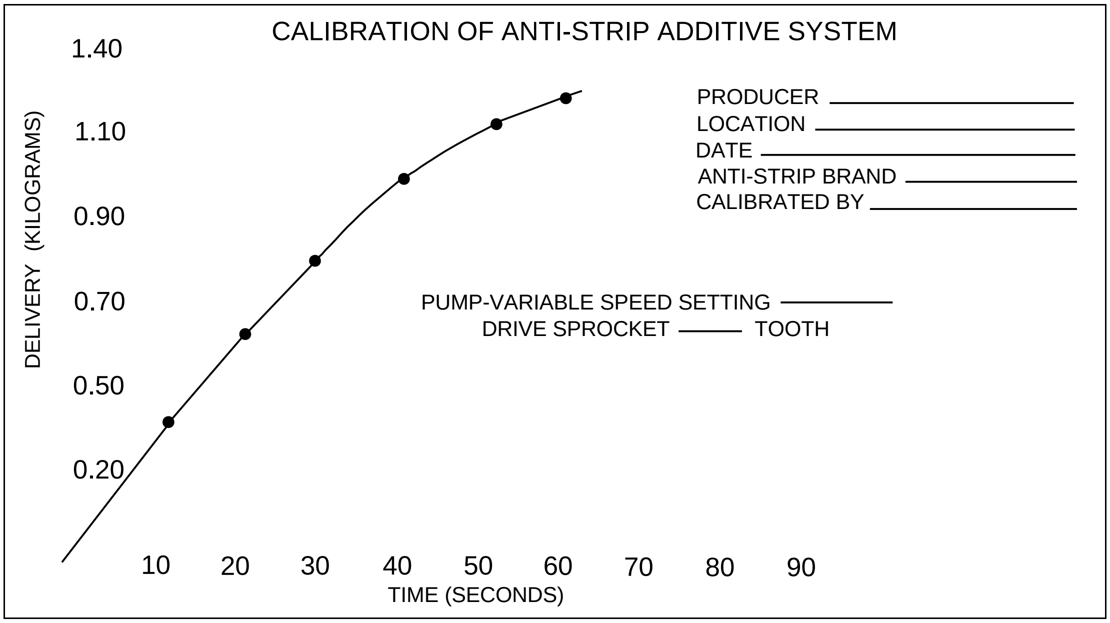


Figure II

4. Calibration Of Anti-Strip Agent - Pumping Time

Note 3: A bypass outlet must be installed on the anti-strip agent line for the purpose of collecting and measuring the flow of the anti-strip agent. (Figure I)

4.1. If the anti-strip agent pump has more than one speed setting such as variable speed selectors or drive tooth sprockets, determine speed setting or number of teeth on drive sprocket and record.

4.2. Position sample container under the anti-strip agent bypass valve outlet.

4.3. Open bypass outlet valve.

4.4. Start anti-strip agent pump and stop watch simultaneously.

4.5. Run anti-strip agent pump for the smallest time interval selected and record time.

4.6. Allow all of the anti-strip agent to drain into the sample container, weigh the container and record the net weight collected.

4.7. Repeat steps 4.2 - 4.6 for at least three or more time intervals; for batch plants suggested time intervals 5 seconds, 10 seconds, 20 seconds, 60 seconds; for continuous mix and dryer drum plants 0.5 min., 1 min., 3 min., 5 min., 10 min.

4.8. Prepare calibration curve(s) with delivery rate plotted on vertical axis and time on horizontal axis. Example Figure II.

5. Control of Anti-Strip Agent

5.1. Specifications require the addition of 0.5 to 1.0 percent of an approved anti-strip agent by weight of the asphalt cement when certain types of coarse aggregates are being used.

5.2. The specified concentration rate of the anti-strip agent may vary ± 10 percent by weight.

Note 4: Consult the approved job-mix formula for the brand and concentration percent of the anti-strip agent.

6. Calculations

6.1. Determine amount of asphalt cement in lbs required per batch or per minute.

6.2. For batch plants the asphalt cement pumping time to nearest second will be required.

6.3. For dryer drum and continuous mix plants the weight in lbs of asphalt cement per minute will be required.

6.4. Multiply the determined amount of asphalt cement by the appropriate agent percent expressed as a decimal, to obtain the required amount of the anti-strip agent in lbs.

6.5. Multiply the product obtained in step 6.2 by the ± 10 percent tolerance expressed as a decimal.

6.6. From calibration curve, Figure II, determine if the required amount of anti-strip agent can be obtained during the required time period.

6.7. **Note 5:** If the required amount of anti-strip agent cannot be obtained, it will be necessary to adjust anti-strip pump in the direction required and repeat steps 4.1 - 4.8.

6.8. Example of calculations:

For batch plant - required 130 kg PG 67-22 / 15 seconds pumping time. Then add 0.5% by wt. Tyfo A-40 (anti-strip)

130 x 0.005 = 0.65 kg
0.65 x 0.90 = 0.585 kg
0.65 x 1.10 = 0.715 kg
0.80 x 15 = 12 Seconds

Range = 0.585- 0.715 kg / 15 seconds

Required at least 0.585 kg in 15 seconds and not more than 0.715 kg in 12 seconds.

For dryer drum or continuous mix plants required 275 kg AC-20 / min., 275 x 0.005 = 1.375 kg anti-strip agent / min., required tolerance = 1.375 x .90 = 1.2375, 1.357 x 1.10 = 1.4027 kg

Required anti-strip agent / minute = 1.2 - 1.5 kg

7. Reporting

7.1. Report results of step 6.5 on form BMT-16.

7.2. Attach work sheet(s) to Project Engineer's copy of BMT-16 for master files.

ALDOT-321-79
TEST FOR GLASSY PARTICLES IN CRUSHED SLAG

1. Scope

1.1. This method of test covers a procedure for the determination of the amount, by weight, of glassy particles contained in crushed slag coarse aggregate.

2. Apparatus

2.1. The apparatus shall consist of the following:

2.1.1. Balance - The balance shall conform to AASHTO M-231, Class D for samples less than 2 kg, Class E for samples of at least 2 kg but less than 5 kg, and Class F for samples of 5 kg or more.

2.1.2. Sieves - The sieves with square openings shall be mounted on substantial frames constructed in a manner that will prevent loss of material during sieving. The woven wire cloth sieves shall conform to AASHTO M-92. Perforated plate sieves with square openings shall conform to the requirements of ASTM E 323.

2.1.3. Oven - The oven shall be capable of maintaining a uniform temperature of 230 ± 9°F (110 ± 5°C).

3. Test Samples

3.1. Samples for glassy particle determination shall be obtained in accordance with AASHTO T-2. Samples shall be dried and reduced to testing size in accordance with AASHTO T-248.

3.2. Samples of coarse aggregate shall not weigh less than the weight indicated in AASHTO T-27.

4. Procedure

4.1. Sieve in accordance with AASHTO T-27.

4.2. Physically examine all particles retained on each sieve size used through the No. 4 (4.75 mm) sieve. Place all particles that have a glossy, slick, non-porous glassy finish on any one face, into a weighing container.

4.3. Weigh and record the total weight of all glassy particles.

5. Calculations

5.1. Calculate the percentage of glassy particles retained on the No. 4 (4.75 mm) sieve on the basis of the total weight of the sample.

6. Reporting

6.1. The percent of glassy particles shall be reported on form BMT-91 when tested by approved producers. When test is performed by Department personnel, percent of glassy particles shall be reported on BMT-16.

ALDOT-322-81
THERMOPLASTIC SAMPLING AND TESTING PROCEDURES FOR PRETESTED STOCKS

1. Scope

1.1. The purpose of this procedure is to prescribe and define the lot size and necessary markings for reflectorized hot applied thermoplastic striping material which is to be used on Department projects. Further, it specifically outlines the procedures and responsibilities for sampling the material at the producer's facilities thereby enabling the establishment of pretested stocks.

2. Lot Size and Marking

2.1. The lot size shall be a maximum of 55,000 lbs. (25,000 kg) as long as the entire 55,000 lbs (25,000 kg) is made in a single 24 hour day.

2.2. Smaller batches can be made if the order calls for less than 55,000 (25,000 kg), but the same sampling procedures will apply regardless of size.

2.3. Markings shall be stamped or sprayed on each bag, and shall be clearly legible and in permanent ink or paint. Procedures will not be allowed to place numbers on bags with felt tip markers or other means by hand. Any evidence of tampering with the lot number on the bags will be considered as cause for rejection.

2.4. The only required markings for this procedure on each bag shall be as follows:

2.5. Company Name

2.6. Lot number as follows:

AL	01	01	4	01	Y
State Designation	Variable Month made	Variable Day Made	Variable Year made	Variable Each 55,000 lbs. (25,000 kg) lot made that day if more than one is made	Variable Y = Yellow W = White

2.7. No other markings will be required, but producers will be allowed to place additional information on the bags as long as it does not confuse the above information.

3. Producer's Responsibility

3.1. The producer will notify the Department each time he has produced a lot of material. Notification should be made to the following:

Alabama Department of Transportation
3704 Fairground Road
Attn: Paint Lab
Montgomery, Al 36110

(205) 242-6552

3.2. The producer will furnish the Department with a certified test report showing actual test results for each parameter listed in current specifications for the thermoplastic. These reports will be submitted to the Department when the samples are submitted for testing.

3.3. The producer will furnish the Department (See 3.1 above) a current status report of approved material, by lot, each time a shipment or change occurs. This report will contain the quantities shipped, and to whom.

4. Sampling Procedures at Production Facility

4.1. If the producer has a sample splitter the producer will obtain a 1 gal, (4 L) sample from the splitter from each bag in the sample. The remainder of the material will be turned over to the producer. The 1 gal (4 L) samples will be properly identified by lot number, date, producer, quantity in lot, consignee and project number if available, and sent immediately to the Central Laboratory.

4.2. One of these samples will be tested and the remainder held in reserve. If the sample meets all of the test requirements, the lot will be accepted. However, if it fails any of the test requirements, two of the remaining samples from that lot will be tested as a resample and both samples must meet the test requirements or the lot will be rejected. No further sampling or testing will take place once these three individual samples have been analyzed for that lot.

5. Sampling at the Job Site

5.1. In those cases where the material arrives at the project site which has not been pretested, project personnel may sample the thermoplastic in accordance with paragraph 4.1 above.

ALDOT-324-83
PLANT REQUIREMENTS FOR PLANTS PRODUCING HOT-MIXED, HOT-LAID BITUMINOUS PAVING MIXTURES

1. Scope

1.1. This procedure covers the requirements for plants suitable for producing hot mixed, hot laid bituminous paving mixtures. This procedure is similar but not equivalent to AASHTO M-156 and ASTM D-995.

2. Applicable Documents

2.1. Standard Specifications (Article 107, Environmental Protection).

2.2. AASHTO M-20 or M-226 - Penetration Graded Asphalt Cement or Viscosity Graded Asphalt Cement.

2.3. AASHTO M-156 - Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

2.4. AASHTO T-164 - Quantitative Extraction of Bitumen from Bituminous Paving Mixture.

2.5. AASHTO T-170 - Recovery of Asphalt from Solution by Abson Method.

2.6. AASHTO T-195 - Determining Degree of Particle Coating of Bituminous-Aggregate Mixtures.

2.7. ALDOT-320.

3. AASHTO M-156 (Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures) Shall Apply Except as Modified Hereinafter.

Section 3 shall be amended as follows:

Article 3.1 shall be amended by adding the following:

Plants which do not comply with all the requirements set forth, but have a history of producing a uniform mixture, may be considered as in substantial compliance upon recommendation of the Division Materials Engineer and approval by the Materials and Tests Engineer. The asphalt plant check (ALDOT-155) shall be performed as currently scheduled in the Job Control Manual.

Add new Article 3.2.6 as follows:

When liquid anti-strip material is added to the bituminous material at the plant site, the anti-strip system must be in accordance with ALDOT-320. Other approved additives will be handled in accordance with an established procedure.

Delete the first sentence of Article 3.4 and add the following in its place:

The plant should be equipped with a cold feed bin for each aggregate used, but at least four (4) cold feed bins will be required, with mechanical means for uniformly feeding the aggregate into the dryer so that uniform production and temperature may be assured.

Delete Article 3.9.3 and add the following in its place:

Mixtures may be stored in properly sealed and insulated silos for 48 hours. At the discretion of the Engineer, test for determining asphalt hardening will be taken and governed in accordance with Section 9.

Add new Article 3.9.4 as follows:

A surge or storage silo may be equipped with load cells and/or strain gauges to determine the amount of mix delivered from the bin.

Add the following new Articles:

3.1.1. Testing Provisions

3.1.1.1. The plant shall be equipped with a testing laboratory meeting the requirements of Article 106 of the Alabama Department of Transportation Standard Specifications.

3.1.1.2. The laboratory shall be equipped with the testing equipment as outlined in ALDOT-349.

Section 6 shall be amended as follows:

Article 6.3.1 shall be amended by adding the following:

If the scales are used for pay purposes, this tolerance shall not exceed 0.2% of the indicated weight when tested for accuracy.

ALDOT-328-82
RAPID METHOD OF SAMPLING FRESH CONCRETE FROM REVOLVING DRUM TRUCK MIXERS OR AGITATORS

1. Scope

1.1. This method describes a procedure for obtaining early samples of fresh concrete from truck mixers or agitators. The samples obtained are considered adequate for determining compliance with air content, slump specifications and temperature specifications.

2. Significance and Use

2.1. AASHTO T-141, requires that approximately half the load of concrete be discharged before the total sample can be obtained. This generally results in some of the concrete being placed in the work before the results of the tests are known. If the subsequent tests indicate that the material does not comply with the specifications, it becomes a very difficult and time-consuming operation to remove the unacceptable material from the job. This method allows the sample to be taken from the first 8.83ft^3 (0.25 m^3) load. Thus, all the concrete can be held in either the truck or the tremie bucket until the results of the air content, slump test and temperature test are known.

3. Size of Sample

3.1. The sample shall consist of not less than 0.7 ft^3 (0.02 m^3).

4. Procedure for Sampling

4.1. The sample shall be taken after not less than 1.76 ft^3 (0.05 m^3) of concrete has been discharged from the batch being sampled.

4.2. Sampling shall be done by repeatedly passing a receptacle through the entire discharge stream, or by diverting the stream completely so that it discharges into a container.

5. Remixing Sample

5.1. The sample shall be remixed with a shovel to insure uniformity.

5.2. The sample shall be protected from sunlight and wind.

5.3. The period between taking and using the sample shall not exceed 15 minutes.

ALDOT-330-83
PROCEDURE FOR MARKING, SAMPLING AND INSPECTION OF CORRUGATED METAL ROUND AND ARCH ROADWAY AND SIDE DRAIN PIPE

1. Scope

1.1. Corrugated metal pipe is supplied by in-state and out-of-state fabricators. The process of certifying test reports and inspection is basically the same. The following procedures will break down the responsibilities of the various individuals in this process.

2. Definitions and Abbreviations

2.1. Producer - The company which produces the flat coiled metal which is used in fabricating the pipe.

2.2. Fabricator - The company which produces the finished product for shipment to the project.

2.3. Base Metal - The flat coil metal from which the pipe is made. Base metal may be steel or aluminum.

2.4. Coating - The material used as a protective cover on the plain metal pipe. May be asphalt or polymeric coating.

2.5. Central Lab - The Alabama Department of Transportation Testing Laboratory, 3704 Fairground Road, Montgomery, Alabama 36110.

2.6. C.S. - Corrugated Steel

2.7. C.A. - Corrugated Aluminum

2.8. P.I. - Paved Invert

2.9. C.C.S. - Coated Corrugated Steel

2.10. C.C.A. - Coated Corrugated Aluminum

2.11. C.C.S.P.I. - Coated Corrugated Steel with Paved Invert

2.12. C.C.A.P.I. - Coated Corrugated Aluminum with Paved Invert

2.13. C.S.L.C.M. - Smooth Line Corrugated Metal (S for Steel, A for Aluminum)

2.14. C.S.F.C.M. - Smooth Flow Corrugated Metal (S for Steel, A for Aluminum)

3. Certifications

3.1. Certified test report containing, physical results, chemical results, galvanization in oz/ft^2 (g/m^2), for each heat number and each gauge thickness of metal, in accordance with Alabama Department of Transportation Specifications Section 850 and AASHTO M-36.

3.2. Asphalt coating - certified test report meeting require-ments of AASHTO M-190. All certifications shall be submitted to the Project Engineer with pipe; then forwarded to the Central Laboratory.

3.3. Pipe coated with polymeric type B coating shall have certified test report meeting requirements of AASHTO M-246. The markings may be put on all sheets with a marker rather than being stamped.

4. Marking of Finished Products

4.1. Plain corrugated metal pipe will be marked with the metal producer's stamped logo, heat number and thickness.

4.2. Coated corrugated metal pipe will be marked as follows:

4.2.1. Each length of pipe will have one section, containing heat number and metal thickness, covered with duct tape before pipe is coated with asphalt. (This spot will be marked for easy field identification.)

4.2.2. Pipe that is not properly marked will not be placed on a project until samples have been cut from the pipe and tested by the Central Laboratory.

5. Fabricator's Responsibility

5.1. Certify base metal and pipe coating as outlined in Section 3 of this procedure.

5.2. Identify all pipes as outlined in Section 4.

5.3. Furnish a copy of the metal producer's certified analysis for each heat and thickness of metal. This copy should be sent to the Project Engineer with pipe.

5.4. For welded seam pipe, the fabricator will furnish a certified test report for each heat number showing that the production will meet the strength requirements. One test will be reported for each heat number. This report will be submitted to the Project Engineer with pipe.

6. Project Engineer's Responsibility

6.1. Inspect pipe after it arrives on the project and before it is installed. This will be a visual inspection using BMT-60 as a guideline.

6.2. After heat number is checked by removing duct tape, asphalt will be repaired with 5X Knife Grade Asphalt, or Bitumastic 50 or approved equal.

6.3. After all necessary checks have been made attach copy of completed BMT-60 to certifications and send to Central Laboratory Certifications Section in Montgomery.

6.4. If the pipe is damaged it shall be rejected.

6.5. If the pipe is not properly marked, it cannot be installed. Samples must be cut from it and submitted to the Central Laboratory for testing. Only after these samples have been tested and approved can the pipe then be installed.

7. Approval for Payment

7.1. Payment for pipe cannot be made until the Project Engineer has made his final pipe inspection and received a Certification (Form CERT C.M.P.) from the Central Laboratory.

8. Additional Testing

8.1. The Alabama Department of Transportation will reserve the right to sample any pipe after the pipe has arrived on the project. This may be done at the Project Engineer's request or whenever the Testing Engineer feels that it is necessary. The results of this testing will be considered to take precedent over all other testing or certification performed previous to this time.

ALDOT-335-83
MEASURING PROFILE INDEX OF A PAVED SURFACE

1. Scope

1.1. This method covers the profile measurement of hot mix asphalt and Portland cement concrete pavement and the determination of profile index.

2. Apparatus

2.1. The device used to measure the profile shall be a California-type profilograph with a mainline section or truss of approximately 24.6 ft in length supported by clusters of support wheels located at either end and having a measuring wheel at the center point of the span. The profilograph shall be assembled and operated according to the manufacturer's specifications.

2.1.1. Before a pavement surface profile is measured, the profilograph shall be inspected by the Engineer or his representative to determine its mechanical condition.

2.1.2. Calibration, horizontal—The Engineer or his representatives should check the profilograph for accuracy before being used on the project. The horizontal distance should be checked by traversing a known distance of 300 ft on a straight, level surface and measuring the length of chart paper used. Care should be taken when beginning the calibration section to eliminate any slackness in the gearing of the profilograph by raising the distance wheel slightly off the surface and turning it in the forward direction with the recorder in gear, then lowering the measuring wheel carefully back to the surface. A beginning point is marked on the profilogram, the test section traversed, and then the ending point is marked. The length of trace between the points should be 12 in. plus or minus 0.1 in.

2.1.3. Calibration, vertical—The vertical calibration should be checked using three ¼-inch thick plates of metal or other hard material approximately 3 in. wide and 6 in. long. The profilograph should be positioned on a level flat section of paved surface with the profile measuring wheel resting on a smooth piece of $^{1}/_{8}$-inch Formica or sheet metal approximately 12 in. square such that it will not rock or tilt. Advance the profilogram (chart) at least ½ in. without moving the profile measuring wheel. Lift the profilograph measuring wheel and place one of the ¼-inch blocks under it, carefully lower the wheel and again advance the chart. Continue with the above sequence until all three of the ¼-inch blocks are under the wheel, one on top of another. Remove all the plates and return the measuring wheel to the base plate. Advance the profilogram again. Remove the profilogram and measure the deviations. If the deviation of the measured trace is greater than $^{1}/_{32}$ in. from the correct thickness, then adjustments must be made to the profilograph.

3. General

3.1. Test Section—A test section shall be defined as a single lane (normally 12 ft wide) of main line pavement surface where the posted speed will be 40 mph or greater beginning at a point where the rear wheels of the profilograph are located just on the new surface (the profile measuring wheel will then be approximately 16 ft onto the new surface). The test section shall continue for a distance of 0.1 mile unless altered by Section 3.3 or 3.4.

3.1.1. If the contractor is responsible for the adjoining existing surface, the profile shall include the last 16 ft of existing roadway surface.

3.2. When a test section begins or ends at a bridge and there is no bridge end slab or if the bridge end slab is recessed and overlaid with plant mix, the measuring wheel of the profilograph shall be approximately 16 ft from the bridge end when beginning or completing the test section.

3.2.1. If there is a bridge end slab to which the pavement abuts, the measuring wheel shall be approximately 16 ft from the bridge end slab when beginning or ending the test section.

3.3. A test section shall be 0.1 mile in length unless altered by a bridge or the end of the paved surface. When a profile is terminated at a point where it is less than 250 ft long, it shall be included with the previous section. If the section is greater than 250 ft in length, it shall be considered a test section.

3.4. If a section is isolated where neither end joins another section (i.e., between bridges or between a bridge and the end of the paved surface) and it is less than 0.1 mile long, it shall be considered a test section.

4. Testing Procedure

4.1. Surface Preparation—The paved surfaces to be profiled shall be reasonably cleaned by the contractor of all mud, loose gravel, debris, etc., before the profile is made.

4.2. Pavement profiles shall be taken in the right wheelpath of the right lane, in the left wheelpath of the left lane and in the wheelpath that the Engineer chooses if the paved surface is wider than two lanes.

4.3. The profilograph shall be manually propelled longitudinally along the pavement at a speed no greater than 3 mph in the direction that the pavement was placed. That test section shall be repeated only to define the limits of an out of tolerance surface variation or as requested by the Engineer.

4.4. The trace should be preceded and followed by at least 12 inches of blank paper.

5. Analysis Procedure

5.1. The ProScan™ system must be properly configured and calibrated before use. Instructions on the proper configuration setup and calibration procedure are available in the ProScan™ User's Guide. A suggested configuration file is shown in Figure 1. The calibration number (shown on line 5 in Figure 1) should be changed to match the number shown on the sticker affixed to the scanner.

```
4.xx     Version  (only first two digits are verified)
Section  Mode of Operation
1        COM Port for Power Scan Control
AL       State Form for Reports
5947     Scanner scanlines for 30 inch calibration tape  5947
15       Filter length
English  Unit System [English or Metric]
528      Length of normal length segment (ft for Engl - meters for Metric)
0        Blanking Band
.01      Scallop resolution      (inches for Eng - cm for Metric)
.03      Minimum scallop height  (inches for Eng - cm for Metric)
.08      Minimum scallop width   (inches for Eng - cm for Metric)
.3       Template height for grind point identification  (in or cm)
.4       Minimum spike height (in or cm)
Full     Scan Area (Full or Varying)
Plotter  PCL5 Letter
```

FIGURE 1
SUGGESTED PROSCAN™ CONFIGURATION FILE

5.2. The unit sits on a table on four plastic feet. The back of the unit has a $^{5}/_{8}$-inch diameter aluminum rod that serves as the McCracken paper dispenser. Profilograms feed from the back of the unit, over the top, between the tall side edges, and off the front of the unit (the edges are named from the perspective of paper going through the unit). When the McCracken paper dispenser is facing the user, the motor housing and cords are attached to the edge facing away from the user (the right side of the unit). The left side faces the operator when the unit is in the standard operating position.

5.3. Mark the ends of the section to be processed by drawing two three-inch demarcation lines across the profilograph trace such that they are square with the edge of the paper. The lines should be dark and approximately $^{1}/_{16}$ in. thick. The trace should intersect near the center of each mark. It is not necessary to delineate each 0.1-mile segment. A two-inch “leader line” should be drawn before the trace begins to allow the scanner to locate the trace. The suggested minimum dimensions of these marks are shown in Figure 2.

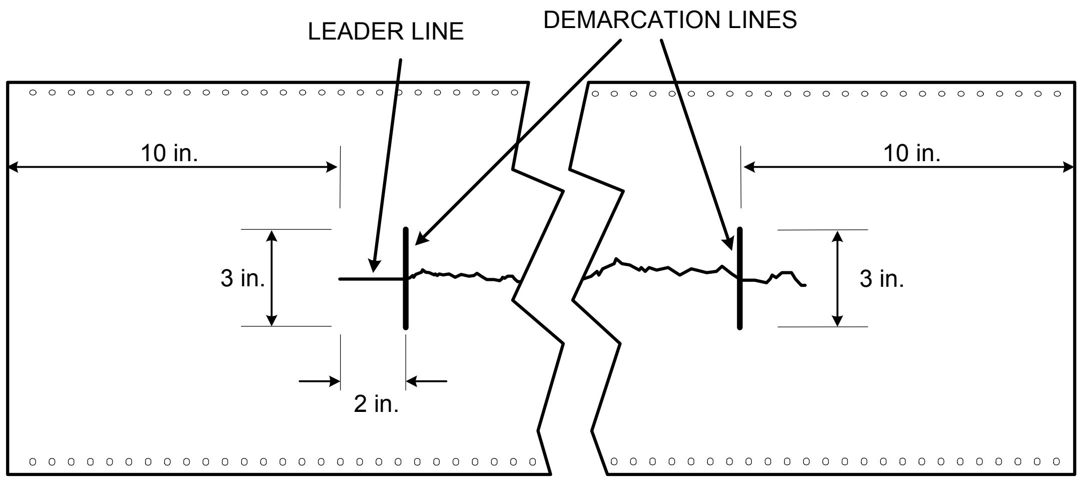


FIGURE 2
PREPARING THE TRACE FOR PROCESSING

5.4. Loading the Trace into the Paper Transport Unit.

5.4.1. Both the Ames and McCracken profilograms are supported by the paper transport unit. The aluminum idler roller assembly and the scanner are removed from the unit prior to loading either type of profilogram paper. The idler roller assembly is removed by pulling out the idler assembly release knob located on the left side panel. Set the assembly aside. Remove the scanner by lifting it and the attached mounting assembly straight up.

5.4.2. <u>McCracken Profilograms</u>—Close the two black plastic tractor feed assemblies that are located near the base of the scanner mount slots. The assemblies are closed if their outside edge is not sticking more than ¾ in. above the top surface of the unit. Place the profilogram roll on the McCracken paper dispenser at the rear of the unit. Feed the paper over the top of the unit so that it lies flat between the scanner mount slots and passes over the friction drive roller near the front of the unit. The first mark across the trace should be at least six inches back from the front edge of the paper transport unit. Replace the idler roller assembly by inserting the tabs on one end of the assembly into the holes opposite the idler release knob and inserting the pin attached to the idler release knob into the other end of the assembly. It may be necessary to turn the idler release knob to get the pin to seat completely. Make sure that the paper is flat between the scanner mount slots. If it is not flat, the roller idler assembly must be released and assembled again.

5.4.3. <u>Ames Profilograms</u>—The idler roller assembly will not be needed for the Ames tractor paper unless the edges of the paper are very worn or the tractor holes have been removed. Locate the two black plastic tractor feed assemblies that are near the base of the scanner rod mount slots. They operate similarly to the ones found on the Ames profilograph. Mount the profilogram so that the first mark across the trace is at least six inches back from the front edge of the paper transport unit.

5.4.4. For both types of paper, the scanner must be placed flat on the paper. The scanner cord should drape over the side of the scanner to avoid interfering with paper movement.

5.5. Scanning a Section of Profilogram

5.5.1. The scanning of the section will proceed automatically after the ProScan™ program is started. After the initial user entry, the user is required to provide responses to the computer prompts as shown below.

User	**proscan** (Enter) ***or*** **proscan *config_file*** where *config_file* specifies the name of the configuration file matching the desired scan parameters
Computer	(Fills computer screen with ProScan™ copyright and configuration information)
Computer	Enter file name for this session:
User	**Enter file name (≤ 8 characters)** (Enter)
Computer	Creating new files Reading rptinfo.gen for report header information Enter Date Paved:
User	**Enter date** (Enter)
Computer	Enter Date Tested :
User	**Enter date** (Enter)
Computer	(Displays Current RPI [report header information]) Modify report information ? (y or [n])
User	**Press Enter** (to proceed without changing report header information)
Computer	Enter track number ([1], 2, or 3):
User	**Enter track number** (or Enter or Space Bar to accept track 1)

Computer	Is up to the left or right of scanner? (l or [r])
User	**Press Enter or space bar** (see Sect. 6.8.1 for further discussion)
Computer	Is scan up station or down station? ([u] or d):
User	**Press Enter or space bar.**
Computer	Enter beginning station number for track 1 segment 1 (nnnn+nn):
User	**Enter beginning station in *nnnn+nn* format.** ProScan™ will accept values to the tenth of a station (i.e., nnnn+nn.n format).

5.5.2. Scanning begins immediately after entering a response to the final information request. The paper transport unit will start moving the paper and the text on the monitor will be replaced with graphics. As the paper transport unit moves the paper, an image of the area that is being scanned scrolls up from the bottom of the screen. If this scrolling does not occur as soon as the paper transport starts moving paper, it means that the scanner is not in scan mode. This can be corrected by pressing the scan button on the scanner. **If anything appears to be going wrong at any time during the scanning process, the system can be stopped by pressing any key on the keyboard.** Restart the scanning by pressing “c” (Continue previous activity).

5.5.3. The computer screen must be closely monitored during the scanning process. The newly scanned area should scroll up from the bottom of the screen, scrolling to disappear off the top. The image on the screen is greatly magnified, especially in the vertical dimension. A 4-inch wide strip of profilogram is shown over the entire width of the screen. A 1.75-inch high section of the strip fills the screen from top to bottom. If the scanner contrast is set correctly, the trace itself should be black and very distinct on a white background.

5.5.4. When the program recognizes the first demarcation line (constructed in step 6.3) across the trace, it will sound a beep to indicate that the processing of a segment has begun. If an audible alarm is not heard, then the scanning must be stopped and the paper reversed. To reverse the paper, stop the scanning by pressing the space bar, remove the scanner and release the paper from the feed mechanism. If the demarcation line is visible on the screen but the audible signal fails to sound, the line must be made thicker and of equal length on both sides of the trace.

5.5.5. During the scrolling process, the program adds a thin line to the display that does not appear on the profilogram itself. This line runs beside, and slightly to the right of, the trace being processed and represents what the program has determined to be the center of the track. It is offset to prevent obliterating any of the trace. One of the principal duties of the user is to verify that the line does in fact parallel the actual track.

5.5.6. After 20 seconds of scanning, the paper transport unit will pause for about one second while the 0.1-mile segment just scanned is processed and written to disk. This pausing action should occur three times. After the last pause, the end mark will be encountered in a few seconds. At that time the paper transport unit will stop, the screen will freeze, the short segment will be analyzed and written to disk, and the program will wait until a key is pressed.

5.5.7. Slight variation in the roughness measures will occur between scans on the same trace. This is due to the physical variance in the scanning process and rounding of values for each scallop. It is impossible to eliminate all variation from one scan to the next. This variation is extremely small, however, when compared to the variations obtained by manual reduction of profilograms that are performed by different people. It is even small compared to the variation obtained when the same person reduces the same trace multiple times. Successive profile index averages obtained by ProScan™ over a long section are always nearly identical.

5.6. Printing a Report

5.6.1. A report can be printed by selecting the "Generate Report" (r) option. When it is specified, the user will be asked to select a report type. The options are inforMation, Initial, inTermediate, or Final (m,i,t or f). The only difference between them is that one of those four words will appear at the top of the report. The report itself is printed in a convenient form and contains several additional pieces of information. Segments are numbered sequentially for each track, beginning at 1, in the order they were scanned.

5.6.2. Track one segments will always appear in ascending order. The other tracks will not necessarily be in that order, but generally so. The actual order will be determined by matching each segment with a corresponding segment from a previous track, if possible. If each track was scanned in the same direction, then all track segment numbers should match up. If one track was scanned in the opposite direction, then its numbers will be reversed.

5.6.3. The bump locations appear in ascending station order and, in the case of identical station numbers, in ascending track number order. In parentheses following the station number of each bump is the track and segment in which it is located. This makes it easy to know which segment to plot to obtain a detail of the bump. When segments are plotted, the grid lines are drawn on the bumps to show the amount of corrective action that is required.

5.6.4. When the printing of the report is finished, ProScan™ returns to the main menu.

5.7. Plotting Segments

5.7.1. Plotting segments is the most time-consuming aspect of the program. It takes five to six times longer to plot a segment than it does to scan and reduce the segment. The segment of the trace is plotted in 180 dpi resolution, with station marks shown every .25 sta. Marks showing the beginning and ending of the segment and ¼ in. of trace beyond each are shown. Strum lines that were detected are plotted and the measured roughness of each scallop is given beside it. In addition, all the parameters in effect for the reduction, the final reduction value, and the filename of the ProScan™ data (.psd) file containing the raw data are given.

5.7.2. A single segment, all segments of a track, all tracks for a given segment number (not necessarily corresponding station number), or all segments in the current file can be plotted from a single command. If the file contains a considerable number of segments (80 would not be unreasonable for one day's asphalt paving), a several-hour print job could be requested. Unlike the scanning process, the printing can occur in an unattended mode. Should a multiple segment job be requested, it can be interrupted by pressing a key on the keyboard. Please note that the plotting of the current segment will complete, even if the job is interrupted with a keystroke. Therefore, it may be as much as two minutes before it is obvious that the interruption has worked.

5.7.3. To specify a single segment, enter the track and segment number. To get all the tracks of a segment or all the segments of a track (or both), use an asterisk (*) instead of a number.

5.7.4. When the plotting of the segments is finished, ProScan™ returns to the same menu.

5.8. Additional suggestions for using the ProScan™ system

5.8.1. The terms “up station” or “down station” refer to whether station numbers are increasing or decreasing as the trace progresses. If the station numbers are increasing, the scan is considered “up station.” Likewise, if the station numbers are decreasing, the scan is “down station.”

5.8.2. Marks locating various points of interest on the trace (such as pavement joints, stations, debris, etc.) can be made by stopping the profilograph and pulling down on the cable linking the wheel and the marking apparatus (“strum” marks). These marks typically do not affect the scanning procedure or results, but will be indicated on the plotted output from ProScan™.

5.8.3. To avoid errors in processing the trace, do not make marks within 1 inch of the trace, with the exception of the leader line and demarcation lines discussed earlier.

5.8.4. Additional reports can be printed by restarting ProScan^{TM} and selecting a file name corresponding to a previous scan.

ALDOT-338-83
TEST METHOD FOR FLOW OF GROUT MIXTURES (FLOW CONE METHOD)

1. Scope

1.1. This test method covers the procedure to be used in the field to determine the flow of grout mixtures.

2. Applicable Documents

2.1. U.S. Corps of Engineers Test Method: CRD-C79-58 Test Method of Test for Flow of Grout Mixtures.

3. Summary of Method

3.1. Measure the length of time required for a specified volume of grout to flow from a standardized flow cone with a stopwatch.

3.2. The time of efflux of the grout mixture is the time measured with the stopwatch.

4. Apparatus

4.1. Flow Cone - The flow cone shall conform to the requirements indicated in Figure 1.

Cross Section of Flow Cone

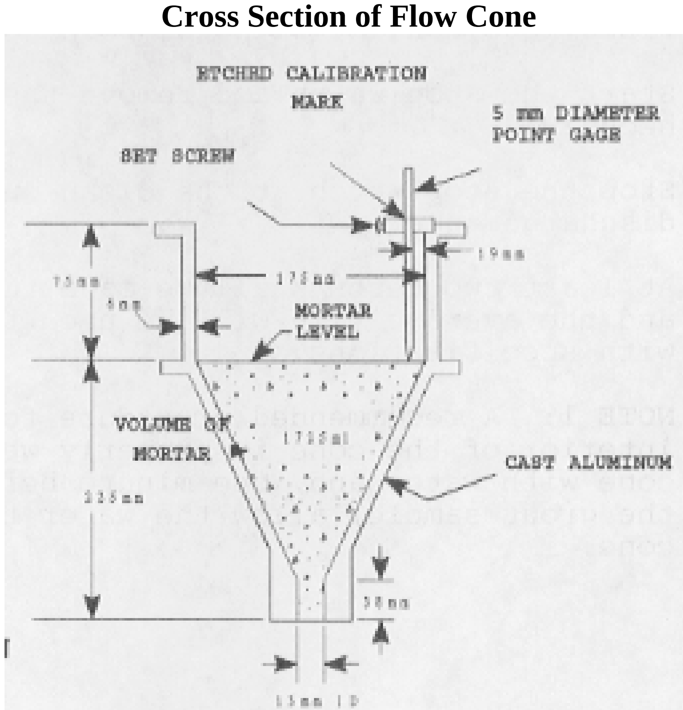


Figure 1

4.2. Stop Watch - A stopwatch capable of reading to the nearest 0.5 second.

5. Preparation of Apparatus

5.1. The flow cone shall be firmly mounted in such a manner that the top will be level and the cone free from vibration.

5.2. The discharge tube shall be closed by placing the finger over the lower end.

5.3. A quantity of water equal to 1725 ± 1 mL shall be introduced into the cone.

5.4. The point gage shall be adjusted to indicate the level of the water surface.

6. Sample

6.1. The test sample shall consist of 1725 ± 1 ml of grout.

7. Procedure

7.1. Moisten the inside surface of the flow cone, refer to Note 1.

7.2. Place the finger over the outlet of the discharge tube.

7.3. Introduce grout into the cone until the grout surface rises into contact with the point gage.

7.4. Start the stopwatch and remove the finger simultaneously.

7.5. Stop the stopwatch at the clean out of grout from the discharge tube.

7.6. At least two tests shall be made for any grout mixture and the average time will be used to verify compliance with specifications.

Note 1: A recommended procedure for insuring that the interior of the cone is properly wetted is to fill the cone with water and, one minute before beginning to add the grout sample, allow the water to drain from the cone.

ALDOT-340-83
METHOD OF TESTING "IAS&T" CONCRETE CYLINDERS

1. Scope

1.1. This method of test permits testing "IAS&T" concrete cylinders in Division Laboratories.

2. Applicable Documents

2.1. FHWA, FHPM Volume 6, latest edition.

2.2. ASTM C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.

2.3. ASTM C617 Method of Capping Cylindrical Concrete Specimens.

2.4. AASHTO T23 Making and Curing Concrete Test Specimens in the Field.

3. Summary of Method

3.1. In accordance with FHWA FHPM, the Department does hereby adopt a policy to permit testing "IAS&T" concrete cylinders in Division Laboratories, provided the breaking of the cylinders is observed by someone from the Division Construction Engineer's office or someone from the Division Materials Engineer's office, who is not assigned to this testing operation on a regular basis. The observer's name shall be on the test report.

3.2. Each calendar year the Central Laboratory will check each Division Laboratory for proper procedures, equipment, and machine calibration.

ALDOT-341-83
STANDARD PROCEDURES FOR COMPARING INDEPENDENT ASSURANCE SAMPLES AND TESTS (IAS&T) AND ACCEPTANCE TEST RESULTS

1. Scope

1.1. This method covers the procedure for comparing IAS&T samples and tests and Acceptance Test results.

2. Applicable Documents

2.1. FAPG Subchapter G, Part 637, Subpart B.

2.2. Alabama Department of Transportation Testing Manual.

3. Summary of Method

Note: No more than 20 percent of IAS&T may be observed tests. All observed tests must be noted as such on the test report. This, for example, applies to the observation of in-place density tests, making concrete test cylinders, and any other IAS&T frequency item's test that is the IAS&T Engineer's responsibility.

3.1. The Division Materials Engineer will designate a qualified employee from the Materials Section to review and compare IAS&T test results with Acceptance Test results. Reference the Testing Manual for the frequency and location of testing for IAS&T samples.

3.2. IAS&T results should be compared with the Acceptance Test as soon as possible. When this comparison is made, using Table 1, it should be noted on the test reports, by a note, that a comparison was made, dated, and initialed by the person making the comparison. Any significant discrepancies or variations should be investigated and corrected immediately with actions noted on the test reports and shown on the BMT-111.

3.3. The attached Table 1 designates the maximum limits of variability between an individual IAS&T test result and an Acceptance Test result for the various types of materials and tests included within this program. Differences between results in excess of those indicated in the Table 1 should be investigated for assignable cause (including additional testing as necessary) and subsequent findings and/or corrective actions (if any) shall be documented as part of the IAS&T Certification. The limits in the table are intended to apply only when tests are performed as nearly as feasible on the same material and at the same time, but by different personnel using different test equipment.

3.3.1. To ensure that job control sampling and testing, and, IAS&T sampling and testing produce valid results, it is necessary to (1) take a representative sample from the same batch, lot, etc., and split (2) perform all tests according to the appropriate procedure without deviation and, (3) ensure accuracy by using like or similar equipment that has been checked, verified, and/or calibrated. Samples for each test shall then be obtained by quartering, splitting or other acceptable procedure such as to minimize sampling variation.

3.3.2. Procedures other than those described above are acceptable within the Independent Assurance program. However, it is beyond the scope of this method to provide guidelines for limits of variability, which would pertain to all acceptable procedures. The IAS&T personnel are expected to use judgment in performing comparisons depending on procedures actually used. (In general, as additional inherent production and sampling variations are introduced, normal test results would be expected to exhibit increasing variability when compared whereas employing techniques such as comparing lot average of numerous test data should result in less variability.)

3.3.3. It is recommended that, as a minimum, procedures which permit direct comparison of IAS&T and Acceptance Tests in accordance with the above guidelines be utilized on the initial test for each type of assurance sample and test required on a project to the extent feasible.

3.3.4. As sampling procedures (which are essentially eliminated as variables in the above procedure) are considered as important as testing procedures or equipment in determining final test results, it is recommended that IAS&T tests be obtained quarterly with particular emphasis on test result variations attributable to sampling. For this purpose one sample should be independently obtained by IAS&T and one by Acceptance Testing personnel, from essentially the same material, with all testing being performed either by the IAS&T or Acceptance personnel and using the same equipment throughout. With this procedure, the guidelines provided in Table 1 may also be used to evaluate any differences in results considered due to sampling procedures.

Table 1. For Comparing Independent Assurance (IAS&T) and Acceptance Test Results

Type Of Test	Material	Maximum Difference Between Test Result
Asphalt Content	Asphalt Plant Mixes	0.3 percent by mass of total mixture.
Sieve Analysis and –#200 (-75 µm) Wash Test	Concrete Aggregates; Selected Soil, Granular Soil, Soil Aggregate, Processed Reef Shell, and Crushed Aggregate in Subbase and Base Courses.	Sieves larger than #16 (1.18mm) - 4% Pts. #100 thru #16 - 3% Pts (1.50 µm thru 1.18 mm) #200 (75 µm Sieve) - 2% Pts. **Note:** 1% Pt. for #200 (-75 µm) test for concrete aggregates.
Density	Embankments; Asphalt Plant Mix Layers; Selected Soil, Granular Soil, Soil Aggregate, Processed Reef Shell, and Crushed Aggregate in Subbase and Base Courses.	4 Pcf (64 kg/m^3)
Air Voids	Asphalt Plant Mixes	1%
Air Content	Cement Concrete	1 1/2%
Slump	Cement Concrete	½” (Avg. of 2<3”) (13 mm (Avg. of 2<75 mm)) ¾” (Avg. of 2, 3”-5”) (19 mm (Avg. of 2, 75 mm to 125 mm)) 1” (Avg. of 2 > 5”) (25 mm (Avg. of 2>125 mm))
Compressive Strength of Cylinders	Structural Cement Concrete	The average of the IAS&T cylinders shall be not less than 85% nor more than 115% of the acceptance cylinder used for comparison.

ALDOT-342-83
SUMMARY OF TESTS (BMT-38)

1. Scope

1.1. Requirements for submitting Summary of Tests (BMT-38).

2. Applicable Document

2.1. FHWA FHPM Volume 6, Current Edition

2.2. Construction Information Memorandum 5-88.

3. Summary of Method

3.1. Form BMT-38 is required to be submitted by each Division to the Materials and Tests Engineer along with a letter of certification (Exhibit A) indicating that all materials used on all projects containing Federal funds, and State projects subject to future federal funding were tested and met the required specifications. The letter of certification shall be signed by the Division Engineer, the Division Materials Engineer or the Division Construction Engineer. This is submitted at the completion of the project. Please note that the BMT-38 Form has two sheets. Sheet 1 will be used for a cover letter and Sheet 2 will be used thereafter. The Specification Item Number under which this material was paid should also be shown in addition to the Laboratory Number in the Laboratory Number column.

LETTER OF CERTIFICATION BY DIVISION ENGINEER

Materials and Tests Engineer
Bureau of Materials and Tests
Alabama Department of Transportation
Montgomery, Alabama 36130

Re: Project No: ___________________________

_______________________________County

BMT-38 Materials Certification

Dear Sir:

This is to certify that all of the materials used on the above referenced project met pertinent specification requirements of the contract. All of the materials were properly covered by samples tested, and/or certified, and accepted by the Bureau of Materials and Tests.

Laboratory reports covering tests of materials reported for this project are attached to Form BMT-38 submitted with this certification and are on file in the Division office.

Sincerely,

Division Engineer

EXHIBIT A

ALDOT-344-83
DESIGN METHOD FOR SELECTING THE GRADE OF RECYCLING AGENT AND OPTIMUM ASPHALT CEMENT CONTENT OF HOT-MIX RECYCLE BITUMINOUS MIXTURES

1. Scope

1.1. This procedure covers the method of designing recycle bituminous mixtures using the Marshall Stability apparatus. This method is for use with mixtures containing aggregate up to 25 mm maximum particle size.

2. Applicable Documents

2.1. AASHTO T 49, Penetration of Bituminous Materials

2.2. AASHTO T 84, Specific Gravity and Absorption of Fine Aggregates

2.3. AASHTO T 85, Specific Gravity and Absorption of Course Aggregates

2.4. AASHTO T 164, Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

2.5. AASHTO T 166, Bulk Specific Gravity of Compacted Bituminous Mixtures

2.6. AASHTO T 170, Recovery of Asphalt from Solution by Abson Method

2.7. AASHTO T 201, Kinematic Viscosity of Asphalts

2.8. AASHTO T 202, Viscosity of Asphalts by Vacuum Capillary Viscometer

2.9. AASHTO T 209, Maximum Specific Gravity of Bituminous Paving Mixtures

2.10. AASHTO T 245, Resistance to Plastic Flow of Bituminous Mixtures using the Marshall Apparatus

2.11. ALDOT-258, Mechanical Analysis of Extracted Aggregate

2.12. ALDOT-307, Design Method for Selecting Optimum Asphalt Cement Content of Bituminous Mixture by Means of the Marshall Apparatus

3. Evaluate Reclaimed Asphalt Pavement

3.1. Determine the asphalt content of the reclaimed asphalt pavement using AASHTO T 164.

3.2. Determine the gradation of the extracted aggregate by ALDOT-258.

3.3. Recover approximately 75 - 100 g of asphalt cement in accordance with AASHTO T 170. If the reclaimed asphalt pavement contains less than one percent asphalt, assume the asphalt cannot be recovered and treat the reclaimed asphalt pavement as untreated aggregate.

3.4. Determine the viscosity of the reclaimed asphalt at 140°F (60°C) by AASHTO T 202. Plot on left y-axis of Figure 2.

3.5. If the viscosity of the reclaimed asphalt is too high to easily measure, measure penetration at 77°F (25°C) and viscosity at 275°F (135°C) by AASHTO T 49 and AASHTO T 201. Using Figure 1, estimate the viscosity at 140°F (60°C).

3.6. Plot specification design target viscosity of the final binder. Draw horizontal line at target viscosity.

3.7. Select the grade of recycling agent to be used.

3.8. Determine percent of recycling agent to use.

3.8.1. Use Figure 2 to determine how much recycling agent is needed to soften the reclaimed asphalt to the desired viscosity.

3.9. Check the blend for specification compliance.

3.9.1. The blend must meet the specified asphalt specifications. If the blend does not substantially meet asphalt specifications, select another grade of recycling agent.

4. Test Procedures

4.1. Stability and Flow

4.1.1. AASHTO T 245 shall apply except where amended as follows:

Paragraph 2.4 shall be amended to include the following:

For the double or triple compaction hammers, a pedestal of suitable material and construction may be used, provided results are comparable to the results using the wooden pedestal.

Paragraph 2.5 shall be amended to read as follows:

Specimen mold holder shall be mounted on the compaction pedestal so as to be centered over the post. It shall hold the compaction mold, collar and base plate securely in position during compaction of the specimen.

Paragraph 3.2 shall be amended to read as follows:

Dry the new virgin aggregates to constant mass at 220 to 230°F (105 to 110°C). The reclaimed asphalt pavement should be air dried to prevent any further hardening of the asphalt cement. If moisture is suspected, reclaimed asphalt pavement may be oven dried at 140°F (60°C).

Paragraph 3.4 shall be amended to read as follows:

Proportion by weight the amount by percentages into separate pans of each material required to a batch that will result in a compacted specimen 65 ± 1 mm in height (about 1200 g). Place the pan or pans of the virgin aggregate in the oven and heat to a temperature not exceeding 600°F (316°C). Charge the mixing bowl with the heated aggregate and combine with the ambient re-claimed asphalt pavement. Dry mixes the blend for about 30 seconds to obtain heat transfer and to avoid smoking on addition of the recycle agent. Then add the heated recycling agent at the specified levels and mix until a uniform, complete, coating is obtained. If the mix is too cold to achieve complete coating or too stiff to compact, discard the mix, make new mix at an elevated virgin aggregate temperature.

4.1.2. Age the specimens (samples for compaction, samples for maximum specific gravities) in a forced draft oven at compaction temperature for 45 minutes.

4.2. Bulk specific gravity of compacted bituminous mixtures.

4.2.1. AASHTO T 166 shall apply.

4.2.2. Prior to testing for stability and flow, the Bulk Specific Gravity shall be determined on the compacted specimen prepared in accordance with AASHTO T 245 as amended.

4.2.3. Average the Bulk Specific Gravities for all compacted specimens of a given asphalt content. Values obviously in error shall not be included in average.

4.3. Maximum Specific Gravity of bituminous mixtures.

4.3.1. AASHTO T 209 shall apply.

4.3.2. Determine the Maximum Specific Gravity of the bituminous mix for at least two asphalt con-tents, preferably on mixes at or near the optimum asphalt content and compute average. The Maximum Specific Gravity of the mixes with other contents can be computed as described in paragraph 4.4 of ALDOT-307.

5. Density and Voids Analysis

5.1. ALDOT-307 shall apply.

6. Selecting Optimum Asphalt Content

6.1. ALDOT-307 shall apply.

7. Determine the Viscosity of the Asphalt Cement at Optimum Asphalt Content.

7.1. Extract asphalt cement in accordance with AASHTO T 164.

7.2. Recover the asphalt cement in accordance with AASHTO T 170.

7.3. Determine viscosity of reclaimed asphalt in accordance with AASHTO T 202.

7.4. If the blend does not substantially meet the specified specifications, select another grade of recycling agent or reduce or increase the amount of reclaimed asphalt pavement.

Asphalt Consistency – Temperature Chart

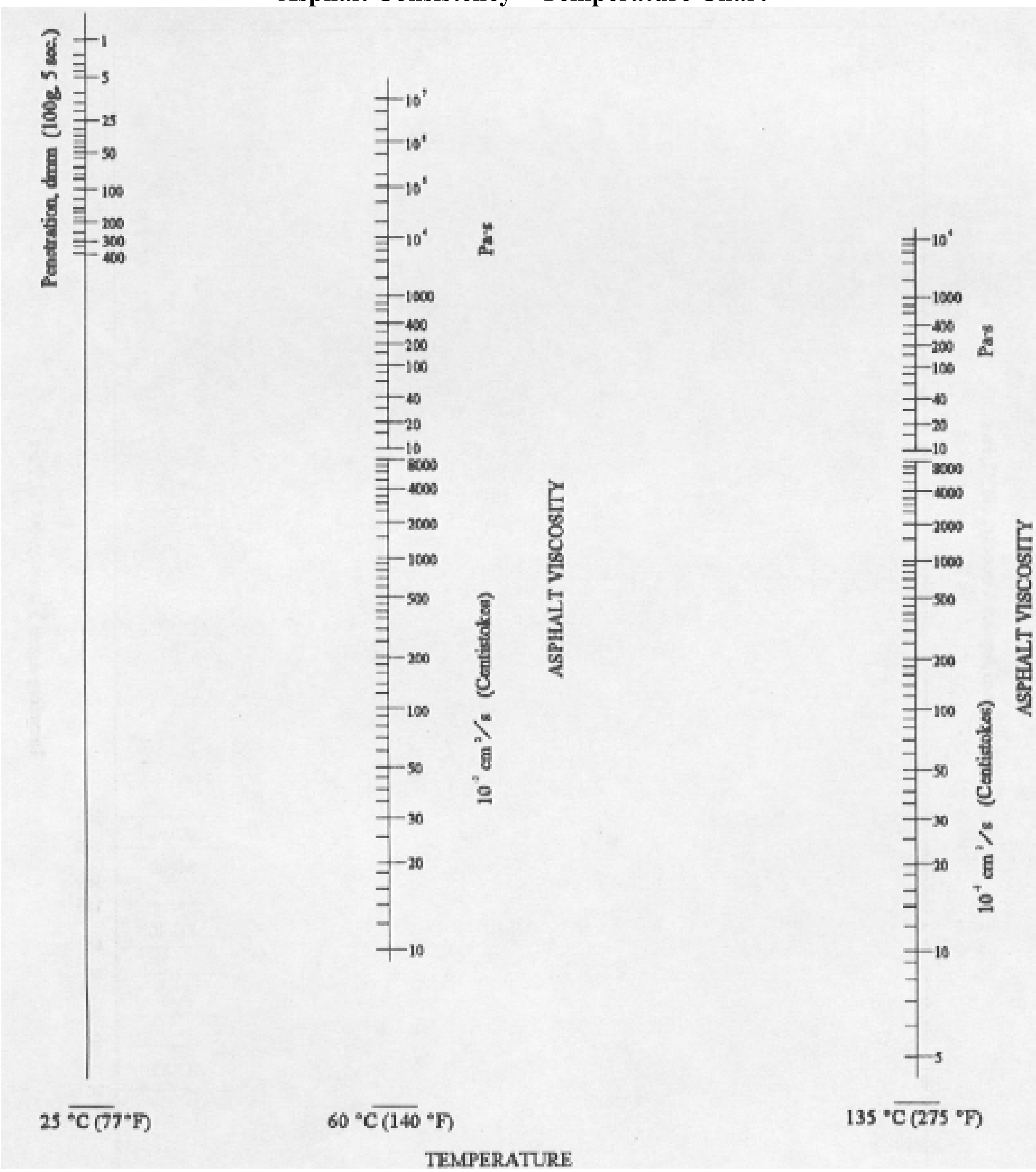


Figure 1

Viscosity Blending Chart

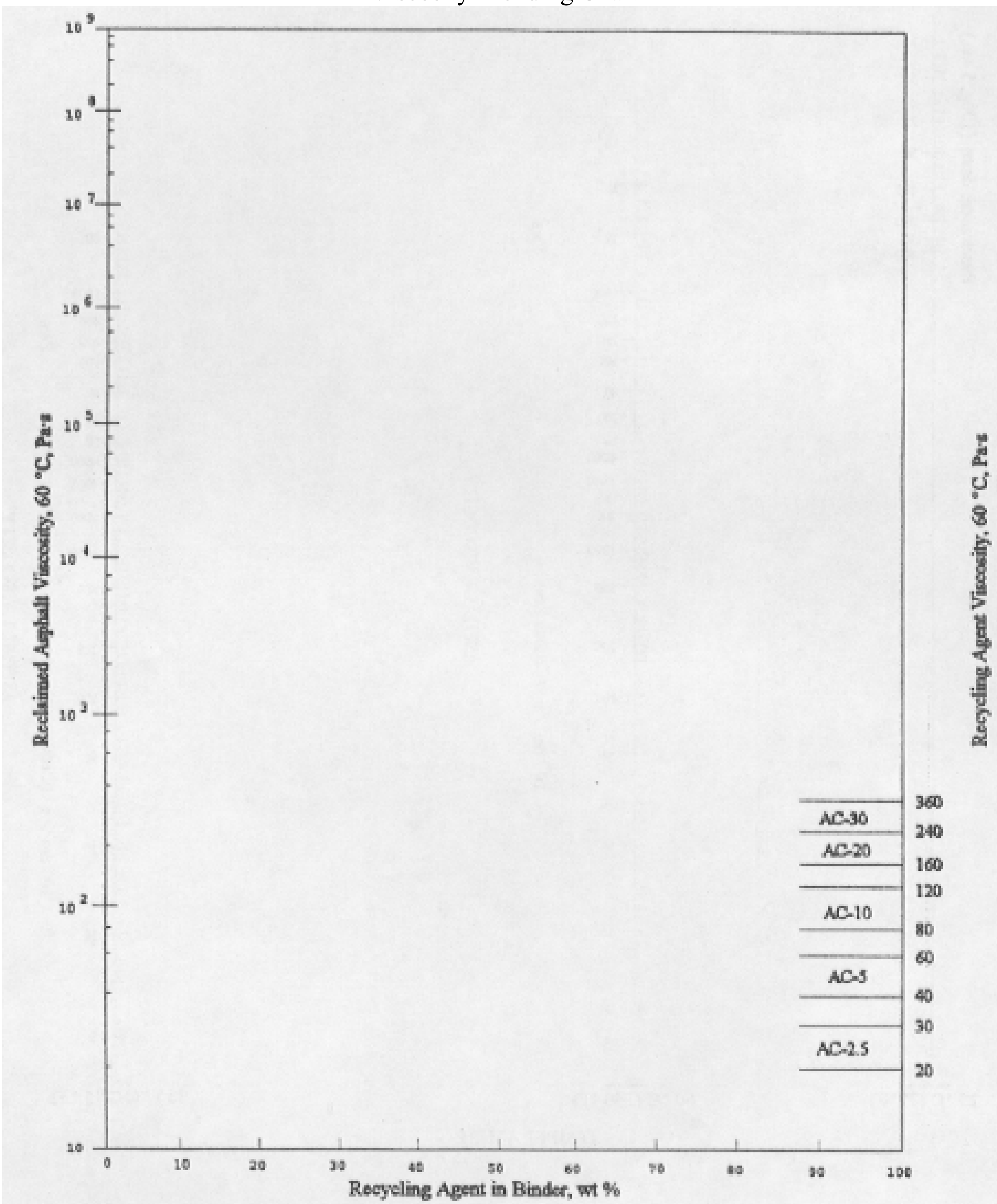


Figure 2

ALDOT-348-84
ACCEPTANCE OF TREATED TIMBER PRODUCTS BY CERTIFICATION

1. Scope

1.1. The purpose of this procedure is to establish a method whereby treated timber products may be accepted by certification from the treating agency hereinafter referred to as the Supplier. This procedure covers all treated timber products listed in Section 833 of the Department's Specifications.

1.2. Under this procedure the Alabama Department of Transportation will not provide inspection at the treating plant either by State Inspectors or by Commercial Laboratories. This is applicable to in-state and out-of-state suppliers.

2. Applicable Documents

2.1. Alabama Department of Transportation Specifications Sections 833, 834, and 864.

2.2. American Wood-Preservers' Association Standard A-3, A-5, A-6, A-7, C-1, M-4, M-6, & C-14.

2.3. Southern Pine Inspection Bureau Grading Rules (SPIB).

3. Acceptance of Material

3.1. The supplier will furnish or have access to quality control personnel with the capability and knowledge to grade timber in accordance with SPIB Standards. The supplier will provide a quality control technician and laboratory equipment to perform all necessary assay retention tests required.

3.2. The supplier will furnish the Certification Engineer a Certificate of Treatment for each charge treated for use by the Department. The Certificate of Treatment will include all measurements of the timber products, made in the "white", an analysis of the preservative used in the treatment and the preservative retention assay after treatment. The Certificate of Treatment will be signed by the supplier's quality control technician or a responsible employee of the supplier and the certificate will be notarized.

3.3. The Certificate of Treatment will serve as a test report to be approved by the Certification Engineer.

3.4. Each post will be stamped or branded on one end with the logo of the treating plant.

4. Shipping Notice

4.1. When the timber products are shipped to an Alabama Department of Transportation Project, send a copy of the Certificate of Treatment with shipment to the Project Engineer with a BMT-170 completed and attached. Use a separate sheet for each type of end anchor..

4.2. Upon receipt of the Certificate of Treatment the Project Engineer will forward a copy to the Division Materials Engineer. The Division Materials Engineer will send a copy of the BMT-170 and the Certificate of Treatment to the Certification Section. The Certification Engineer will check/verify and issue test report.

5. Departmental Inspections

5.1. Timber products shipped to projects will be visually inspected by the Project Engineer for appearance and measured for dimension compliance, spacing, and size of holes.

6. Storage of Supplier

6.1. All timber products which are to be stocked for future shipment will be stacked in a manner which will permit circulation of air within the stack.

7. Failure to Maintain Adequate Quality Control

7.1. If it is determined that there is evidence that a supplier has failed to maintain adequate quality control during the inspection and treatment of the material at his treating facility, or if the timber products fail to meet the required specifications on the project inspections, all shipments from that supplier will stop immediately and an in-depth investigation will be made by the Bureau of Materials and Tests to determine what corrective action is necessary.

7.2. If, after due notice, corrective action is not taken by the supplier his product will not be acceptable by the Department.

ALDOT-349
HOT MIX ASPHALT FIELD TESTING EQUIPMENT

1. Scope

1.1. This procedure covers equipment required for field testing of bituminous asphalt mixtures. All testing equipment shall meet or exceed the following requirements, as well as any requirements in the referenced AASHTO, ASTM, or ALDOT documents (including additional equipment), and be present on sight and maintained in proper working order during all hot mix asphalt (HMA) production. Any equipment not meeting the requirements herein shall not be used without the written approval of the Materials and Tests Engineer.

2. Referenced Documents

2.1. AASHTO Standards

2.1.1. AASHTO T27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

2.1.2. AASHTO T30, Standard Method of Test for Mechanical Analysis of Extracted Aggregates

2.1.3. AASHTO T84, Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate

2.1.4. AASHTO T85, Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate

2.1.5. AASHTO T164, Standard Method of Test for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

2.1.6. AASHTO T166, Standard Method of Test for Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens

2.1.7. AASHTO T168, Standard Method of Test for Sampling Bituminous Paving Mixtures

2.1.8. AASHTO T176, Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test

2.1.9. AASHTO T209, Standard Method of Test for Maximum Specific Gravity of Bituminous Paving Mixtures

2.1.10. AASHTO T245, Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

2.1.11. AASHTO T248, Standard Method of Test for Reducing Field Samples of Aggregate to Testing Size

2.1.12. AASHTO T283, Standard Method of Test for Resistance of Compacted Mixture to Moisture Induced Damage

2.1.13. AASHTO TP4-93, Method for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the SHRP Gyratory Compactor

2.1.14. AASHTO TP33-93, Test Method for Uncompacted Void Content of Fine Aggregate (As Influenced by Particle Shape, Surface Texture, and Grading)

2.1.15. AASHTO TP53-95, Test Method for Determining the Asphalt Content of Hot Mix Asphalt (HMA) by Ignition Method

2.2. ASTM Standards

2.2.1. ASTM D2041, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

2.2.2. ASTM D4125, Standard Test Methods for Asphalt Content of Bituminous Mixtures by the Nuclear Method

2.2.3. ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

2.3. ALDOT Procedures

2.3.1. ALDOT-130, Moisture Content of Bituminous Mixtures by Drying

2.3.2. ALDOT-307, Design Method for Selecting Optimum Asphalt Cement Content of Bituminous Mixture by Means of the Marshall Apparatus

2.3.3. ALDOT-319, Rapid Method to Determine the Bitumen Content in Bituminous Paving Mixtures

2.3.4. ALDOT-354, Asphalt Content of Bituminous Mixtures by the Nuclear Method

2.3.5. ALDOT-361, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage

2.3.6. ALDOT-381, Method for Correlation of Marshall Hammers

3. General Equipment Needed

3.1. Sample quartering table (AASHTO T248).

3.2. Sieve nest and shaker, 8 in or 12 in (200 or 300 mm) diameter. (AASHTO T30).

3.3. Washing screen deck and decanter (AASHTO T27).

3.4. Balances/scales with 11 kg capacity and 0.1 g sensitivity calibrated annually.

3.5. Wire basket or platform suspended from scales into overflow equipped temperature controlled water bath to determine compacted specimen bulk specific gravity (AASHTO T166).

3.6. Vacuum pump, mamometer, accurate to 1 mm mercury absolute pressure, fan (for dry back), and Rice picnometer (AASHTO T209).

3.7. TSR breaking head (sized for the proper specimen diameter and height) and vacuum saturation picnometer, sufficient capacity to completely immerse the specimen while the specimen is held off the bottom of the picnometer with a mesh spacer or other device, and TSR loading machine (AASHTO T283).

3.8. Constant temperature water bath, 140ºF (60°C) (AASHTO T283 & T245).

3.9. Thermometers accurate to 1°F (0.5 ºC) from 68 to 356 ºF (20 to 180°C).

3.10. Specimen extruder using a rigid 0.5 in (12.7 mm) thick steel disk having a diameter no more than 1/16 in (1.6 mm) smaller than the diameter of the specimen mold.

3.11. Forced draft oven(s), having a minimum interior oven space of $10ft^3$ ($0.3\ m^3$) total. Two ovens, one for mix and one for molds, are required for Marshall. The Superpave molds are larger, but in the field molds and mix are at the same temperature.

3.12. Trowels and towels, pans, bowls, spoons and spatulas, insulated and rubber gloves, lumber crayons or paints pens, scoops, machine lubricant, asphalt solvent and soap, and protective paper specimen disks.

3.13. (For 424 & 429 mixes) Sand Equivalent apparatus (AASHTO T176), Uncompacted Void Content apparatus (AASHTO TP33), and Flat or Elongated Proportional Caliper (ASTM D4791).

3.14. Microwave oven and pyrex dish (ALDOT-130).

3.15. Nuclear gauge (ALDOT-354) or Ignition Furnace (AASHTO TP53-95).

4. Equipment for Marshall Mixes

4.1. Marshall molds and compactor assembly, including a concrete slab with approximate dimensions of 3ft x 3ft x 1 ft (1.0 x 1.0 x 0.3 m), calibrated and correlated according to ALDOT-381. Marshall molds, and a stability and flow breaking head with recording devices (AASHTO T245).

5. Superpave Equipment

5.1. SHRP (Superpave) gyratory compactor with molds and specimen height recorder maintained and calibrated according to the manufacturer's or Superpave's recommended schedule, whichever is more frequent (AASHTO TP4-93).

ALDOT-350-87
IN-PLACE BITUMINOUS PLANT MIX DENSITY MEASUREMENTS

1. Scope

1.1. This method of test provides a non-destructive measurement of in-place density of bituminous plant mix using a thin layer or dual-purpose nuclear density gauge for thin lift overlays.

Note: All operators must be certified as Roadway Technicians by the Bureau of Materials and Tests. Before becoming certified as a Roadway Technician, operators must pass the Radiological Safety Course. When these requirements are met, an operator will be issued a card by the Bureau of Materials and Tests certifying him/her as an operator.

2. Applicable Documents

2.1. M&T-33, Technical Specifications for Thin Layer Nuclear Density Gauges.

2.2. Nuclear Gauge Training Manual.

2.3. Radiological and Operational Manual on use of Nuclear Moisture and Density Gauges.

2.4. AASHTO T-166, Bulk Specific Gravity of Compacted Bituminous Mixture Using Saturated Surface-Dry Specimens.

2.5. ALDOT-210, Selecting Samples Using Random Numbers.

2.6. ALDOT-341, Standard Procedures for Comparing Independent Assurance Samples and Tests (IAS&T) and Acceptance Test Results.

3. Nuclear Gauging Device

3.1. This device must meet Technical Specifications M&T-33, available at the Bureau of Materials and Tests.

4. Gauge Application Thicknesses

4.1. Troxler Electronic Labs Model 4640-A - 1 in. (25 mm) to 2 ½ in. (63 mm)
Troxler Electronic Labs Model 4640-B – 1 in. (25 mm) to 4 in. (100 mm)
Troxler Electronic Labs Model 3430, 3440, & 3450 – 1 in. (25 mm) to 4 in (100 mm)
Campbell Pacific Nuclear Corp. Model MC-3 - 1 in. (25 mm) to 4 in. (100 mm)

5. Gauge Operation

5.1. Operation of the gauge shall be in accordance with the manufacturer's instruction manual and Alabama Department of Transportation Nuclear Gauge Training Manual, available from the Bureau of Materials and Tests.

5.2. When operating nuclear gauges, standard counts must be taken on a daily basis in order to maintain gauge accuracy while testing. The gauges and standard frequency are as follows:

Gauge Type/Model	Standard Information
Troxler 4640-A & B	Daily / Default time
Troxler 3430, 3440 & 3450	Daily / Default time
Campbell-Pacific MC-3	Daily / Default time

5.3. When operating the Troxler Electronics Model 4640-A Thin Layer Gauge, a standard reference value will be established every six- (6) months or at the beginning of the project, whichever is shorter. In order to establish a reference value with this device, five four-minute counts will be taken on the 1 in (25 mm) thick standard plate supplied with the gauge. The average of these counts must fall between 105 lbs/ft^3 (1680 kg/m^3) and 115 lbs/ft^3 (1840 kg/m^3). If not, the gauge should be replaced. Once this value is established, it becomes the standard value used when daily reference values are taken. One four-minute count must be taken on the standard plate each day the gauge is used. The daily count must be within 2 lbs/ft^3 (32 kg/m^3) of the established standard.

6. Calibration

6.1. Calibration of gauges will be under the direction of personnel from the Bureau of Materials and Tests.

6.2. All gauges will be calibrated to densities of cores taken from the material being tested, as determined by AASHTO T-166.

6.3. Calibration of the thin layer or dual-purpose gauges shall be in accordance with Alabama Department of Transportation Nuclear Gauge Training Manual available from the Bureau of Materials and Tests.

6.4. The certified technicians will select an area within the first 500 T. (500 t) test section that is free of segregation and between the wheel paths. A minimum of five (5) cores will be taken and used to calibrate the thin-layer or dual-purpose gauges. The gauge(s) to be calibrated will take four (4) one (1) minute counts around each of the five (5) cores, in accordance with article 7.3. The average density of these 20 counts is compared to the average density of the five cores. This difference is the correction value for the layer being tested.

6.5. Once the correction value has been applied, the technician will retake the same four (4) one (1) minute counts around each of the five (5) cores. The average density derived by the gauge, at each core location, must be within ± 1.5% of the actual core density. This must be performed for each of the five (5) cores. If the gauge reads within ± 1.5% of each calibration core, no recalibration will be necessary.

6.6. If recalibration is necessary, the cores previously taken, as outlined in article 6.4 should be used and the calibration process repeated.

7. In-Place Density Test

7.1. Determine the stations and locations for the In-Place Density Test in accordance with ALDOT-210. (Select samples by the random numbers method.) Use an engineering tape or other suitable measuring device to precisely locate the test location. Pacing is not permissible. Record/document, and maintain all random number test locations.

7.2. Place the gauge on the surface of the asphalt pavement as determined above. Check for uniform seating by placing hands on opposite corners of the gauge. If the gauge cannot be properly seated, cores shall be taken at the exact random number location to determine the density.

7.3. Take four one-minute counts rotating the gauge 90° over the same centerpoint after each count. Record these readings and average for the in-place density.

7.4. When operating nuclear gauge within 24 in, (600 mm) of the edge of the asphalt mat, use the following procedure. For initial reading, place gauge parallel to the edge of the layer being tested. Then, rotate gauge at 60° intervals (over same centerpoint) to obtain the next three (3) readings. The last reading should be taken opposite the first reading, leaving the gauge parallel to the edge of the layer being tested.

8. Comparing IAS&T Samples and Tests and Acceptance Test Results

8.1. Frequency of (IAS&T) Tests shall be in accordance with the IAS&T schedule section of the testing manual. IAS&T tests shall be taken at the same location as the acceptance test taken by field or contractor personnel. IAS&T tests shall follow the guidelines set forth in ALDOT-341 with comparison tolerances outlined in Table 1.

ALDOT-352-87
CERTIFICATION PROGRAM FOR PORTLAND CEMENT CONCRETE PRODUCERS

1. Scope

1.1. The Alabama Department of Transportation hereby establishes the Certification Program for Portland Cement Concrete Producers.

1.2. The purpose of this program is to establish the requirements necessary for certification of concrete plants producing concrete for Department projects.

1.3. The Quality Control and Quality Assurance of the concrete produced for Department projects will be the responsibility of the producer.

1.4. The Alabama Department of Transportation will be responsible for monitoring and enforcing this program.

1.5. The Alabama Department of Transportation will be responsible for verifying that Portland Cement Concrete produced for the Department's use meets the applicable specifications.

2. Applicable Documents

2.1. Alabama Department of Transportation Specifications, Sections 106, 450, 501, 801, 802, 806, 807, 808, 809, and 815.

2.2. ALDOT-170.

2.3. ALDOT-328.

2.4. AASHTO M-157.

2.5. The Alabama Department of Transportation's "Materials, Sources, and Devices with Special Acceptance Requirements" manual.

3. Procedure for Plant Approval

3.1. The concrete plant owner or manager shall schedule an inspection of the plant facilities with the Department.

3.2. Plants with facilities that are found to meet the Department's requirements shall provide the Materials and Tests Engineer with a certification stating that all concrete supplied for Department work shall be produced from materials from approved sources, proportioned in accordance with a mix design approved by the Department and under the provisions outlined in this document. This certified statement will then be resubmitted annually on the first month of each calendar year.

3.3. The physical plant equipment of an approved plant shall meet all requirements as specified in ALDOT-170 and Sections 450 and 501 of the Alabama Department of Transportation Specifications.

3.4. The concrete producer is responsible for materials, aggregate moisture determinations, scale weight corrections, batching, weighing, mixing, delivery, and completion/transmission of necessary documentation in the manner and to the degree provided for in the Alabama Department of Transportation Specifications and procedures.

3.5. Approved plants will have certified personnel to fulfill the concrete plant's responsibility of testing and accurately proportioning concrete. Certified personnel shall demonstrate proficiency in respective areas of Responsibilities by successfully meeting the requirements of Section 6 of this procedure.

4. List of Approved Portland Cement Concrete Producers

4.1. The Department will maintain a list of Approved Sources of Portland Cement Concrete Producers (List I-7) that are in compliance with this document in the "Materials, Sources, and Devices with Special Acceptance Requirements" manual. Only plants on this List will be eligible to supply concrete for Department work. The List will include the producer's name, assigned vendor's code, plant's classification, and the certified personnel.

4.2. Any producer may be removed from the List I-7 for deliberate violation of the Department's Specifications, the deliberate use of nonspecification materials, or for the use of materials from a non-approved source.

4.3. The Concrete Engineer or authorized representative will conduct random and unscheduled visits to approved concrete plants in List I-7.

5. Plant Classification

5.1. The classification of an approved plant shall be predicated upon the fulfillment of specified minimum requirements. Plants shall not produce Department concrete when certified personnel are not present.

5.2. Plant classification will be based upon the following definitions. Concrete production and placement schedules shall be governed accordingly.

5.2.1. Classification A Plants

5.2.1.1. Classification A plants are defined as those plants with approved concrete production facilities and Quality Control equipment, staffed and operated in a manner that insures concrete is produced in accordance with the Department's Specifications and with minimum production inspection by the Department's concrete inspectors.

5.2.1.2. Classification A plants may maintain concrete production schedules at the convenience of the Project Engineer and the Contractor. The Engineer may at random intervals assign a Department inspector to observe batching and mixing techniques. Unscheduled visits will be made to all concrete producers periodically by inspecters from the various Division Offices.

5.2.1.3. Classification A plants shall have a full time plant employee certified by the Department to be proficient in concrete technology. The Certified Concrete Technician shall have a sound knowledge of the Department's Specifications as they relate to concrete production and testing of fresh concrete.

5.2.1.4. Classification A plants shall have a full time plant employee certified by the Department to be proficient in concrete batching technology. The Certified Batcher shall have a sound knowledge of the Department's Specifications as they relate to concrete material components.

5.3. Any plant which violates the requirements of this document or any other applicable specification will be subject to loss of its classification status.

5.4. Any Classification A plant found to be in violation shall be removed from the List of Approved Portland Cement Concrete Producers (List I-7) and will not be allowed to produce Department concrete.

5.5. A plant may apply to be reinstated after three months from removal, provided the cause for removal has been corrected to the satisfaction of the Department. A plant that has been removed and then reinstated will be placed in a probational period of six months.

6. Certified Personnel

6.1. Certified personnel will fulfill the concrete plant's responsibility of testing, accurately proportioning concrete, and managing the plant's quality control program.

6.2. The Alabama Department of Transportation will certify plant personnel as Concrete Technicians or Concrete Batchers after they successfully pass a written examination on concrete technology.

6.3. Alabama Department of Transportation personnel who will inspect any concrete operation must be certified as Concrete Technicians.

6.4. Applicants for Certification as Concrete Technicians shall pass a Department approved practical examination prior to taking the Alabama Department of Transportation's test. PCI Technician or ACI Level I Technician are examples of approved practical examinations.

6.5. A three-month waiting period is required before retaking the Department's concrete technology test.

6.6. The Concrete Technician and Concrete Batcher certification will be valid for a period of five (5) years.

6.7. Re-certification of Concrete Technicians and Concrete Batchers shall be as per the following schedule:

6.7.1. All re-certifications, shall be completed before the last day of the month shown as the expiration date of the certified card.

6.8. Certified Concrete Technicians and Concrete Batchers must be assigned to only one concrete plant; however, certified personnel may work at other plants if their assigned plant is not producing concrete for the Alabama Department of Transportation and they have previously notified the Division Office.

6.9. The Certified Concrete Batcher at the concrete plant will be responsible for, but not limited to, the following tasks:

6.9.1. Concrete batching from approved mix design.

6.9.2. Temperature check of cement.

6.9.3. Temperature check of concrete.

6.9.4. Conducting moisture tests on aggregates.

6.9.5. Batch weight corrections.

6.9.6. Transmission of certified delivery tickets.

6.9.7. Documentation.

6.10. The Certified Concrete Technician at the concrete plant will be responsible for, but not limited to, the following tasks:

6.10.1. Responsible for the plant's Quality Control Program.

6.10.2. Perform gradation on aggregates.

6.10.3. Determine Fineness Modulus.

6.10.4. Determine Working Fineness Modulus.

6.10.5. Determine moisture in aggregates.

6.10.6. Perform slump test.

6.10.7. Determine air content of concrete.

6.10.8. Determine unit weight of concrete.

6.10.9. Perform compression testing of concrete cylinders.

6.11. The Certified Concrete Technician must have a thorough knowledge of concrete mix design, be a partner with the Department to resolve problems, and be qualified to perform those duties assigned to the Certified Concrete Batcher.

7. Laboratory Requirements

7.1. Classification A and B plants shall maintain a laboratory approved by the Department that contains equipment to perform tests for aggregate surface moisture.

7.2. Classification A plants shall also have sufficient equipment to conduct slump, air content, and unit weight tests on fresh concrete and gradation tests on aggregates.

7.3. Reference material to be maintained at the plant will include but not be limited to:

7.3.1. Alabama Department of Transportation Specifications (current edition).

7.3.2. A copy of applicable AASHTO or ASTM specifications.

7.3.3. All applicable Alabama Department of Transportation Procedures.

7.3.4. Copies of any Supplemental Specifications or Special Provisions which apply to the concrete to be produced.

8. Concrete Production

8.1. The concrete producer shall be responsible for producing concrete, which meets all applicable specification requirements.

8.2. The Department will administer a materials assurance program for approved Portland Cement Concrete Producers which will insure the Department that materials incorporated into the concrete mix are from approved sources and in compliance with the Specifications.

8.3. The quality of the materials will be verified by testing plant control and Independent Assurance Samples of materials secured by Department inspectors from plant storage during random periods of production of Department concrete.

8.4. Each concrete plant will be issued concrete mix designs for each class of concrete to be produced. The batched concrete shall adhere to those mix designs.

8.5. Any changes to any of the components making up the mix will not be allowed unless they are approved in writing prior to concrete production.

8.6. If changes are necessary, the concrete producer is responsible for contacting the appropriate Division Materials Engineer to request the needed changes.

9. Required Testing

9.1. Production of the required aggregate gradation in the mix will be the responsibility of the concrete producer.

9.2. Certified plant personnel will be responsible for performing gradation tests and determining Fineness Modulus and Working Fineness Modules at Classification A plants.

9.3. Gradation tests on both coarse and fine aggregate shall be made once before Department concrete production begins and then at least once for every 500 yd^3 (400 m^3) of total concrete production that takes place while Department concrete is being produced.

9.4. Where Department concrete is not produced on a continuous day to day basis, gradation tests will start over each time production of Department concrete is resumed.

9.5. Plants which have a total concrete production of less than 500 yd^3 (400 m^3)in a one week period will be required to perform one gradation test per week, and it will be performed immediately before that week's production of Department concrete is begun. Additional gradation tests shall be made as often as required.

9.6. Checks for aggregate moisture determination shall be performed before batch operations begin and then as often as it is necessary to compensate for moisture changes in the aggregate.

9.7. The method used to determine moisture in the aggregates, such as heat drying, Speedy Moisture Test, Chapman flask, drying with a Turkish towel, or any other accepted test method, will be the decision of the concrete producer.

9.8. The use of an accurate automatic moisture indicating device (such as a moisture probe) shall be allowed provided that its accuracy can be demonstrated by an alternate method of moisture determination, and that it is maintained in good operating condition.

9.9. Tests for slump and air content will be performed whenever necessary to check or to adjust the mix for slump or air content requirements.

9.10. The slump test must be performed according to AASHTO T-119 (ASTM C-143).

9.11. The air content test must be performed according to either the volumetric method in AASHTO T-196 (ASTM C-173) or the pressure method in AASHTO T-152 (ASTM C-231).

9.12. Temperature checks of both the cement and the concrete must be performed as often as necessary to insure compliance with the Department Specifications.

10. Documentation

10.1. It will be the responsibility of the certified personnel at each concrete plant to see that all required documentation is completed and properly maintained.

10.2. The Department will furnish any necessary forms. However, if requested, alternate forms (such as ones generated by a computerized control system) may be approved by the Materials and Tests Engineer provided that all required information is clearly shown and sufficient copies are available.

10.3. The required minimum documents to be maintained at the concrete plant are:

10.3.1. Approved Concrete Mix Design:
Each plant will maintain a file containing all concrete mix designs issued to that plant.

10.3.2. Concrete Delivery Ticket (BMT-122):
All plants shall have a system for transmitting with each delivery of concrete a form which documents specific Specification requirements, such as project number, truck number, date, time of batching, batch proportions, mixing revolutions, volume of concrete, aggregate moisture, quantity of mixing water withheld, etc. Authorized plant personnel shall complete this form and certify the data to be correct.

10.3.3. Certified Cement Shipment (BMT-114):
Authorized plant personnel will collect these forms when each shipment of cement arrives and the Certified Concrete Technician shall complete part two. The forms will then be held until a Department representative picks them up.

10.3.4. Aggregate Shipment:
Inspection notices (BMT-10) received with aggregate shipments will be maintained on file to document the sources of all aggregates used in the production of concrete and shall be made available to the Department's representative when requested.

10.3.5. Test Reports:
All plants will maintain records of compliance testing performed by or under the supervision of the Certified Concrete Batcher or the Certified Concrete Technician. These records will include, but not be limited to the following: Aggregate moisture determination, gradation checks, Fineness Modulus determinations, temperature checks on cement and concrete, slump tests, air content tests, and equipment performance tests.

10.3.6. Plant Diary:
The Certified Concrete Batcher or Technician shall keep a plant diary furnished by the Department with entries on, but not limited to, dates Department concrete is produced and calculations of moisture corrections, etc.

10.3.7. Plant Visit Checklist:
Plants that produce Department concrete on a daily basis shall be visited by Division Materials or Project Personnel every two weeks. Other plants shall be visited

monthly. These visits shall be documented on form BMT-95 (Concrete Plant Visit Checklist) by Division Materials or Project Personnel.

ALDOT-353-90
DETERMINING HOT MIX ASPHALT (HMA) LABORATORY QUALITY CONTROL/ASSURANCE PARAMETERS

1. SCOPE

1.1 These are the guidelines for field quality control and quality assurance of each parameter such as the determination of laboratory compacted air voids, Marshall stability and flow, percent of maximum theoretical density versus gyrations (for gyratory mixes such as Superpave 424), roadway mat density, dust to asphalt ratio, and voids in the mineral aggregate (VMA). This procedure also covers the operation of field laboratories and issuing test reports. There are other requirements that are not outlined in this procedure that must also be followed such as testing for gradation, liquid asphalt binder content, moisture content, tensile strength ratio, coarse and fine aggregate angularity, etc. Also, this procedure does not cover all of the Department/contractor responsibilities such as inspection of stockpiles, truck beds, etc. These are beyond the scope of this procedure.

2. APPLICABLE DOCUMENTS

2.1 AASHTO STANDARDS

2.1.1 AASHTO T-166, Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens.

2.1.2 AASHTO T-168, Sampling Bituminous Paving Mixtures.

2.1.3 AASHTO T-209, Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

2.1.4 AASHTO T-245, Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.

2.1.5 AASHTO T-248, Reducing Samples of Aggregate to Testing Size.

2.2 Alabama Department of Transportation Specification, Section 106, Control of Materials.

2.3 Alabama Department of Transportation Testing Manual.

2.4 ALDOT PROCEDURES

2.4.1 ALDOT-210, Selecting Samples by the Random Numbers Method.

2.4.2 ALDOT-222, In-Place Density and Moisture Measurements and Establishing Moisture Correlation for Nuclear Moisture/Density Gauges.

2.4.3 ALDOT-307, Design Method for Selecting Optimum Asphalt Cement Content of Bituminous Mixture by Means of the Marshall Apparatus.

2.4.4 ALDOT-324, Plant Requirements for Plants Producing Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

2.4.5 ALDOT-344, Design Method for Selecting the Grade of Recycling Agent and Optimum Asphalt Cement Content of Hot-Mix Recycle Bituminous Mixtures.

2.4.6 ALDOT-349, Hot Mix Asphalt Field Testing Equipment.

2.4.7 ALDOT-350, In-Place Bituminous Plant Mix Density Measurements.

2.4.8 ALDOT-375, Contractor Quality Control System for Hot-Mix Asphalt.

2.4.9 ALDOT-380, Forms and Examples for Sampling and Computing Pay Factors for Hot Mix Asphalt.

2.4.10 ALDOT-384, Mix Design Procedure for Superpave Level I.

2.4.11 ALDOT-388, Superpave Volumetric Mix Design Procedure Using Recycled Asphalt Pavement.

2.5 BMT-20, Asphalt Plant Mixture Test Report.

3. REQUIRED EQUIPMENT

3.1 Required equipment for field control laboratories is listed in ALDOT-349. Inspection of the field laboratories and equipment is the responsibility of the Engineer (Division).

4. CONTRACTOR'S RESPONSIBILITY

4.1 Refer to ALDOT-375 and ALDOT-324.

4.2 Sample and store samples according to AASHTO T-168, ALDOT-210, and ALDOT-380.

4.3 Sample and test using the frequency set in the ALDOT Testing Manual and Department Specifications, Section 106.

4.4 Furnish daily test reports including the raw data to the Engineer. When the job mix formula is the same for different pay items on the same project or even for different projects run from the same plant, the total tonnage of these items shall be combined into one lot for testing purposes. For pay purposes, the tonnage of each pay item shall be noted on BMT-20 or split proportionately into separate BMT-20's for different projects.

5. DEPARTMENT'S RESPONSIBILITY

5.1 Inspect contractor's field laboratory and equipment in accordance with ALDOT-349.

5.2 Monitor Contractor's sampling and testing to insure accuracy.

5.3 Select random numbers by ALDOT-210 to determine what time or ton to sample. Notify the Contractor approximately fifteen minutes before sampling time (or ton).

5.4 Sample (when needed) and select a verification sample by AASHTO T-168, ALDOT-210, and ALDOT-380. If the contractor shares or furnishes a laboratory and equipment for verification testing to the Department, the Department will use this laboratory to expedite the verification tests. However, separate scales, manometers, sieves, and compactors must be used for verification testing (even if they are located within the same laboratory).

5.5 Sample and test using the frequency set in the current Testing Manual and Department Specifications Section 106.

5.6 Keep a daily diary concerning plant and testing activities.

5.7 Visually inspect for segregation, contamination, etc.

5.8 Check and verify the Contractor's raw data, compare verification test results, and determine lot pay factors.

6. ISSUANCE OF TEST REPORTS BY PRODUCTION LOT ON VERIFICATION TESTS

6.1 When the job mix formula is the same for different pay items on the same project, the total tonnage of these pay items shall be combined into one lot. For pay purposes, the tonnage for each pay item shall be noted on BMT-20 in the remarks section.

6.2 When the job mix formula is the same for multiple projects run from the same plant, the total tonnage for this job mix formula shall be combined for calculating testing increments. For pay purposes, the tonnage shall be separated proportionately onto separate BMT-20's for each project (the testing results will be the same for each project).

6.3 The verification test report (BMT-20), for all applicable mixes, must contain the following information: air voids, liquid asphalt binder content, dust to asphalt ratio (dust proportion), VMA, and gradation (all sieves out of tolerance shall be noted).

6.4 Issue the test report as soon as practical. Compare test results for air voids and liquid asphalt binder content as per the specifications and ALDOT-380. If the values for other parameters do not compare reasonably close one to the other, and/or are out of specifications, check production, sampling, testing, etc., to determine the cause and correct the problem.

7. ALLOWED VARIATION AND REDESIGNING THE JOB MIX FORMULA

7.1 The job mix formula must be redesigned when the source of aggregate or RAP or liquid asphalt binder changes and when there is a wide variation in the gradation from the job mix formula gradation.

7.2 The job mix formula must be redesigned if a component percentage varies by more than one-fourth of the percentage shown on the job mix formula (however, any component that is 20 percent or less of the job mix formula is allowed a five percent variation).

CAUTION: Do not exceed the maximum percentages allowed by the specifications for clay content, RAP, natural fine aggregates, limestone (and other aggregate that tend to polish) etc. Do not fall below the minimum requirements for crushed particle count, fine aggregate angularity, etc.

EXAMPLE: Job mix formula for Section 416, mix 5.

COMPONENT PERCENTAGE	DESCRIPTION	VARIATION ALLOWED
15	19 mm Slag	10 – 20
65	13 mm Slag	49 – 81
20	Natural Sand	15 – 20

7.3 When two consecutive gradations yield results that exceed specification tolerances on the same size sieve, no plant mix produced may be accepted by the Engineer until proper adjustments are made.

7.4 When VMA and/or dust to asphalt ratio (dust proportion) are outside the specification limits for two or more consecutive samples, no plant mix produced may be accepted by the engineer until both VMA and dust to asphalt ratio (dust proportion) are tested and shown to be within specification limits.

8. DETERMINING AIR VOIDS, VMA, AND DUST TO ASPHALT RATIO (DUST PROPORTION)

8.1 Sample the HMA mix from the loaded truck according to AASHTO T-168, ALDOT-210, and ALDOT-380. Sample from four places, one from each quadrant of the truck bed, immediately after the truck has completed loading and moves to the sampling stand. Take care to avoid contamination and/or segregation.

8.2 Using a flat non-absorptive surface (that may be heated), reduce the sample by AASHTO T-248 (method B) to the required amount to compact specimens and determine the maximum gravity of the mix. See ALDOT-307, ALDOT-344, ALDOT-384, and ALDOT-388 for sample compaction requirements. Compact three specimens when making 100 mm diameter specimens and compact two specimens when making 150 mm diameter specimens. When using slag as an aggregate, compact one additional specimen; after determining the average bulk specific gravity of all these specimens, disregard the specimen's individual bulk specific gravity that is furthest from that average and then recompute the average bulk specific gravity using the remaining specimens for determining the laboratory compacted air voids.

8.3 Determine the maximum gravity of the mix by AASHTO T-209. The maximum gravity used to compute contractor air voids is the average of the last four maximum gravity test results. At start up, first one, then two, then three maximum gravity test results are averaged until four results are available to use. These carry over from day-to-day in a continuous running average of the last four test results. This running average is used by the Department and the contractor to determine the percent of maximum gravity for mat density (roadway compaction) as in ALDOT-222 and ALDOT-350.

8.4 When slag is used as an aggregate, the contractor shall use a running average (as in section 8.3) of the last four bulk specific gravity determinations to calculate air voids. The department will not use a running average to calculate air voids.

8.5 Where 100 mm diameter specimens are used, use ALDOT-307 to calculate VMA, air voids, and the stability and flow (as in AASHTO T-245).

8.6 Where 150 mm diameter specimens are used, use ALDOT-384 to calculate VMA, air voids, and percent of maximum theoretical density at Ni, Nd, and Nm.

8.7 Where effective asphalt content is used to calculate the dust proportion (dust to asphalt ratio), use ALDOT-384 to calculate the dust proportion (dust to asphalt ratio). Where total asphalt content is used to calculate the dust to asphalt ratio, use ALDOT-307 to calculate the dust to asphalt ratio.

9. REPORTING

9.1 Report these calculated values on BMT-20, along with gradation, mix temperature, etc.

ALDOT-354-87
ASPHALT CONTENT OF BITUMINOUS MIXTURE BY THE NUCLEAR METHOD

1. Scope

1.1 This test method covers the quantitative determination of the asphalt content of bituminous mixtures by examining a sample with a device that utilizes neutron thermalization techniques.

NOTE 1: Operators shall have a current operator's card issued by the Bureau of Materials and Tests and wear a Neutron Film Badge.

2. Applicable Documents

2.1 ASTM D-4125 Asphalt Content of Bituminous Mixtures by the Nuclear Method.

2.2 M&T 30 Technical Specifications for Nuclear Asphalt Content Gauge.

2.3 Radiological Safety Manual for the use of Nuclear Moisture Density and Asphalt Content gauges.

2.4 Nuclear Gauge Training Manual.

2.5 Gauge Instruction Manual.

2.6 AASHTO T-168, Sampling Bituminous Paving Mixtures.

3. Apparatus

3.1 Nuclear Asphalt Content Gauge meeting Technical Specification M&T 30.

3.2 Metal Sample Pans - Supplied with AC gauge.

3.3 Balance, capable of weighing to 01 kg, readable to 0.1 g.

3.4 Straightedge, steel approximately 450 mm in length.

3.5 Plywood, 20 mm or heavier, or 10 mm or heavier metal plate having an area slightly larger than the sample pans.

3.6 Assorted spoons, mixing bowls, spatula, scoop, putty knife, and heat resistant gloves.

3.7 Microwave oven with variable power control and approximately .03 m^3 minimum capacity.

3.8 Laboratory oven and thermostatically controlled hot plate.

3.9 Thermometer capable of measuring to 177°C.

3.10 Two large metal mixing bowls.

3.11 Pyrex container capable of holding 500 g minimum of sample.

NOTE 2: The asphalt content gauge is sensitive to its surroundings. Before calibrating, be sure that it is located in a place in the laboratory where it will not need to be moved and where it will be away from water storage tanks, other bitumen material and other nuclear testing devices.

4. Preparation of Calibration Specimens

4.1 Prepare three calibration specimens in accordance with Alabama Department of Transportation Nuclear Gauge Training Manual instructions. The specimens must be prepared at the same weight within ± 10 g. The aggregate blend and asphalt cement to be used in the mix must be used to prepare the calibration specimens. Prepare one specimen at the design bitumen content. Prepare another specimen at 1% higher than the design bitumen content and one specimen at 1% lower than the design bitumen content.

4.2 The calibration specimens shall be kept in moisture proof containers until the calibration is accomplished or placed in an oven at low temperature to prevent moisture accumulation.

NOTE 3: The calibration temperature of calibration materials should be between 150°C and 160°C at start of calibration.

5. Calibration of Gauge

5.1 Use the calibration specimens prepared in Section 4 and calibrate the gauge in accordance with Alabama Department of Transportation Nuclear Gauge Training Manual instructions.

5.2 To check calibration of the gauge take the specimen at the design bitumen content and run a four minute test count to check gauge calibration. Gauge accuracy must be within ± 0.25.

5.3 Any change in aggregate source and/or liquid asphalt grade will require a new calibration.

NOTE 4: Calibration specimen at design bitumen content shall be retained after gauge calibration to be used as a check sample for gauge accuracy. The specimen shall be sealed in a plastic bag to prevent the specimen from accumulating moisture.

6. Preparation of Test Specimen

6.1 Obtain a representative sample of mix from the hauling vehicle as per AASHTO T-168.

6.2 Place mix in test pan in three equal layers.

6.3 The tared weight of the test specimen should be ± 10 g of the initial calibration pan weight.

6.4 Prepare a second specimen of 500 to 1000 g for a moisture test as given in ALDOT-130.

7. Procedure

7.1 Place test specimen in the AC gauge and take two, four-minute counts, rotating the specimen 180° after the first count. Average the two counts for % AC.

7.2 Correct the % AC for moisture by subtracting the percent moisture obtained in paragraph 8.2 from the percent asphalt obtained in paragraph 7.1 above and record as the corrected percent asphalt.

7.3 Remove specimen from the gauge, empty and clean the specimen pan.

8. Reportiing

8.1 Report the bitumen content to the nearest 0.01 percent on BMT 65.

8.2 Determine moisture content of bituminous mixture as per ALDOT-130. The moisture sample used to correct the % AC shall be split from the sample obtained in paragraph 6.

ALDOT-355-88
GENERAL INFORMATION CONCERNING MATERIALS, SOURCES, AND DEVICES WITH SPECIAL ACCEPTANCE REQUIREMENTS

1. Scope

1.1. The Alabama Department of Transportation presently maintains several lists of materials, sources, and devices, which have undergone some form of preliminary evaluation. Lists are established both as reference sources of materials and as methods to eliminate lengthy time delays required in evaluating certain products. Each list is unique. Product requirements and job control acceptance vary. Before using any products, read all requirements carefully.

1.2. The lists are in no way a blanket approval which relieves the contractor of the responsibility of furnishing quality materials, nor the Project Engineer the responsibility of inspecting all materials. The Project Engineer must inspect the material and, if doubt exists, job control samples should be taken. Project and Maintenance personnel should also report any problems in workability or premature failure of products on these lists since these factors are very important in maintaining these lists.

1.3. These lists are found in the publication "Materials, Sources, and Devices with Special Acceptance Requirements". They are established and maintained by the individual sections in the Department of Transportation concerned with quality assurance for the products. To obtain information concerning a particular list, persons should either contact the section listed under "Jurisdiction", which can be found at the beginning of the individual procedure for that list or the Product Evaluation Engineer.

1.4. The Alabama Department of Transportation Product Evaluation Board is composed of employees from the various disciplines within the Department of Transportation. The Board is the final authority over this program and decides the ultimate fate of products and requirements.

1.5. The Bureau of Materials and Tests acts as a clearinghouse to duplicate and disseminate these documents

1.6. Lists are divided into five general categories of similar requirements

I. Qualified Sources

II. Approved Materials

III. Qualified Materials

IV. Approved Traffic Control Devices and Materials

V. Qualified Traffic Control Devices and Materials

1.7. The Board has one additional category of products which has been termed ***“Specialty Items”***. Specialty Items are items, which do not fall into any area of the present Department Specifications or Standard Drawings but may be useful in construction or maintenance work on a very limited and specialized basis. The Product Evaluation Board has reviewed only the paper work submitted by the producers of these items. No tests or research evaluating the product’s usefulness or other attributes has been conducted by the Department. Individual

Divisions may elect to try these products on a limited basis should they find a specialized need for such items. The Board would caution that the items are basically experimental in nature and should be approached as such. If a Division elects to try such an item, the Board would encourage them to contact the Bureau of Research & Development for more detailed information about the product, and in order that the Bureau may monitor the usefulness of the item. If an item proves useful, the Department may wish to develop a specification for its general use.

2. Definitions

2.1. Qualified Sources - Sources of materials such as cement, lime, and aggregates. These sources may be quarries, plants, or refineries that have agreed to a systematic program of sampling, testing, and inspection to provide quality assurance for Department work. Materials from these sources may be used without Job Control Testing, provided they meet the visual inspection by the Project Engineer.

2.2. Approved Materials - Materials and/or products that may fall into one or both of the following categories: A. Items having a high probability of acceptance. B. Items whose use is non-critical to the performance of the finished roadway. Because these items are of this nature, the Alabama Department of Transportation allows an abbreviated testing program for quality assurance. Job Control testing is not required.

2.3. Qualified Materials - These are materials, which the Department requires field performance testing in addition to laboratory testing. Job control testing will not be required, however some items may require pretesting. (Requirements for pretesting may be found in the instructions for individual lists.)

2.4. Approved Traffic Control Devices and Materials - These are items evaluated prior to bidding on projects. This is necessary so that only items which meet current project requirements will be furnished. Job Control Testing will not be necessary. Project personnel will verify that the equipment and materials received on the project are those called for by the approved submittal data.

2.5. Qualified Traffic Control Devices and Materials - These items are initially evaluated for color, design, and satisfactory field performance. The items must then either have job control samples taken or be pretested as stock (see ALDOT-195). The Project Engineer must consult with the Testing Manual to determine current requirements.

3. Eligibility Procedures for Existing Lists

3.1. Persons wishing to place items on any of the lists maintained by the Alabama Department of Transportation may obtain detailed information by contacting the Product Evaluation Engineer for the Department at:

MAILING ADDRESS:

Product Evaluation Engineer
Bureau of Research and Development
Alabama Department of Transportation
1409 Coliseum Boulevard
Montgomery, AL 36130-3050

PHYSICAL ADDRESS:
(For bulk submittals)

Product Evaluation Engineer
Bureau of Research and Development
Alabama Department of Transportation
3704 Fairground Road
Montgomery, AL 36110

Phone: (334) 206-2240

3.2. The Department will forward detailed instructions concerning the information, test data, fees and samples required for evaluation of the item.

3.3. Please read thoroughly and compare company product data with current specifications for conformance. Submit only those items, which meet these specifications.

3.4. Items that perform the same function as currently specified items, but do not meet current specifications, should be processed as new products (see Section 4).

3.5. Complete and submit all forms, samples, fees, and correspondence to the addresses above.

4. New Products

4.1. Products that do not meet current specifications or for which specifications have not been established are considered as new products. This includes items that perform the same function as currently specified materials.

4.2. The Department will forward detailed instructions concerning the information, test data, fees and samples required for evaluation of the item.

4.3. Complete and submit all forms, samples, fees and correspondence (including proposed uses) to the address above.

5. Alternate Evaluation of Items Requiring Field Testing

5.1. Some lists require field testing for extended periods. Unless these requirements are completed well in advance of the anticipated marketing time, the producer will be delayed in selling products. To give as much flexibility as possible for the use of these products this procedure may be utilized.

5.2. The producer may negotiate with a prime contractor to have the product used in an ongoing project that will then be used as the field test.

5.3. The prime contractor will be required to post a bond equal to a value of the total bid price for that item (estimated quantity multiplied by the unit bid price). Where the item is not a direct pay item, but is an incidental part of a larger pay item, the bond shall be equal to the amount of the larger pay item.

5.4. Approval for this procedure must be authorized by the Product Evaluation Board prior to any installation.

5.5. This procedure will not be an acceptable alternate for "Approved Traffic Control Devices and Materials", Lists IV-1, IV-2, IV-3, IV-4). State Law requires that these items be approved prior to bidding on projects for direct Department purchase. When these items are furnished on projects by a contractor, approval must be obtained prior to installation.

5.6. Any item, which fails during the testing period, shall be removed, and the posted bond will be kept and utilized to make repairs.

6. Fees

6.1. To control requests for unnecessary testing of marginally used products and help defray cost to the Department for this testing, nominal fees will be required for the testing and inspection performed by the Department.

6.2. Manufacturers should narrow selections of products to those where a real market is anticipated prior to submittal. This will lessen the cost to the Department and manufacturer for these services.

6.3 Fees are as follows:

Submittal Fee	$50
Laboratory Testing	$500
Field Testing	$500
Laboratory/Field Test	$750
Source Approval	$200
Portland Cement Concrete Plants	$200
Asphalt Mix Design (Virgin Mix)	$1900
Asphalt Mix Design (Recycle Mix)	$2200
Concrete Verification Mix Design Tests	$3000

6.3.1. The submittal fee covers the paperwork necessary for initial processing of a request and is required for all submittals.

6.3.2. Fees for "Approved Traffic Control Devices" can be found in Section iii of the manual "Materials, Sources and Devices with Special Acceptance Requirements".

6.3.3. Source approval fees will be charged for the initial approval and each time the source relocates.

6.3.4. Sources of Bituminous Concrete (List I-5) will be inspected annually or when the plant relocates or is significantly changed, and will be charged for each inspection ($50 submittal, plus $200 inspection fee).

6.3.5. Sources of Portland Cement Concrete (List I-7) will be inspected as required in the Department Specifications, Sections 450 and 501.

6.3.6. When specifications are changed to an extent that new testing or inspection is required, fees will be required as if the submittal is new.

6.3.7. When the formulation of a product is changed, new testing and fees will be required.

6.3.8. All fees should be paid by check or money order made payable to the "Alabama Department of Transportation".

7. Testing and Evaluation of Products

7.1. All testing and evaluation will be conducted at the convenience of the Department.

7.2. Tests will be conducted according to the Alabama Department of Transportation Specifications.

7.3. Test reports are property of the Department and will not be given to producers. Producers may view copies of their reports only in the offices of the Department.

7.4. The costs for samples, shipping and field installation requiring special equipment and personnel are the responsibility of the producer.

7.5. The producer will be responsible for clean up and disposal of all materials remaining after installation of each field test.

7.6. Any item for which there has been an opportunity to be evaluated by the AASHTO’s National Transportation Product Evaluation Program (NTPEP) will not be reviewed by the Product Evaluation Board until the vendor has submitted the results of the NTPEP evaluation. Producers with products now under evaluation at these facilities should wait until testing is complete and data published before submitting to the PEB for approval.

ALDOT-358-88
JACK CALIBRATION PROCEDURE

1. Scope

1.1. The Alabama Department of Transportation hereby establishes procedures for the calibration of piling jacks; jacks and/or jack systems used with the three-edge bearing apparatus; jacks and gauges, load cells, dynamometers, etc.,used in prestress operations.

2. Piling Jacks

2.1. The testing machine used for calibration shall be calibrated in accordance with ASTM E-74.

2.2. The capacity of the jack shall be divided into 10 equal increments for the calibration.

2.3. When calibrating the jack, the Ram shall be extended.

2.4. The first cycle readings shall be taken with the ram extended 25% of its stroke. The second and third cycle readings shall be taken with the ram extended 50% and 75% of its stroke respectively. The average of the calibrations of the three (3) Ram extensions shall be used to generate the dial versus indicated load.

2.5. The jack shall be capable of holding the load and the jack dial shall be clean and easily readable.

2.6. The calibration shall be valid for six (6) months from date calibrated for all DOT projects.

2.7. Calibration shall be conducted by applying pressure with the jack to the testing machine, and it shall be the Contractor's responsibility to furnish personnel to operate the jack during test procedure.

2.8. All calibrations shall be accurate within ± 5% of the applied load, i.e., the indicated load shall be within ± 5% of the actual load applied.

2.9. When a jack, gauge and hydraulic pump are calibrated they shall remain as a unit. Changing any one of the three components shall require a recalibration.

3. Jacks, Three-Edge Bearing Apparatus

3.1. Double ram pipe testing racks with a dual hydraulic ram loading system.

3.2. Calibration force measuring instruments for verifying the load indications of above rack shall be calibrated in accordance with ASTM E74.

3.3. Procedure for calibration:

3.3.1. For the first calibration each Ram must be extended approximately 25% of the ram stroke with a minimum of six calibration points divided equally over the scale range.

Readings on the proving rings or load cells shall be averaged at each calibration point and the average reading of each calibration point must be with-in ± 2% of the pipe testing rack dial reading.

3.3.2. For the second calibration each ram must be extended approximately 50% of the ram stroke with a minimum of six calibration points divided equally over the scale range. Readings on the proving rings or load cells shall be averaged at each calibration point and the average reading of each calibration point must be with-in ± 2% of the pipe testing rack dial reading.

3.3.3. Calibration No. 1 and Calibration No. 2 are independent of each other and both calibrations must be within ± 2%.

3.3.4. The calibrations shall be valid for one year from date of calibration unless the Engineer or quality control has reason to suspect that another calibration is warranted.

3.3.5. The intent of the two (2) calibrations (one (1) at 25% and one (1) at 50% of ram extension) is to assure that jack(s) is/are calibrated within operating range of ram when used to test pipe.

3.4. Single ram pipe testing racks with a single hydraulic ram loading system.

3.5. Calibration force measuring instruments for verifying the load indications of above rack shall be calibrated in accordance with ASTM E74.

3.6. Procedure for Calibration:

3.6.1. For the first calibration, the ram must be ex-tended approximately 25% of the ram stroke with a minimum of six calibration points divided equally over the scale range. Readings on the proving ring or load cell must be within ± 2% of the pipe testing rack dial reading.

3.6.2. For the second calibration the ram must be extended approximately 50% of the ram stroke with a minimum of six calibration divided equally over the scale range. Readings on the proving ring or load cell must be within ± 2% of the pipe testing rack dial reading.

3.6.3. Calibration No. 1 and Calibration No. 2 are independent of each other and both calibrations must be within ± 2%.

3.6.4. The calibrations shall be valid for one year from date of calibration unless the Engineer or quality control has reason to suspect that another calibration is warranted.

3.6.5. The intent of the two (2) calibrations (one (1) at 25% and one (1) at 50% of ram extension) is to assure that jack(s) is/are calibrated within operating range of ram when used to test pipe.

4. Tensioning Systems, Prestress Concrete - Post-Tensioned Concrete

4.1. Tensioning systems for prestress and post tensioned concrete items. Jacks and Gauges, Load Cells, Dynamometers.

4.2. Calibration force measuring instruments for verifying the load indications shall be calibrated in accordance with ASTM E-74.

4.3. Calibration for low pressure gauges shall be conducted at no greater than 5 kN increments.

4.4. Calibration for high pressure gauges shall be conducted at no greater than 25 kN increments.

4.5. The tensioning system must be capable of holding the load and the dial shall be clean and easily readable.

4.6. The calibration shall be accurate within ± 2%, i.e., the indicated load shall be within ± 2% of actual applied load.

4.7. The calibration shall be valid for one year from date of calibration.

4.8. When a tensioning unit is calibrated, i.e., jack, gauge and hydraulic pump, it shall remain as a unit. Changing any of the components shall require a recalibration.

4.9. Stressing jack calibrations shall be conducted by applying pressure with the jack to the calibration measuring instrument.

4.10. When calibrating the jack, the Ram shall be extended. The first cycle readings shall be taken with the Ram extended 25% of its stroke. The second and third cycle readings shall be taken with the Ram extended 50% and 75% of its stroke respectively. The average of the three (3) Ram extensions shall be used to generate the dial versus indicated load.

Jack Calibration Procedure
Piling Jack

Contractor: ______________________________

Contractor's Address: ______________________________

Make of Jack: ______________________________

Serial No. of Jack: ______________________________

Serial No. of Pump: ______________________________

Make of Dial: ______________________________

Dial Graduation: ______________________________

Smallest Increment of Dial: ______________________________

Marks on Dial: ______________________________

Travel of Ram (mm): ______________________________

Ram Extended ____________ mm During Calibration

Calibrated by: ______________________________ Date: ______________

Increment No.	Applied Load kN	Jack Dial Reading Mpa			
		Average	Cycle 1	Cycle 2	Cycle 3
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

ALDOT-361-88
RESISTANCE OF COMPACTED BITUMINOUS MIXTURE TO MOISTURE INDUCED DAMAGE

1. Scope

1.1. This method covers preparation of specimens and measurements of the change of diametral tensile strength resulting from the effects of saturation and accelerated water conditioning of compacted bituminous mixtures in the laboratory. The results may be used to predict long term stripping susceptibility of the bituminous mixtures, and evaluating liquid anti-stripping additives which are added to the asphalt cement of pulverulent solids, such as hydrated lime, which are added to the mineral aggregate.

2. Applicable Documents

2.1. AASHTO T 166, Bulk Specific Gravity of Compacted Bituminous Mixtures

2.2. AASHTO T 167, Compressive Strength of Bituminous Mixtures

2.3. AASHTO T 168, Sampling Bituminous Paving Mixtures

2.4. AASHTO T 209, Maximum Specific Gravity of Bituminous Paving Mixtures

2.5. AASHTO T 245, Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

2.6. AASHTO T 269, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures

2.7. AASHTO T 283, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage

2.8. AASHTO M 156, Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

2.9. ASTM D 3549, Test for Thickness or Height of Compacted Bituminous Paving Mixture Specimens

2.10. ASTM D 2041, Test Method for Theoretical Maximum Specific Gravity of Bituminous Paving Mixture

3. Significance and Use

3.1. As noted in the scope, this method is intended to evaluate the effects of saturation and accelerated water conditioning of compacted bituminous mixtures in the laboratory. This method can be used (a) to test bituminous mixtures in conjunction with mixture design testing; (b) to test bituminous mixtures produced at mixing plants; and, (c) to test the bituminous concrete cores obtained from completed pavements of any age.

3.2. Numerical indices of retained indirect tensile properties are obtained by comparing the retained indirect properties of saturated, accelerated water-conditioned laboratory specimens with the similar properties of dry specimens.

4. Summary of Method

4.1. Six test specimens for each set of mix conditions, such as, plain asphalt, asphalt with anti-stripping agent, and aggregate treated with lime, are tested (Note 1). Each set of specimens is divided into two subsets and one subset tested in dry condition for indirect tensile strength. The other subset is subjected to vacuum saturation and then tested for indirect tensile strength. Numerical indices of retained indirect tensile strength properties are computed from the test data obtained on the two subsets: dry and conditioned.

Note 1: It is recommended to prepare two additional specimens for the set. These specimens can then be used to establish the vacuum saturation technique as given in Section 9.3.

5. Apparatus

5.1. Equipment for preparing and compacting specimens from AASHTO T 245.

5.2. Vacuum Container, preferably Type D, from ASTM D 2041 and vacuum pump or water aspirator from ASTM D 2041 including manometer or vacuum gauge.

5.3. Balance and water bath from AASHTO T 166.

5.4. Water bath capable of maintaining a temperature of 140 ± 2ºF (60 ± 1ºC).

5.5. Forced air draft oven capable of maintaining a temperature of 140 ± 2ºF (60 ± 1ºC).

5.6. Loading jack and ring dynamometer from AASHTO T 245, or a mechanical or hydraulic testing machine from AASHTO T 167 to provide a range of accurately controllable rates of vertical deformation including 2in (50 mm) per minute.

5.7. Loading Strips - If used, steel loading strips with a concave surface having a radius of curvature equal to the nominal radius of the test specimen. For specimens 4 in (100 mm)in diameter the loading strips shall ½ in (13 mm)wide, and for specimens 6 in (150 mm) in diameter the loading strips shall be ¾ in (19 mm)wide. The length of the loading strips shall exceed the thickness of the specimens. The edges of the loading strips shall be rounded by grinding.

6. Preparation of Laboratory Test Specimens

6.1. Specimens 4 in (100 mm)in diameter and 2 ½ in (63 mm) thick are usually used. Specimens 6 in. (150 mm) in diameter and 4 in (100 mm) thick (either by compaction or sawing) are used in all Superpave mixes and in mixes with aggregate retained on the 1 in (25 mm)sieve.

6.2. Place the mixture in an oven at 276ºF (130ºC)for one-half hour prior to compaction. The mixture shall be compacted to 7 ± 1.0 percent or a void level expected in the field. This level of voids can be obtained by adjusting the number of blows in AASHTO T 245.

6.3. For superpave mixes use the conditioning time and compaction temperature as per ALDOT-384. Adjust the number of gyrations to achieve 7 ± 1.0 percent air voids.

6.4. After extraction from the molds, the test specimens shall be allowed to cool to room temperature.

7. Preparation of Core Test Specimens

7.1. Select locations on the completed pavement to be sampled, and obtain cores. The number of cores shall be at least six for each set of mix conditions.

7.2. Separate core layers as necessary by sawing or other suitable means, and store layers to be tested at room temperature.

8. Evaluation of Test Specimens and Grouping

8.1. Determine theoretical Maximum Specific Gravity of mixture by AASHTO T 209.

8.2. Determine specimen thickness by ASTM D 3549.

8.3. Determine Bulk Specific Gravity by AASHTO T 166. Express volume of specimens in mm3.

8.4. Calculate air voids by AASHTO T 269.

8.5. Sort specimens into two subsets of three specimens each so that average air voids of the two subsets are approximately equal.

9. Preconditioning of Test Specimens

9.1. One subset will be tested dry and the other will be preconditioned before testing.

9.2. The dry subset will be stored at room temperature until testing. The specimens shall then be placed in a 77ºF (25ºC) water bath for one hour and then tested as described in Section 10.

9.3. The other subset shall be conditioned as follows:

9.4. Place the specimen in the vacuum container supported above the container bottom by a spacer. Fill the container with distilled water at room temperature so that the specimens have at least one inch of water above their surface. Apply partial vacuum, such as 30 in. (500 mm)Hg for a short time, such as five minutes. Remove the vacuum and leave the specimen submerged in water for five minutes.

9.5. Determine Bulk Specific Gravity by AASHTO T 166. Compare saturated surface-dry weight with dry weight determined in Section 8.3. Calculate volume of absorbed water.

9.6. Determine degree of saturation by comparing volume of absorbed water with volume of air voids from Section 8.4. If the volume of water is between 55 percent and 80 percent of the volume of air, proceed to Section 9.3.4. If volume of water is less than 55 percent, repeat the procedure beginning with Section 9.3.1 using more vacuum and/or time. If volume of water is more than 80 percent, specimen has been damaged and is discarded. Repeat the procedure beginning with Section 9.3.1 using less vacuum and/or time.

9.7. Place the specimens into a 140± 2ºF (60 ± 1ºC) water bath filled with distilled water for 24 hours.

9.8. After 24 hours in the 140ºF (60ºC) water bath, remove the specimens and place them in a water bath already at 77±1ºF (25 ± 0.5ºC) for one hour. It may be necessary to add ice to the water bath to prevent the water temperature from rising above 77ºF (25ºC). Not more than 15 minutes should be required for the water bath to reach 77ºF (25ºC). Test the specimens as described in Section 10.

10. Testing

10.1. Determine the indirect tensile strength of dry and conditioned specimens at 77ºF (25ºC).

10.2. Remove the specimen from 77ºF (25ºC) water bath and place between the two bearing plates in the testing machine. Care must be taken so that the load will be applied along the diameter of the specimen. Apply the load to the specimen by means of the constant rate of movement of the testing machine head of 2 in (50 mm) per minute.

10.3. If steel loading strips are used, record the maximum compressive strength noted on the testing machine, and continue loading until a vertical crack appears. Remove the specimen from the machine and pull apart at the crack. Inspect the interior surface for stripping and record the observations.

11. Calculations

11.1. Calculate the tensile strength as follows:

$$St = \frac{2P}{t\ D\ 3.14}$$

where:
St = tensile strength, psi (pascals)
P = maximum load, pounds (Newton)
t = specimen thickness, inches (mm)
D = specimen diameter, inches, (mm)

11.2. Express the numerical index or resistance of asphalt mixtures to the detrimental effect of water as the ratio of the original strength that is retained after the freeze-warm water conditioning. Calculate as follows:

$$\text{Tensile Strength Ratio (TSR)} = \frac{S2}{S1}$$

where:
S1 = average tensile strength of dry subset, and
S2 = average tensile strength of conditioned subset.

ALDOT-362-89
PROCEDURE FOR MEASUREMENT OF THE SURFACE TEMPERATURE OF PAVEMENT

1. Scope

1.1. This procedure describes the equipment and techniques used in measuring the surface temperature of pavement. Pavement temperatures are used to control placement of asphalt, rolling, and other operations in the field. This procedure should be followed as closely as possible to insure accurate and reproducible results.

2. Apparatus

2.1. Surface Temperature Thermometer, dial type, having a range of 0ºF – 300ºF (5ºC - 150ºC), accurate to 2.5 percent. Silicone grease or equivalent.

3. Procedure

3.1. Find a smooth spot on the surface of the pavement large enough to place the thermometer. The smoother the pavement the more accurate the reading.

3.2. Place a small amount of silicone grease on the back of the thermometer and stick the thermometer to the surface of the pavement. Apply enough pressure to the thermometer to assure that the grease has spread and that the thermometer is in good contact with the pavement.

3.3. Protect the thermometer from direct wind and sunlight and allow the thermometer to stabilize for a minimum of three minutes. No physical contact should be made with the thermometer during this period. The temperature can be read at the end of the stabilization period. The thermometer should be removed after the reading has been taken and all grease removed.

3.4. The accuracy of the thermometer should be checked periodically by placing it on a surface of known temperature.

ALDOT 364-89
PROCEDURE FOR INSPECTION OF CONCRETE PIPE, PRECAST MANHOLES, PRECAST BOX CULVERTS, PRECAST NON-PRESTRESS CONCRETE BRIDGE MEMBERS AND MISCELLANEOUS PRECAST PRODUCTS

Note: Miscellaneous precast products are such items as right-of-way Markers, Concrete Pipe End Treatments, and Barrier Rail.

1. Scope

1.1. The Alabama Department of Transportation (hereinafter referred to as the Department) hereby establishes the Quality Control Program for Production, Inspection and Acceptance of Concrete Pipe Precast Manholes, Precast Box Culverts, Precast Non-Prestress Concrete Bridge Members and Miscellaneous Precast Concrete Products (hereinafter referred to as the Precast Concrete Products Program). The purpose of this procedure is to ensure that all precast concrete products purchased by the Department, directly, or through its contractors and subcontractors meet and otherwise conform to the Department's Specifications. This will be accomplished by placing the responsibility of quality control on the producer.

1.2. This program is a supplement to the Department's established procedures for ensuring and maintaining a quality supply of precast concrete products. In order to qualify for this program, the producer's company must be contained in the current listing of the Department's "Materials, Sources and Devices with Special Acceptance Requirements", List I-8, hereinafter referred to as the "Approved Sources List".

2. Producer Qualification Requirements

2.1. Any producer of precast concrete products who wishes to furnish his product for use in highway construction must:

2.2. Make request by letter to the Materials and Tests Engineer;

2.3. Request plant inspection;

2.4. Submit Quality Control Plan;

2.5. Employ a Certified Precast Concrete Products Technician;

2.6. Submit a signed BMT-45, "Annual Certification and Guarantee for Precast Products";

2.7. Submit initial fees per ALDOT-355, "General Information Concerning Materials Sources and Devices with Special Acceptance Requirements"; and,

Note: Fees should be paid by check, made payable to the Alabama Department of Transportation.

2.8. Submit a list, identifying the source of all materials.

2.9. After all requirements of Section 2 have been met, the Working Task Force will recommend approval of the source to the Product Evaluation Board requesting the source be placed on List I-8, Approved Sources Lists. The Product Evaluation Board normally meets during the first week in each month.

3. Responsibilities

3.1. The Department in conjunction with the Alabama Concrete Pipe Association will administer a viable training program to train Precast Concrete Products Technicians per ALDOT-377, "Certification Program for Precast Concrete Products Technicians".

3.2. The Producer's Certified Technician will:

3.2.1. Be responsible to the producer's Registered Professional Engineer for the Quality Control Program;

3.2.2. Be present during the production and shipment of their particular product;

3.2.3. Perform tests per Section 6;

3.2.4. Ensure test equipment is calibrated/maintained per Section 6.

3.2.5. Visually inspect each joint, section, unit, etc.;

3.2.6. Ensure all products are properly cured per the applicable specification;

3.2.7. Ensure that all materials used are from an approved source (per Section 5);

3.2.8. Maintain a daily production log;

3.2.9. Ensure all products are marked per Section 8 and the attached "Marking Guide";

3.2.10. Stencil DOT and Technician Number on each unit;

3.2.11. Ensure all products are properly stored;

3.2.12. Fill out, submit and maintain test reports per Section 7; and,

3.2.13. Maintain documentation files to substantiate testing and material sources.

3.3. DOT Division Personnel will:

3.3.1. Visit each producer in his/her particular Division twice each month (Divisions 1, 3, 5 and 9);

3.3.2. Monitor the producer's Quality Control Procedures;

3.3.3. Review shipping reports, BMT-72;

3.3.4. Review test reports, BMT-47 and BMT-53;

3.3.5. Ensure testing per Section 6;

3.3.6. Visually inspect products that have been accepted and stenciled by producer's technician;

3.3.7. Perform required tests if applicable;

3.3.8. Perform and complete "Check List for Periodic Review", and submit copy of same to Central Lab in Montgomery;

3.3.9. Pick up and submit one (1) absorption test sample (core) per year per producer (preferably during October) to the Central Laboratory in Montgomery. (Pipe and Precast manholes only) Cores may be obtained from any size pipe;

3.3.10. Provide producer's technician with copies of test reports;

3.3.11. Inspect out-of-state producers twice each month if shipping products frequently to Alabama;

3.3.12. Inspect "Three-Edge Bearing" apparatus if applicable per AASHTO T-280; and, Issue test reports, (Divisions 1, 3, 5 and 9) and submit original to Central Laboratory in Montgomery.

3.4. Central Laboratory Personnel will:

3.4.1. Administer the Precast Concrete Products Program and monitor effectiveness of same;

3.4.2. Assist the Alabama Concrete Pipe Association with classroom and practical "hands-on" training as required;

3.4.3. Provide classroom space as required;

3.4.4. Test and certify Precast Concrete Products Technicians;

3.4.5. Perform <u>all</u> initial plant inspections;

3.4.6. Approve all new sources and Producer Quality Control plans;

3.4.7. Issue test reports;

3.4.8. Perform annual absorption tests for all sources;

3.4.9. Maintain files for all approved producers;

3.4.10. Be the focal point for any problem;

3.4.11. Generate the required actions if required to remove a source from the Approved Sources List;

3.4.12. Ensure oversight responsibilities by visiting Divisions 1, 3, 5 and 9 each year. The visits will include a trip to one (1) of the producers in the particular Division with a Division representative to ensure all duties and responsibilities are complied with as outlined in this procedure. The Central Laboratory will generate a written report to document the visit; and,

3.4.13. Perform all duties as listed in Section 3.3, except those specifically pertaining to the Divisions.

3.5. Producers of Precast Non-Prestress Concrete Bridge Members will be required to provide a permanent identification method for each unit to identify the unit as to which standard drawing it was built and what use requirements it meets. See Section 8.

4. Producer Quality Control Plan

4.1. Each producer must submit a Quality Control Plan for approval by the Materials and Tests Engineer. The Quality Control Plan must contain at least, but not limited to, the following;

4.1.1. A statement defining how the particular company intends to control the quality of the product(s) being produced;

4.1.2. Name, address, (location if different from mailing address) and telephone number of company;

4.1.3. Names of company officers, i.e., owner, president, etc.;

4.1.4. Name of key plant personnel and specific duties, i.e., superintendent, general manager, technician, production foreman, etc.;

4.1.5. Name and specific duties of person who will perform quality control duties;

4.1.6. Name and registration number of Professional Engineer who will be responsible for the overall Quality Control Program;

4.1.7. List of all products being produced to include sizes;

4.1.8. List of all major production equipment;

4.1.9. If applicable, name, address, telephone number and services of Independent Testing Lab; and,

4.1.10. List of testing equipment for "in-house" testing.

5. Materials

5.1. Materials used in the production of Precast Concrete Products shall meet the requirements of the appropriate sections of the Department's Specifications and must be purchased from an approved source as listed in the Approved Sources Lists.

5.1.1. Coarse/Fine Aggregate - List I-1;

5.1.2. Cement - List I-2;

5.1.3. Admixtures - List II-1;

5.1.4. Reinforcing steel used must be traceable to a certified mill test report and meet all requirements of the Department's Specifications with special attention directed to Section 106; and,

5.1.5. Water used shall be per the Department's Specifications, Section 807; (Water for Cement Concrete).

5.2. The producer must maintain all documentation necessary to substantiate the purchase and use of all approved materials and shall make same available to the Department upon request.

6. Acceptance

6.1. Acceptance of all precast concrete pipe shall be in accordance with Department Specifications and the following ASHTO/ASTM Specifications: AASHTO M-86/ASTM C-14, AASHTO M-170/ASTM C-76, AASHTO M-175/ASTM C-444, AASHTO M-176/ASTM C-654, AASHTO M-178/ASTM C-412, AASHTO M-206/ASTM C-506, AASHTO M-207/ASTM C-507 and AASHTO M-242/ASTM C-655.

6.1.1. In general, concrete pipe in all diameters and classes shall be accepted on strength test results determined by the Three-Edge Bearing test, AASHTO T-280. Producers have the option to cut cores from pipe that have a wall thickness of 4 in.(100 mm) and greater. Cores may be tested according to AASHTO T-280 or AASHTO T-22. Concrete cylinders shall be tested according to AASHTO T-22.

6.2. Acceptance of precast concrete box culvert sections shall be in accordance with Department Specifications and the following AASHTO/ASTM Specifications: AASHTO M-259/ASTM C-789, and AASHTO M-273/ASTM C-850.

6.2.1. Precast concrete box culvert sections shall be accepted on strength test results determined by compression testing of concrete cores or concrete cylinders. Cores may be tested according to AASHTO T-280 or AASHTO T-22. Concrete cylinders shall be tested according to AASHTO T-22.

6.3. Acceptance of precast concrete manholes shall be in accordance with Department Specifications and the following ASHTO/ASTM Specifications: AASHTO M-199/ASTM C-478.

6.3.1. Precast concrete manholes shall be accepted on the same basis as precast concrete box culvert sections as outlined above.

6.4. Precast concrete pipe end treatments shall be accepted on strength test results determined by compression testing (AASHTO T-280 or AASHTO T-22).

6.5. Precast concrete right-of-way markers - (Visual Inspection).

6.6. Joints of concrete pipe or any unit of a precast concrete product that have been cored and found to meet requirements may be accepted for use if the core holes have been repaired in an acceptable manner.

6.7. Precast non-prestress concrete bridge members shall be accepted on strength test results determined by compression testing of concrete cylinders (AASHTO T-22).

6.8. Visual inspections for defects and imperfections shall be made immediately after the form is removed. The technician will allow only cosmetic repairs to enhance finish and appearance to be made.

6.9. Concrete Cylinders shall be made and cured in accordance with AASHTO T-23. Capping shall be in accordance with AASHTO T-231.

6.10. Independent Testing Labs identified in the Producer's Quality Control Plan must be inspected and approved by the Department, prior to the producer being approved. The Department will conduct annual inspections there after. Inspections cover the following:

6.10.1. Concrete cylinder/core breaking machine for calibration - ASTM C-39 and ASTM E-4,

Note: The Independent Testing Lab shall furnish the producer with a copy of the annual certified calibration report.

6.10.2. Capping apparatus - ASTM C-617;

6.10.3. Capping material - ASTM C-617; and,

6.10.4. Curing facilities - ASTM C-511.

6.11. Testing equipment used by the producer for "in-house" testing shall be inspected by the Department on an annual basis or as often as deemed necessary. Inspections shall be the same (if applicable) as described in Section 6., Independent Testing Labs, with the following addition:

6.11.1. The three-edge bearing apparatus shall be inspected annually to ensure compliance with AASHTO T-280;

6.11.2. The producer shall have the three-edge bearing jacks calibrated annually. The producer is required to submit a copy of the calibration certificate to the appropriate Division Materials Engineer or the Central Lab;

6.11.3. The producer shall ensure that the three-edge bearing jacks are calibrated in accordance with ALDOT-358, utilizing the Department's forms;

6.11.4. Curing methods required for the finished product shall be in accordance with the applicable AASHTO/ASTM Specification; and,

6.11.5. Concrete compression testing machines are required to be calibrated annually. Producers are required to furnish a copy of the certified calibration report to the Department. The Department will perform inspections as per Section 6.

6.12. Testing Frequency - For every lot of precast product, at least one joint or unit shall be tested according to this section. A "Lot" of precast product is specifically defined as follows:

6.12.1. Pipe (all diameters and classes), 1-day's production or a maximum of 300 joints;

6.12.2. Box culvert sections - 1-day's production or a maximum of 15 units;

6.12.3. Manholes (wet cast) - 1-week's production or a maximum of 50 units;

6.12.4. Manholes (dry cast) - 1-day's production or a maximum of 100 units;

6.12.5. Pipe end sections - 1-week's production or a maximum of 50 joints;

6.12.6. Right-of-way markers - 100 units;

6.12.7. Testing frequency for precast non-prestress concrete bridge members shall be in accordance with Department Specifications, Section 512; and,

6.12.8. Miscellaneous precast structures - 1-week's production or a maximum of 50 units.

7. Reporting

7.1. All producers shall comply with the approved system of reporting each shipment of product to a Department project. Each shipment shall be reported to the appropriate Division Materials Engineer or Central Lab on Form BMT-72, "Shipping Report", within one (1) week of delivery. The Precast Concrete Products Technician will complete this form and certify the data to be correct.

7.2. The Central Lab or Division Materials Engineer, whichever is responsible, will review each shipping report. If the information furnished is complete and correct, form BMT-72 will be distributed to the appropriate project along with a test report.

7.3. As soon as the inspection and testing of the product is completed, Form BMT-47 or BMT-53, whichever is applicable, will be submitted to the appropriate Division Materials Engineer or Central Lab on a weekly basis. Sufficient evidence must be provided on the forms to indicate that the appropriate acceptance tests have been performed in accordance with Section F.

8. Marking, Shipping, Handling and Storage

8.1. In addition to inspection and testing prior to shipment, the Technician will visually inspect each joint or unit of product before and after loading to ensure no damage has occurred and that each joint or unit of product is properly marked.

8.2. Precast Products will be marked as follows:

8.2.1. Concrete pipe, precast manholes and precast box culvert sections will be appropriately marked as per the applicable AASHTO/ASTM Specification;

8.2.2. Concrete pipe end treatments - class, date of manufacture, name or trademark and lot no.;

8.2.3. Right-of-way markers - date of manufacture and lot no.; and,

8.2.4. Precast non-prestress concrete bridge members will be appropriately marked per the attached "Marking Guide for Precast Non-Prestressed Concrete Bridge Members" to include the number code that indicates the name and size of the unit and the Standard Drawing number and date of same.

8.3. In addition to the above requirements for markings, the Technician will stencil the letters "DOT" plus his technician number on the inside or outside of each joint or unit of product along with the lot number.

8.4. The Project Engineer may accept precast concrete products at the job site provided the product is properly marked and a visual inspection reveals no damage due to shipping and handling. Any joint or unit found to be damaged to the extent that serviceability is impaired, will be rejected and shall not be used in the work.

8.5. Precast concrete products shall be stored in a manner that will not damage the product and will allow easy access for inspecting, marking and handling.

9. Miscellaneous

9.1. Recertification of all producers is required annually. At that time, the producer will submit a signed BMT-45, "Annual Certification and Guarantee for Precast Products". There is no fee charged for the annual recertification.

9.2. Quality Control Technicians - Each producer must be staffed with a Certified Precast Concrete Products Technician. The technician, once certified, will be issued a Certified Technician Card, BMT-145, by the Department. The technician's certification is valid for a period of three (3) years, provided he has been employed and performing those duties as outlined in Section 3.

9.2.1. Certification/Recertification shall be as outlined in ALDOT-377, "Certification Program for Precast Concrete Products Technicians".

9.3. When quality problems persist, or if they are severe enough in nature, the producer may be removed from the Precast Concrete Products Program. Upon receiving due written notice, the producer will surrender the inspection stamp and any test report forms remaining in his possession.

9.4. The Department will provide guidance and assistance to producers in identifying and correcting problems which may arise. Cooperation between the producer and the Department in recognition and correction of a problem in early stages will result in a mutual benefit to both.

9.5. The producer is required to report to the Department any significant changes in personnel, production and Quality Control Procedures as identified in the Quality Control Plan.

MARKING GUIDE FOR PRECAST NON-PRESTRESS CONCRETE BRIDGE MEMBERS

The following procedure explains how code numbers have been assigned to the "Marking Guide."

Example: 340304

34 - Span
0 - Skew
3 - Design Loading
04 - Unit Description

The first two digits indicate the span length for which the unit was designed (i.e., 19', 24', 34' (6m, 7m, 10m).

Even though the cap numbers can apply to other span lengths, they are assigned as to the longest span the design meets.

The third digit indicates the skew of the bridge.

0 = 0° Skew
3 = 30° Skew (Left Ahead)
4 = 30° Skew (Right Ahead)

The fourth digit indicates design loading.

For 34' (10m) Spans:

2 = H-15 Loading
3 = HS-20 Loading
*9 = Denotes a modification to the standard.

For 19'(6m) & 24'(7m) Spans:

1 = H-15 Loading
6 = HS-20 Loading
*9 = Denotes a modification to the standard.

The fifth and sixth digits indicate the type unit itself.

02 through 09 Interior Units
11 through 22 Curb Units and Exterior Units (Except Barrier Rail Exterior Units)
92, 93, & 94 Barrier Rails
95 Barrier Rail Exterior

For Abutment Panels: (i.e., 700490)

The first two digits indicate the pile spacing on a standard roadway as follows:

70 - 28' (8.5m) Roadway
80 - 26' (8m) Roadway
90 - 24' (7m) Roadway

***Note:** When 9 is used as the fourth digit in the code number it indicates a modification to the standard. This modification will appear on the project drawings.

Marking Guide For Precast Non-Prestress Concrete Bridge Members

Code #	Size & Description	Standard Drawing Number	Date of Drawing
190192	19'X4'1"X15" BR INTM	PCBR-19-1-20	MAR/1980
190193	19'X4'1"X15" BR LEFT	PCBR-19-1-20	MAR/1980
190194	19'X4'1"X15" BR RIGHT	PCBR-19-1-20	MAR/1980
190601	19'X2'6"X17" INTERIOR	PC-19-1-20	JUNE/27/1986
190604	19'X3'6"X17" INTERIOR	PC-19-1-20	JUNE/27/1986
190695	19'X3'6"X17" EXTERIOR	PC-19-1-20	JUNE/27/1986
240192	24'X4'1"X15" BR INTM	PCBR-1 (24)	NOV/29/1990
240193	24'X4'1"X15" BR LEFT	PCBR-1 (24)	NOV/29/1990
240194	24'X4'1"X15" BR RIGHT	PCBR-1 (24)	NOV/29/1990
240602	24'X2'6"X17" INTERIOR	PC-120-1	NOV/30/1990
240605	24'X3'6"X17" INTERIOR	PC-120-1	NOV/30/1990
240611	24'X2'4"X17" "A" CURB	PC-120-1	FEB/1979
240613	24'X3'9"X17" CURB	PC-120-1	FEB/1979
240616	24'X3'6"X17" EXTERIOR	PC-120-1	FEB/1979
240647	28'X1'6"X19" ABT.CAP W/PLATES	PCA-2424	NOV/30/1990
240651	33'X1'6"X20" ABT. CAP W/PLATES	PCA-2824	NOV/30/1990
240673	28'X1'6"X20" INTM.CAP W/PLATES	PCB-2424	NOV/30/1990
240679	31'6"X18"X20"INTM.CAP W/PLATES	PCB-2824	NOV/30/1990
240695	24'X3'6"X17" EXTERIOR	PC-120-1	NOV/30/1990
323292	32'X4'1"X15" BR INTM.	PCBR-1(32)-30	AUG/17/1994
323293	32'X4'1"X15" BR LEFT	PCBR-1(32)-30	AUG/17/1994
323294	32'X4'1"X15" BR RIGHT	PCBR-1(32)-30	AUG/17/1994
323604	32'X3'6"X21" INTERIOR	PC-32-2-30	AUG/17/1994
323651	18'4"X18"X20 5/16" ABT. CAP	PCA-2832-30	AUG/17/1994
323679	18'4"X2'X24 1/2" INTM. CAP	PCB-2832-30	AUG/17/1994
323695	32'X3'6"X21" EXTERIOR	PC-32-2-30	AUG/17/1994
324292	32'X4'1"X15" BR INTM.	PCBR-1(32)-30	AUG/17/1994
324293	32'X4'1"X15" BR LEFT	PCBR-1(32)-30	AUG/17/1994
324294	32'X4'1"X15" BR RIGHT	PCBR-1(32)-30	AUG/17/1994
324604	32'X3'6"X21" INTERIOR	PC-32-2-30	AUG/17/1994
324651	18'4"X18"X20 5/16" ABT. CAP	PCA-2832-30	AUG/17/1994
324679	18'4"X2'X24 1/2" INTM. CAP	PCB-2832-30	AUG/17/1994
324695	32'X3'6"X21" EXTERIOR	PC-32-2-30	AUG/17/1994
340211	34'X2'4"X12" "A" CURB	PC-34-2	SEP/30/1978
340292	34'X4'1"X15" BR INTM.	PCBR-1 (34)	NOV/30/1990
340293	34'X4'1"X15" BR LEFT	PCBR-1 (34)	NOV/30/1990
340294	34'X4'1"X15" BR RIGHT	PCBR-1 (34)	NOV/30/1990
340304	34'X3'6"X21" INTERIOR	PC-34-2	NOV/30/1990
340315	34'X3'3"X21" INTERIOR	PC-34-2	NOV/30/1990
340347	28'X18"X19" ABT. CAP W/PLATES	PCA-2434	NOV/30/1990

Code #	Size & Description	Standard Drawing Number	Date of Drawing
340375	27'6"X2'X19"INTM.CAP W/PLATES	PCB-2434	NOV/30/1990
340395	34'X3'6"X21" EXTERIOR	PC-34-2	NOV/30/1990
340651	33'X18"X20" ABT. CAP W/PLATES	PCA-2834	NOV/30/1990
340679	31'6"X2'X2' INTM.CAP W/PLATES	PCB-2834	NOV/30/1990
340779	31'6"X33"X21"INTM.CAP W/PLATES	PCB-2834-C	OCT/26/1993
400304	40’ X 3’6” X 24’ INTERIOR	PC-40	
400348	28” X 24” X 19” ABUT. CAP W/6” RISER	PCA-2434	AUG/20/1999
400351	33’ X 27” X 20” ABUT. CAP W/RECESS	PCA-2840 CP	
400352	33’ X 24” X 20’ ABUT. CAP W/6” RISER	PCA 2840	
400375	27’ X 6” X 2’ X 19” INTM. CAP W/6” RISER	PCB-2434	AUG/20/1999
400378	31’ X 6” X 2’ X 2’ INTM. CAP W/6” RISER	PCB-2834	AUG/20/1999
400379	31’ X 6” X 27” X 20” INTM. CAP W/RECESS	PCB-2840 CP	
400391	40’ X 4’1” X 15” B. R. DBL. TRANS.	PCBR-	
400392	40’ X 4’1” X 15” B. R. INTM.	PCBR-1 (40)	
400393	40’ X 4’1” X 15” B. R. LEFT	PCBR-1 (40)	
400394	40’ X 4’1” X 15” B. R. RIGHT	PCBR-1 (40)	
400395	40’ X 3’6” X 24” EXTERIOR	PC-40	
400679	31’6” X 2’ X 2’ INTM. CAP	PCB-2840	
600494	13'X2'3"X5" W-1 PANEL	PCP-2400 & 2800	NOV/30/1990
600495	13'X3'3"X5" W-2 PANEL	PCP-2400 & 2800	NOV/30/1990
600496	13'X4'3"X5" W-3 PANEL	PCP-2400 & 2800	NOV/30/1990
700490	7'4"X2'3"X5" A-1 PANEL	PCP-2800	DEC/1992
700491	7'4"X3'3"X5" A-2 PANEL	PCP-2800	DEC/1992
700492	7'4"X4'3"X5" A-3 PANEL	PCP-2800	DEC/1992
700597	12'5"X3'3"X5" W/C LEFT	PCP-2400 & 2800	NOV/30/1990
700598	12'5"X3'3"X5" W/C RIGHT	PCP-2400 & 2800	NOV/30/1990
900490	6'1"X2'3"X5" A-1 PANEL	PCP-2400	NOV/30/1990
900491	6'1"X3'3"X5" A-2 PANEL	PCP-2400	NOV/30/1990
900492	6'1"X4'3"X5" A-3 PANEL	PCP-2400	NOV/30/1990

The Code Number, Standard Drawing Number, Date of Drawing and Date Poured shall be stenciled, tagged, or otherwise placed on each member produced, along with the letters "DOT" plus the technician number.

ALDOT 366-89
TEST METHOD FOR PULL OUT ON STEEL TIE BARS SECURED IN CONCRETE WITH EPOXY

1. Scope

1.1. This test method covers the procedure to be used in checking the pull out strength on steel tie bars secured in concrete paving with epoxy.

2. Applicable Documents

2.1. Alabama Department of Transportation Specifications Sections 450 and 453.

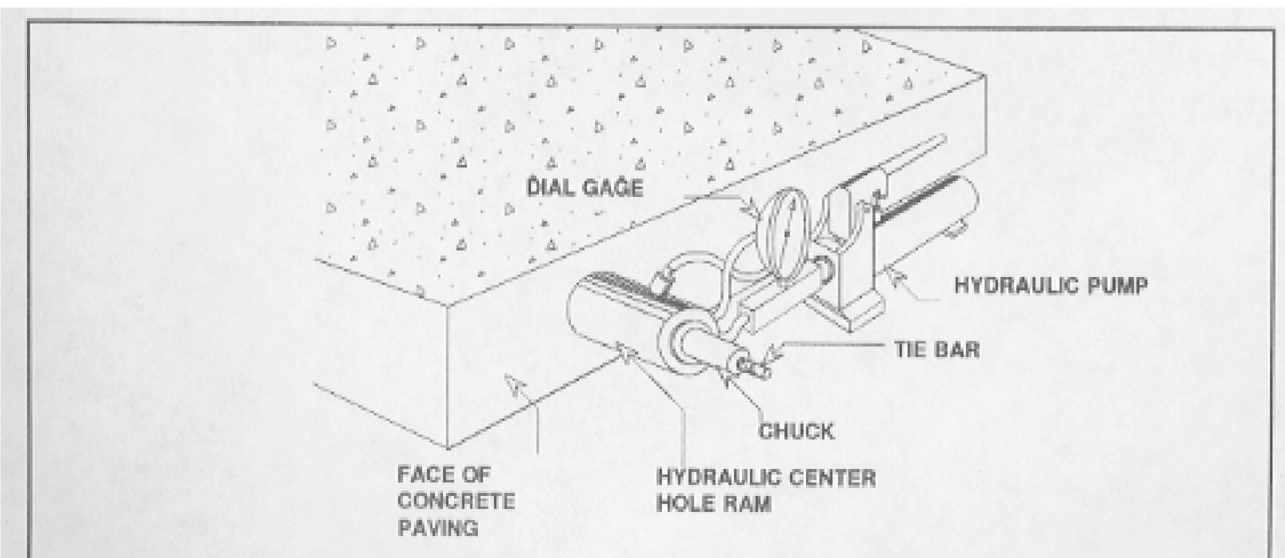
3. Summary Of Method

3.1. After epoxy has cured as recommended by the producer, 7200 lbs. (32 kN) pull out force shall be applied to the steel tie bar. Should the steel tie bar pull out before the required force is attained the test will be considered a failure.

4. Apparatus

4.1. Hydraulic pump capable of producing required load. Center hole ram with travel of at least 3 in. (75 mm).

4.2. Chuck of sufficient size to hold bar being tested.



DIAGRAM

4.3. Gage to measure hydraulic pressure accurate to 2 percent of required load.

4.4. Pump and gage to be calibrated as a unit in accordance with ALDOT-358.

5. Procedure

5.1. Place ram over steel tie bar with base against face of concrete.

5.2. Place chuck over steel tie bar against face of ram.

5.3. Apply 7200 lbs (32 kN) pull out force with hydraulic pump.

5.4. If tie bar pulls out at less than 7200 lbs (32 kN) all the tie bars shall be pulled until at least five consecutive pulls in each direction have been made that do not pull out at an applied load 7200 lbs (32 kN) or in the case of a full depth spall repair, until all tie bars in the area being repaired have been tested.

ALDOT-368-89
SAMPLING PROCEDURES FOR ELASTOMERIC BRIDGE BEARING PADS

1. Scope

1.1. This procedure covers the requirements for marking and sampling of elastomeric bridge bearing pads. The specifications for these items can be found in Section 837 of the Department's Specifications.

2. Definitions

2.1. Elastomeric Bridge Bearing - A vibration absorbing pad made from an elastomeric material and designed to compensate for thermal expansion and contraction, rotation, camber changes, creep and shrinkage of structural members. These bearings are divided into five types according to the design of the pad. Specifications for components of these pads can be found in Section 837 of the Department's Specifications.

2.2. Manufacturer - The company actually taking raw components and producing a finished bearing.

2.3. Department - The Alabama Department of Transportation.

2.4. Lot - A lot of pads shall be considered to be a group of 100 or less pads which are manufactured from the same batch of elastomer, cured under the same conditions, and are of the same type. A lot may include different sizes of pads, but not different types.

2.5. Type - Refers to general design of a bearing as outlined in section 837 of the Department's Specifications.

3. Marking

3.1. The manufacturer shall stencil each pad with a legible order number, lot number, bearing identification number, elastomer type and grade number. All markings shall be done with paint or a semi-permanent material not easily removed from the surface of the pad. All markings shall be applied on a face visible after installation, if possible, and shall be applied prior to shipment to the project.

4. Sampling

4.1. All pads along with certified test reports for each lot of bearings shall be shipped to the project for sampling and inspection.

4.2. A representative of the Department will inspect all pads for workmanship and markings. He/she will divide the pads according to lots and choose a random sample of one pad from each lot (see ALDOT-210). When a lot contains more than one size of pad the inspector will treat the lot as if all pads were the same size and choose only one sample.

4.3. The Department inspector will complete a BMT-18 and attach it to the sample. The sample, sample card and a copy of the manufacturer's test report shall be sent to the Department's Central Laboratory for testing.

4.4. In cases where larger and more expensive pads, Type 3, Type 4 and Type 5 pads, are used, an alternate sampling plan may be elected by the Department. Some bridge structures require a large variety of Type 3, Type 4 and Type 5 pads in small quantities. The cost and time required to make additional replacement pads is not feasible. When this occurs the contractor may furnish the Materials and Tests Engineer, in writing, the number and types of pads involved. The Materials and Tests Engineer may, at his option, elect to specify which types and sizes of pads from which the samples shall be taken. This will allow the contractor to have additional pads of that size and type made at the same time as the other pads are produced. The inspector will then choose at random from these pads.

4.5. Should the contractor elect this option, he/she should make arrangements prior to production of the pads, in order that the manufacturer may make these additional pads along with the balance of the order. This should be done immediately after the shop drawings have been approved by the Bridge Bureau.

ALDOT-369-89

PROCEDURE FOR ACCEPTANCE OF MATERIALS USED IN THE CONSTRUCTION OF REST AREAS AND WELCOME CENTERS

1. Scope

1.1. The purpose of this procedure is to establish the requirements for acceptance and documentation of materials to be used in the construction of the buildings and grounds at rest areas and welcome centers.

2. Materials Used in Grounds Construction

2.1. Materials used in grounds construction will be accepted by test reports or certifications, being submitted as required by Testing Manual, specifications, or shop drawings.

Example:
1. Base Material
2. Paving
3. Drainage Pipe
4. Concrete (Cement and Aggregates)
5. Steel Reinforcement
6. Fencing Materials
7. Light Poles

3. Materials Used in Building Construction

3.1. Cast-in-Place Concrete Materials used in the Cast-in-Place Concrete will be tested by the Alabama Department of Transportation and must meet applicable Architectural Specifications. Items used in the building construction are governed by the Architectural Specifications included in the Contract. These specifications cover the buildings plus 3 feet (1 m) outside the building structure. Products such as those listed below are accepted by brand name, model number, etc. as specified by approved submittal data, plans and/or specifications. Documentation should be inserted in project files by project personnel. Examples are typical and this list is not intended to be all inclusive.

Example:
1. House Paint
2. Roofing Materials
3. Plumbing Supplies and Fixtures
4. Lumber
5. Lighting Supplies and Fixtures
6. Brick or Block
7. Caulk
8. Windows

4. Miscellaneous Supplies

4.1. Miscellaneous supplies will be accepted on visual inspection by the Project Engineer.

Example:
1. Nails
2. Screws
3. Bolts
4.
5.
6.
7.
8.

5. Additional Testing

5.1. The Alabama Department of Transportation reserves the right to sample and test any materials delivered to the project. These test results will take precedent over any other test report or certification previously submitted.

ALDOT-370-90
GUIDELINES FOR OPERATION OF HOT MIX ASPHALT PLANTS AND THE ISSUANCE OF TEST REPORTS

1. Scope

1.1. These are the guidelines for the operation of hot mix asphalt plants and the issuance of daily reports. There are other requirements that are not outlined in this procedure that must be adhered to, such as, moisture content, viscosity of recycled asphalt mixes, tensile strength ratio, Marshall Stability, flow, VMA, etc., and must be handled on an individual basis and are beyond the scope of this procedure. Also, this procedure does not outline all of the routine inspection responsibilities of the Department, such as, the visual inspections of stockpiles, truck beds, etc.

2. Division Of Responsibility

2.1. Contractor's Responsibility.

2.1.1. Refer to ALDOT-375.

2.1.2. Take a sample as directed by the Department (approximately 130 lbs (60 kg)). Split this sample into two 65 lb (30 kg) samples, the Contractor’s sample and the Referee Sample.

2.1.3. Take an independent sample (from the next loaded truck, for example) as directed by the Department (approximately 130 lbs (60 kg)). Split this sample into two 65 lb (30 kg) samples, the Department’s Sample and the Contractor Verification Sample (the contractor may test this sample if desired; it is not required).

2.1.4. Give the Referee Sample to the Department (in case it is needed later) and run all needed tests on the Contractor Sample.

2.1.5. The following tests shall be conducted using the frequency outlined in the current Department Testing Manual: (a) Moisture content of aggregates and bituminous mixtures, (b) Crushed particles of bituminous mixtures and aggregates, (c) Clay content, (d) Adherent coating test and (e) Coated aggregates of bituminous mixtures.

2.1.6. Furnish DOT daily test reports including raw data: (a) When the job mix formula is the same for different pay items on the same project the total tonnage of these pay items shall be combined into one Lot. For pay purposes, the tonnage of each pay item shall be noted on BMT-20 in the remarks section, (b) When the job mix formula is the same for multiple projects being run simultaneously from a single plant, the total tonnage for this job mix formula, regardless of pay item designation for these projects shall be combined for calculating testing increments and testing the hot mix asphalt. For pay purposes, the tonnage of each project shall be separated proportionately into individual lots for each separate project on separate test reports but testing results will be the same for each project.

2.2. Department's Responsibility.

2.2.1. Monitor Contractor's sampling and testing for compliance with appropriate procedure or standard.

2.2.2. Select random numbers to determine sampling times.

2.2.3. Notify Contractor's technician approximately fifteen (15) minutes before sampling time.

2.2.4. Randomly select one of the stored samples and run verification tests. The Department will make every effort to issue the verification test report as soon as possible but no later than noon the next normal working day. Should the Contractor desire to furnish a laboratory and equipment for verification testing or share his laboratory with the Department, the Department will utilize such laboratory. However, separate Compactors shall be used by the Contractor and the Department. The Department can use a Compactor furnished by the Contractor or Department. Sample and test the bituminous asphalt cement, using the frequency set forth in the current Department's Testing Manual.

2.2.5. Determine the viscosity of the recovered asphalt cement from recycled mixtures using the frequency and procedure set forth in the current Department Testing Manual.

2.2.6. Keep a daily diary concerning Contractor's testing procedures and compliance with specifications.

2.2.7. Check Contractor's raw data to verify computations.

2.2.8. Visually inspect stockpiles for contamination, cold feed bins for proper operation, finished mix for segregation, etc.

2.2.9. Compare verification test results to Contractor's data.

2.2.10. Determine pay factor for Lot.

3. Issuance of Test Reports on Verification Tests

3.1. Organize test results according to production Lot. When the job mix formula is the same for different pay items on the same project, the total tonnage of these pay items shall be combined into one Lot. For pay purposes, the tonnage of each pay item shall be noted on BMT-20 in the remarks section. When the job mix formula is the same for multiple projects being run simultaneously, the total tonnage for this job mix formula, regardless of pay item designation for these projects shall be combined for calculating testing increments and testing the hot mix asphalt. For pay purposes, the tonnage of each project shall be separated proportionately into individual Lots for each separate project on separate test reports but testing results will be the same for each project. Minimum information included in test reports (BMT-20) for verification tests: (1) Air Voids, (2) Percentage asphalt cement, and (3) Dust to asphalt ratio.

3.2. VMA.

3.3. Gradation - Individual sieves that are out of tolerance shall be noted on the test report. Issue test report no later than noon of the next normal working day. Compare test results for 3.2.1(1) and 3.2.1(2) as per specifications. (If the results of the verification test and the Contractor's test do not compare within the tolerances of Table 4, but yield the same pay factor for the lot, no further testing will be required). Others should also be within specification tolerances, but if not, monitor Contractor's operations, sampling methods, test procedures, etc., in those areas more closely to determine problem.

4. Variations from Job Mix Formula

4.1. When to redesign.

4.1.1. Source of aggregate/RAP changes.

4.1.2. Wide variation of aggregate gradation compared to design gradation.

4.1.3. When the component percentage varies by more than one-fourth of that shown on the job mix formula; however, for those components shown as less than 20 percent on job mix formula a ± 5 percent is allowed. **Caution:** Do not exceed maximum percentages allowed by specifications for limestone and other polish prone aggregate. **Example:** Job Mix Formula Section 424, 19mm Percent On Allowable Sieves.

Job Mix Formula	Description	Variation
15	¾ in. (19 mm) Slag	10 – 20
40	½ in. (13 mm) - Dust Slag	30 - 50
20	Natural Fine Aggregate	15 - 25
25	Limestone (BPN 25)	19 - 30

4.2. Nonconforming Gradations

4.2.1. When two consecutive gradations yield results that exceed specification tolerances on the same size sieve, the plant shall cease operations until proper adjustments are made.

4.2.2. Other Nonconforming Parameters

4.2.2.1. When VMA and/or dust/asphalt ratio exceeds the specification limits on two (2) consecutive samples, the plant shall cease operations until proper adjustments are made.

ALDOT-371-90

RAPID METHOD TO DETERMINE THE ASPHALT CONTENT AND GRADATION OF ASPHALT PAVING MIXTURES USING BIODEGRADABLE EXTRACTANT

1. Scope

1.1. This is a rapid method to be used routinely for determining the asphalt content and the gradation of hot-mixed paving mixtures.

2. Apparatus

2.1. Apparatus as required in ALDOT-354.

2.2. Pan, approximately 12 in x 8 in x 1 in deep (300 mm x 200 mm x 25 mm) deep or 10 qt, (L) rounded plastic pail.

2.3. Balance: AASHTO M-231, Class D.

2.4. Solvent: Biodegradable, high flash, non-toxic asphalt extractant. DOT approved.

2.5. Oven: Capable of maintaining a uniform temperature of 230 ± 9°F (110 ± 5°C).

2.6. Sieves: As required by the gradation specifications and meeting the requirements of AASHTO M-92.

2.7. Liquid detergent (powder detergents are not permitted), optional.

3. Procedure

3.1. Secure a representative sample of the asphalt mixture in accordance with AASHTO T-168.

3.2. Determine the percent asphalt and moisture in accordance with ALDOT-354.

3.3. Select an extraction test sample of the size as required in Table 1, AASHTO T-164. Record mass to the nearest 0.1 g.

3.4. Place the extraction sample in pan or pail and cover with extractant. Gently agitate the sample frequently with a spatula or trowel allowing sufficient time (20-30 minutes for virgin mixtures; 45 min. - one hour for recycle mixtures) for the extract-ant to dissolve the asphalt from the aggregate.

3.5. Decant extractant, pouring over a No. 8 (2.36mm) sieve nested over a No. 200 (75 µm) sieve, continue decanting with water until wash water is clear.

Note: Care must be taken while agitating and decanting to prevent loss of particles.

3.6. Dry sample to constant mass in an oven at a temperature of 230 ± 9°F (110 ± 5°C).

3.7. Screen the sample over sieves required by the job mix formula and weigh the accumulative material retained on each sieve to the nearest gram.

4. Calculations

4.1. Calculate total extracted weight of mineral aggregate as follows:

$$W_1 = W_s (1\text{-}AC - W_m)$$

Where:
W_1 = total extracted weight of mineral aggregate in grams.
W_s = total sample weight in grams (AC and aggregate).
AC = asphalt content expressed as a decimal number.
W_m = Moisture in mix expressed as a decimal number.

4.2. The accumulative weights of material retained on each sieve from subsection 3.7 shall be converted to percent-age by dividing by the weight of total aggregate (W1) as obtained in subsection 4.1, and multiplying by 100.

5. Reporting

5.1. The results of the sieve analysis shall be reported as total percentages passing each sieve. Percentages shall be reported to the nearest whole number in accordance with AASHTO R11 except for the percentage passing the No.200 (75 µm) sieve which shall be reported to the nearest 0.1 percent.

ALDOT-372-90
APPROVAL OF RECLAIMED ASPHALT PAVEMENT STOCKPILES

1. Scope

1.1. This method describes the procedure to be used for approval of reclaimed asphalt pavement (RAP) stockpiles.

2. Stockpile Constructed of Rap Traceable to a Prior DOT Job that had an Approved Job Mix Formula

2.1. Keep the RAP materials separated by projects milled, unless evidence can be provided to indicate that the reclaimed material from other projects have similar analysis, such as the same coarse aggregate, asphalt grade and content and is traceable back to a job mix formula.

2.2. Assign a number to the stockpile containing the year and Division such as 94 1-1, 94 2-1, 94 3-1 so that mix designs can be properly referenced. The first number is the year the stockpile was constructed, the second number is the Division in which the stockpile is located and the third number is a sequential number for that Division. After a stockpile has been properly referenced, the Contractor shall furnish the Department documentation to identify that stockpile. The Department will have the responsibility of monitoring the stockpiles.

2.3. No new materials shall be added to a stockpile already sampled and evaluated for design.

2.4. Materials and Tests Engineer will approve, disapprove, request additional testing, etc., based on the report and test results. The information shall be included with submittal of job mix formula.

3. Stockpiles of Rap of Unknown Origin or from Several Sources

3.1. In no case will the contractor utilize RAP from multiple and/or unknown origins at a rate that exceeds 15 percent by weight of total mix. When 15 percent or less is used, the contractor shall obtain five (5) representative samples from the first 10,000 T (t) or portion thereof. An additional two (2) samples shall be taken for each 5,000 T (t) thereafter. Samples shall be taken randomly throughout the stockpile. Remove at least 6 in. (150 mm of the material from the surface of the stockpile before obtaining samples to minimize any potential segregation effect. Whenever possible, samples should be taken as the stockpile is being built, so samples will represent the entire stockpile.

3.2. Scalp off and discard the materials retained on the 2 in. (50 mm) sieve.

3.3. Sample size should be at least 30 lbs. (15 kg) after scalping.

3.4. Samples shall be utilized by the Contractor for evaluation and mix design purposes.

3.5. Testing RAP from unknown or blended stockpiles.

3.5.1. Contractor shall determine gradation and asphalt content on all samples in accordance with current departmental procedures.

3.5.2. Contractor shall evaluate the recovered properties such as type of coarse aggregate, fractured face count, etc.

3.6. Submit report to Materials and Tests Engineer with mix design.

3.6.1. Report results of each individual sample.

3.6.2. Mean and standard deviation of gradation of all samples.

3.6.3. Mean and standard deviation of asphalt content of all samples.

3.6.4. Mean and standard deviation of fractured faces of all samples.

3.7. Materials and Test Engineer will approve, disapprove, request additional testing, etc., based on these report and test results from split samples submitted.

ALDOT-374-91
CERTIFICATION PROGRAM FOR HOT-MIX ASPHALT TECHNICIANS

1. Scope

1.1 The purpose of this program is to develop and maintain a pool of well-trained technicians for Department and contractors to design, test, and manage hot mixed asphalt materials. The intent of this program is to improve the quality and performance of hot mixed asphalt pavements through knowledge and understanding of the product. This program will provide training and certification for Roadway Technician, Laboratory Technician (Level I), Quality Management Technician (Level II), Mix Design Technician (Level III), and Superpave Technician.

2. Certification Standards

2.1 Level I - Laboratory Technician

2.1.1 Training: Licensing by the State Health Department to operate nuclear gauges and Aggregate Technician certification are prerequisites for Laboratory Technician (Level I) training (see ALDOT-376, Certification Program for Aggregate Technicians). In addition, the candidate must complete three to five days of classroom and laboratory training covering sampling, testing, and analysis of HMA (Hot Mix Asphalt) specimens.

2.1.2 Performance: A Laboratory Technician (Level I) is able to perform all tests and calculations (including random sampling) required to analyze HMA samples in the laboratory.

2.1.3 A Laboratory Technician must properly perform HMA testing in the presence of a qualified evaluator and/or instructor approved by the Department and pass a written examination administered by the Department.

2.2 Level II - Quality Management Technician

2.2.1 Training: Roadway Technician and Laboratory Technician (Level I) certification are prerequisites for Quality Management Technician (Level II) training. In addition, the candidate must complete two to four days of training covering basic mix design principles, asphalt plant operations, Alabama's HMA specifications, and statistical analysis of test results.

2.2.2 Performance: A Quality Management Technician (Level II) may perform all the duties of both a Laboratory Technician (Level I) and a Roadway

Technician. Additionally, a Quality Management Technician is able to improve HMA quality by using statistical analysis of test results and changing the asphalt plant operations.

2.2.3 A Quality Management Technician must pass a written examination administered by the Department.

2.3 Level III - Mix Design Technician

2.3.1 Training: Laboratory Technician (Level I) certification is a prerequisite for Mix Design (Level III) training. In addition, the candidate must complete three to five days of classroom and laboratory training covering Alabama's HMA specifications and mix design procedures.

2.3.2 Performance: A Mix Design Technician (Level III) may perform all the duties of a Laboratory Technician (Level I). Additionally, a Mix Design Technician is able to design HMA job mix formulas according to Alabama's specifications to be used on all Department projects.

2.3.3 A Mix Design Technician must pass a written examination administered by the Department and demonstrate the ability to design a HMA job mix formula that meets all of Alabama's specifications using materials selected by the Departmental evaluator.

2.4 Roadway Technician

2.4.1 Training: Successful completion of a two to three day training course consisting of classroom and laboratory sessions. Also, the successful completion of Radiological Safety course and licensed by the State Health Department to operate/handle nuclear gauges. The technician shall have received training and must be capable of operating a nuclear density gauge.

2.4.2 Performance: Demonstrate ability to operate a nuclear density gauge and be capable of performing thin layer gauge calibrations under the supervision of a certified Level II Technician. He/she must thoroughly understand random sampling as well as paving operations.

2.5 Superpave Technician

2.5.1 Training: Laboratory (Level I) or Quality Management (Level II) or Mix Design (Level III) Technician certification is a prerequisite for Superpave certification. Additionally, the candidate must complete a prescribed course

of classroom and laboratory training using the gyratory compactor and

Alabama's Superpave specifications.

2.5.2 Performance: A Superpave Technician may perform all the duties for which he or she is certified through Marshall mix design procedures. Additionally, Superpave certification allows the technician to perform Laboratory (Level I) and Design (Level III) testing on all Superpave projects. For example, a Superpave Quality Management Technician (Superpave Level II) may perform all the duties of laboratory testing, roadway testing, and quality management on both Marshall and Superpave projects.

2.5.3 A Superpave Technician must pass a written examination administered by the Department.

2.6 Design Laboratory

2.6.1 A mixture design laboratory must have all the required equipment necessary to perform a mixture design as outlined in ALDOT-307 and ALDOT-344 except for Abson recoveries. All equipment must be in compliance with the appropriate specification.

2.6.2 The Marshall compactor must be calibrated continuously with the Materials and Tests Marshall compactor.

2.6.3 All balances must be checked and calibrated annually for accuracy by a reputable scale service company.

2.6.4 The Materials and Tests Central Laboratory will check and certify a mixture design laboratory every 18-24 months.

2.7 Certification

2.7.1 Personnel meeting all the qualifications for any of the aforementioned certified technician positions shall be certified upon recommendation by the Working Task Force and approval by the Certification Board. The Working Task Force may allow experience and/or other education to substitute for the schools required for certification. The request should be made in writing (BMT-100) to the Working Task Force. Certification shall be contingent upon the technician signing a document (BMT-105) informing him of his rights and responsibilities as a certified technician and the penalties attached to the abuse or neglect of these rights and responsibilities.

2.8 Decertification

2.8.1 Accusations of abuse or neglect of these rights and responsibilities shall be made to the Working Task Force. Penalties shall be implemented upon recommendation by the Working Task Force and approval by the Certification Board, and will range from a minimum **30** day suspension to permanent revocation.

2.9 Recertification

2.9.1 Certification of a technician is good for three (3) years, after which the technician must be recertified. Recertification can be accomplished in one of the following:

2.9.1.1 The technician may take a one (1) day refresher course to update him/her on changes in specifications and procedures.

2.9.1.2 The Working Task Force may designate the technician "active" (the technician having kept pace with changes in specifications and procedures by working with or for the Alabama Department of Transportation on a continuously competent basis) and thereby continue his certification for another three (3) years.

2.10 Certification Board

2.10.1 Membership of the Certification Board shall be composed of the following:

2.10.1.1 Materials and Tests Engineer (Position), Chairman

2.10.1.2 Assistant Chief Engineer (Appointed by Transportation Director)

2.10.1.3 Construction Engineer (Position)

2.10.1.4 Division Engineer (Appointed by Transportation Director)

2.10.1.5 Industry Member (Appointed by Alabama Asphalt Pavement Association)

2.11 Working Task Force

2.11.1 The Membership of the Working Task Force shall be composed of the following:

2.11.1.1 Bituminous Engineer (Position)

2.11.1.2 Assistant Construction Engineer Roadway (Position)

2.11.1.3 Industry Association Member

ALDOT-375-91
CONTRACTOR QUALITY CONTROL SYSTEM FOR HOT MIX ASPHALT

1. Scope

1.1. This establishes minimum requirements and activities for a Contractor Quality Control System for hot mix asphalt. These requirements pertain to the inspections and tests necessary to substantiate material and product conformance to contract requirements and to all inspections and tests required by the contract. Unless the Department is otherwise notified in writing by the Contractor, the Contractor formally adopts this Quality Control Plan as his own.

2. Functions and Responsibilities

2.1. The Department - The Department will approve material and mix designs, inspect plants and equipment, and monitor control of the operations to assure conformity with the specifications. The Department will perform testing to verify Contractor's data used for acceptance or rejection of work. The Department will design all opengraded friction mixes (Section 420), if any. The Department's Quality Assurance Plan is outlined in the specifications.

2.2. The Contractor - Prior to the preconstruction conference, the Contractor shall submit in writing his proposed Quality Control Plan for approval by the Engineer. The plan shall contain the sampling, testing, inspection and the anticipated frequencies of each that the Contractor expects to accomplish to maintain control. The Contractor's minimum required sampling and testing plan is outlined in the specifications. A minimum series of sampling, testing, and inspecting activities are shown below.

3. Minimum Requirements for a Contractor Quality Control Plan

3.1. All Types of Plants

3.1.1. Stockpiles - (a) Determine gradation of all incoming aggregates, and (b) Inspect stockpiles for separation, contamination, segregation, etc.

3.1.2. Cold Bins - (a) Calibrate the cold feed gate settings and prepare calibration charts, (b) Observe operation of cold feed for uniformity, and (c) Observe loading of bins to insure correct procedures are followed.

3.1.3. RAP - (a) Inspect stockpiles for contamination, segregation and material variations, (b) insure that additional material is not added to approved stockpiles, and (c) Determine bitumen content and gradation.

3.1.4. Dryer - (a) Observe pyrometer for aggregate temperature control, and (b) Observe efficiency of the burner

3.1.5. Bituminous Mixture - (a) Determine percent bitumen with nuclear gauge or furnace (ALDOT-354), (b) check mix temperature, (c) compact samples in field laboratory and determine voids, VMA, stability, flow, and (d) measure Rice Specific Gravity and Bulk Specific Gravity, (e) determine in-place density, and (f) Determine gradation, dust-to-asphalt ratio, moisture content of mix.

3.1.6. Trucks - (a) Inspect trucks to insure clean beds and approved release agent used, and (b) insure that segregation does not occur when loading trucks.

3.1.7. Asphalt Cement - (a) Obtain only from Department approved sources, and (b) Maintain copies of temperature viscosity curves generated by suppliers for each load of asphalt cement received

3.2. Batch Plants

3.2.1. Batch Weights - Determine percent used and amount to be pulled from each hot bin to assure compliance with Job Mix Formula.

3.2.2. Check mixing time.

3.2.3. Check operations of weight bucket and scales.

3.3. Continuous Mix Plant

3.3.1. Determine gradation of aggregates and gate calibration chart for each bin.

3.3.2. Determine settings for each hot bin to assure compliance with the Job Mix Formula.

3.3.3. Determine Gallons (Liters) of bitumen per revolution or gallons (Liters) per minute to assure compliance with the Job Mix Formula.

3.3.4. Set dam gate to insure satisfactory mixing time.

3.3.5. Observe overflow chutes to insure no excessive overflow

3.4. Drum Mix Plant

3.4.1. Calibrate the cold feed and prepare a calibration chart for each feeder.

3.4.2. Evaluate moisture content of aggregate.

3.4.3. Develop information for the synchronization of the aggregate feed and the bituminous material feed including allowance for moisture content in the cold feed aggregate.

3.5. The activities shown above are considered to be normal activities necessary to control the production of bituminous plant mix at an acceptable quality level. It is recognized, however, depending on the type of process or materials, some of the activities listed may not be necessary and in other cases, additional activities may be required. The frequency of these activities will also vary with the process and the materials. When the process varies from the defined process average and variability targets, the frequency of these activities will be increased until the proper conditions have been restored. The Contractor or Producer shall plot and keep up-to-date control charts for all Quality Sampling and Testing. Control charts shall be provided for the following:

3.5.1. Gradation of aggregate and RAP stockpiles.

3.5.2. Bitumen content of bituminous mixture and RAP.

3.5.3. Stability and flow.

3.5.4. Average percent maximum density of each sublot.

3.5.5. Percent air voids (laboratory compacted samples).

3.5.6. Voids in the mineral aggregate (laboratory compacted samples).

3.5.7. Theoretical maximum density.

3.5.8. Mixture gradation (3/8 in. (9.5 mm), No.4 (4.75 mm), No. 8 (2.36 mm) and No. 200 (75 µm) sieves) and dust-to-asphalt ratio.

3.6. The Contractor shall maintain all current control charts in the laboratory where they can be seen. Individual values as well as running average of last four samples shall be plotted.

3.7. The Contractor shall be responsible for the development of all mix designs. Contractor-furnished mix designs shall be approved by the Materials and Tests Engineer prior to their use. See Section 410. The Contractor shall be responsible for the process control of all materials during handling, blending, mixing, and placing operations. When the Contractor desires to change the Job Mix Formula he must request approval for the change in writing. The Materials and Tests Engineer must approve the request prior to permitting the change to be made. After prior approval, an adjustment of the job mix formula for individual sieves sizes without a redesign will be permitted under the following range as long as the job mix formula remains in the master range.

3.7.1. ± 7% for the No. 4 (4.75 mm) and larger sieves

3.7.2. ± 4% for the No. 8 (2.36 mm) through the No. 100 (150 µm) sieve

3.7.3. ± 2% for the No. 200 (75 µm) sieve

3.7.4. ± 0.40% for the asphalt cement

4. Quality Control System

4.1. General Requirements - The Contractor shall perform or have performed the inspections and tests required to substantiate product conformance to contract requirements and shall also perform or have performed all inspections and tests otherwise required by the Contractor. The Contractor shall have at least one (1) Certified Field Tester (Level I) and at least one (1)

Certified Roadway Technician present when producing or placing hot-mix asphalt, respectfully. In addition, the Contractor shall have a Certified Quality Management Technician (Level II) readily available during the production and placement of hot-mix asphalt. See ALDOT-374 for certification program. When it becomes evident to the Department that the Quality Control Technician cannot perform as required by the position, the Department will revoke the certifications and require appropriate replacements. The Contractor's quality control procedures, inspection, and tests shall be documented and that information shall be made available to the Department on a daily basis throughout the life of the contract. The Department reserves the right to sample and test the mix and to make and test Marshall specimens at the plant for informational purposes. The information will be used to determine if the Contractor is producing the mix established by the approved mix design and to determine if the design mix should be modified to meet field conditions.

4.2. Documentation - The Contractor shall maintain adequate records of all inspections and tests. The records shall indicate the nature and number of tests made, test results, the number and type of deficiencies found, the quantities approved and rejected, and the nature of corrective action taken as appropriate. The Contractor's proposed documentation procedures will be subject to the review and approval of the Department prior to the start of the work and to perform compliance checks during the progress of the work. All charts and records documenting the Contractor's quality control tests and inspections shall become the property of the Department upon completion of the work.

4.3. Charts and Forms - All inspections and test results of conforming and non-conforming materials shall be recorded on approved forms and charts which shall be kept up to date and complete, and shall be available at all times to the Department during the performance of the work. Test properties for the various materials and mixtures shall be charted on forms which are in accordance with the applicable requirements of the Department. A copy of each chart and form to be used by the Contractor will be furnished by the Department. The Contractor shall furnish his own supply of the charts and forms.

4.4. Corrective Actions - The Contractor shall take prompt action to correct any errors, equipment malfunctions, process changes, or other assignable causes which have resulted or could result in the submission of materials, products, and completed construction which do not con-form to the requirements of the specifications. When it becomes evident to the Department that the Contractor is not controlling his process and is making no effort to take corrective action, the Department will require that plant operations be ceased until such time as the Contractor can demonstrate that he can and will control the process.

4.5. Laboratories with Measuring and Testing Equipment – The Contractor or Producer shall furnish a fully equipped laboratory at the production site. This facility shall meet the requirements of Article 106. The laboratory shall be furnished with the necessary testing equipment and supplies for performing Contractor Quality Control sampling and testing. To assure accuracy, the testing equipment shall be checked periodically as directed by the

Bureau of Materials and Tests in accordance with applicable standards. In addition to the above requirements, the Contractor's Marshall hammer and the Department's Marshall hammer used for verification testing shall be correlated with the Materials and Tests Marshall hammer as outlined in ALDOT-381.

4.6. Sampling and Testing - Sampling and testing methods and procedures used by the Contractor to determine quality conformance of the materials and products will be furnished by the Department and will be the same as those used by the Department.

4.7. Nonconforming Materials - The Contractor shall establish and maintain an effective and positive system for controlling nonconforming material, including procedures for identification, isolation, and disposition. Re-claiming or reworking nonconforming materials shall be in accordance with procedures acceptable to the Department. The details of this system will be discussed at the preconstruction conference and become a part of the record of the conference.

4.8. Department Inspection at Subcontractor or Supplier Facilities - The Department reserves the right to inspect materials not manufactured within the Contractor's facility. Department inspection will not constitute acceptance nor shall it in any way replace the Contractor's inspection or otherwise relieve the Con-tractor of his responsibility to furnish an acceptable material or product. Subcontracted or purchased materials shall be inspected by the Contractor when received, as necessary, to assure conformance to con-tract requirements. The Contractor shall report to the Department any nonconformance found on Department source inspected material and shall require his supplier to take necessary corrective action.

ALDOT-376-92
CERTIFICATION PROGRAM FOR AGGREGATE TECHNICIANS

1. Scope

1.1. The purpose of this program is to develop, train, maintain, and certify a pool of qualified technicians for the Department and aggregate producers necessary to manage the Quality Control and Quality Assurance Programs for aggregate materials. The intent of this program is to improve the performance of aggregates that are used in the highway construction industry through knowledge and understanding of the product. This program will provide training and certification for aggregate technicians participating in a producer’s Quality Control Program and the Department's Quality Assurance Program.

2. Training

2.1. Each applicant must complete both classroom and laboratory training provided by the Department in cooperation with the Academia. The classroom training shall consist of all AASHTO Test Specifications and Alabama Department of Transportation (ALDOT) Procedures necessary to perform all required tests. They are as follows:

2.1.1. ALDOT-249, Aggregate Control Program

2.1.2. AASHTO T-2, Sampling Aggregates

2.1.3. AASHTO T-11, Materials Finer Than No. 200 (75 µm) Sieve in Mineral Aggregates by Washing

2.1.4. AASHTO T-19, Unit Weight and Voids in Aggregates

2.1.5. AASHTO T-27, Sieve Analysis of Fine and Coarse Aggregates

2.1.6. AASHTO M-92, Wire Cloth Sieves for Testing Purposes

2.1.7. AASHTO M-231, Weighing Devices Used in the Testing of Materials

2.1.8. AASHTO T-248, Reducing Field Samples of Aggregate to Testing Size

2.1.9. ALDOT-150, Method of Sampling Coarse and Fine Aggregate from a Conveyor Belt

2.1.10. ALDOT-239, Method of Sampling and Testing Riprap Stone

2.1.11. ALDOT-253, Rapid Drying of Soil and Aggregate Samples for Field Tests

2.1.12. ALDOT-321, Test for Glassy Particles in Crushed Slag

2.1.13. ASTM D4791, Method of Determining Flat and Elongated Pieces in Coarse Aggregate

2.1.14. Sections 801 and 802, DOT Specifications

3. Certification

3.1. Written Examination:

3.1.1. Alabama Department of Transportation, Central Laboratory personnel, will administer an open-book, written examination at the conclusion of the classroom training. The participant must attain a score of 70 to pass.

3.2. Practical Examination:

3.2.1. All applicants are expected to successfully demonstrate proficiency with performance of the following laboratory tests: AASHTO T-11, AASHTO T-19, AASHTO T-27, and AASHTO T-248.

3.3. Actual proficiency testing will be performed in the presence of a qualified evaluator approved by the Materials and Tests Engineer. The evaluator will utilize a proficiency guide that was prepared by the Bureau of Materials and Tests and reviewed by the Aggregate Industry. At the completion of the practical laboratory examination, the evaluator will render a decision as to whether the applicant demonstrated a level of competence necessary to perform the above tests in strict compliance with the particular testing specification. Personnel meeting the qualifications for both the written and practical laboratory examinations shall be certified upon recommendation by the Working Task Force and approved by the Certification Board. Certification shall be contingent on the technician signing the Certified Technician Warrant (BMT-138) which informs the technician of his rights and responsibilities as a Certified Aggregate Technician and the penalties attached to the abuse and/or neglect of these rights and responsibilities.

3.4. Certification Board: The Aggregate Technician Certification Board will be composed of the following:

3.4.1. Materials and Tests Engineer, Chairman (Position)

3.4.2. Assistant Chief Engineer (Appointed by Transportation Director)

3.4.3. Construction Engineer (Position)

3.4.4. Division Engineer (Appointed by Transportation Director)

3.4.5. Industry Member (Appointed by the Road Builders Association)

3.5. Working Task Force:

3.5.1. Testing Engineer (position)

3.5.2. Aggregate Engineer (position)

3.5.3. Division Materials Engineer (approved by the Materials and Tests Engineer)

3.5.4. Industry Member (appointed by Alabama Road Builders Association)

4. Recertification

4.1. Certification of a technician is good for three (3) years, after which the technicians must be re-certified. Re-certification can be accomplished as follows:

4.1.1. The Technician must attend a refresher course or seminar to update him/her on specification changes, procedures, etc., (if available).

4.1.2. The Technician must complete BMT-136, "Application for Recertification", which provides a summary of work, education and training received since initial certification or last recertification.

4.1.3. The Technician must complete and sign BMT-138, “Certified Technician Warrant".

4.1.4. All required documentation must be sent to the Working Task Force.

5. Decertification

5.1. Accusations of abuse or neglect of the Technician's rights and responsibilities shall be made to the Working Task Force. Charges and accusations shall be investigated by same. Penalties shall be implemented upon recommendation by the Working Task Force and approval by the Certification Board after a thorough review of all facts. Penalties shall range from a minimum 30 day suspension to permanent revocation.

ALDOT-377-92
CERTIFICATION PROGRAM FOR PRECAST CONCRETE PRODUCTS TECHNICIANS

1. Scope

1.1. The purpose of this program is to develop, train, maintain and certify a pool of qualified technicians for the Department and producers of concrete pipe, precast manholes, precast box culvert sections, precast, non-prestress concrete bridge members and miscellaneous precast concrete products to manage the Quality Control and Quality Assurance Programs. The intent of this program is to improve the quality and performance of all precast concrete products that are used in the highway construction industry through knowledge and an understanding of the product. The program will provide training and certification for precast concrete products technicians participating in the producer's Quality Control Program and the Department's Quality Assurance Program.

2. Training

2.1. Each applicant is required to complete both classroom and practical "hands-on" training. The Department in conjunction with industry will provide the training.

2.2. Classroom training shall consist of all applicable AASHTO/ASTM Specifications, Department Specifications and Department (ALDOT) procedures. They are as follows:

2.2.1. ALDOT-364 "Production, Inspection and Acceptance of Pipe, Precast Manholes, Precast Box Culverts, Precast Nonprestress Concrete Bridge Members and Miscellaneous Precast Concrete Products";

2.2.2. Department Specifications, all applicable sections;

2.2.3. AASHTO T-22 (ASTM C-39), Compressive Strength of Cylindrical Concrete Specimens;

2.2.4. AASHTO T-23 (ASTM C-31), Making and Curing Concrete Test Specimens in the Field;

2.2.5. AASHTO T-24 (ASTM C-42), Obtaining and Testing Drilled Cores and Sawed Beams of Concrete;

2.2.6. AASHTO M-86 (ASTM C-14), Concrete Sewer, StormDrain and Culvert Pipe;

2.2.7. AASHTO M-170 (ASTM C-76), Reinforced Concrete Culvert, Storm Drain and Sewer Pipe;

2.2.8. AASHTO M-175 (ASTM C-444), Perforated Concrete Pipe;

2.2.9. AASHTO M-176 (ASTM C-654), Porous Concrete Pipe;

2.2.10. AASHTO M-178 (ASTM C-412), Concrete Drain Tile;

2.2.11. AASHTO M-199 (ASTM C-478), Precast Reinforced Concrete Manhole Sections;

2.2.12. AASHTO M-206 (ASTM C-506), Reinforced Concrete Arch Culvert Storm Drain and Sewer Pipe;

2.2.13. AASHTO M-207 (ASTM C-507), Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe;

2.2.14. AASHTO M-242 (ASTM C-655), Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe;

2.2.15. AASHTO M-259 (ASTM C-789), Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers;

2.2.16. AASHTO M-273 (ASTM C-850), Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers with less than two (2) feet of cover subjected to highway loadings;

2.2.17. AASHTO T-231 (ASTM C-617), Capping Cylindrical Concrete Specimens; and,

2.2.18. AASHTO T-280 (ASTM C-497), Concrete Pipe, Sections or Tile.

2.3. Technicians working for companies who produce PRECAST, NONPRESTRESS CONCRETE BRIDGE MEMBERS will be required to be PCI certified as an Inspector/Technician Level I and ACI Field Testing Technician Grade I. Technicians in this category will not be required to comply with Section 3.1 and Section 3.2.

3. Certification

3.1. Written Examination:

3.1.1. Alabama Department of Transportation, Central Laboratory Personnel, will administer an open-book, written examination at the conclusion of the classroom training. The participant must attain a score of 75 to pass.

3.2. Practical "Hands-On" Examination:

3.2.1. All applicants are expected to successfully demonstrate proficiency with AASHTO T-280, Three-Edge Bearing apparatus to include inspection of same and AASHTO T-23, Making and Curing Concrete Test Specimens in the field.

3.2.2. Practical "Hands-On" testing will be performed at the producer's site in the presence of a qualified evaluator approved by the Materials and Tests Engineer. The evaluator will use AASHTO T-23 and AASHTO T-280 to determine if the applicant demonstrated a satisfactory level of competence necessary to perform the test. A rating of satisfactory or unsatisfactory will be given by the evaluator for the practical test.

3.2.3. Applicants meeting the qualifications and requirements for both the written and practical examinations shall be certified upon recommendation by the Working Task Force and approved by the Certification Board. Certification shall be contingent on the technician signing BMT-133, Certified Technician Warrant, which informs the technician of his rights and responsibilities as a Certified Precast Concrete Products Technician and the penalties attached to the abuse and/or neglect of these rights and responsibilities. The applicant/technician must also submit BMT-134, Application for Certification or Recertification. Once approved by the Certification Board, the Department will issue BMT-145, Certified Technician Card, to the technician.

3.2.4. Applicants meeting the requirements of Section 2.3 shall be certified in accordance with Section 3.2.3 provided they present documentation and/or certificate of satisfactory completion of all PCI and ACI training.

4. Certification Board

4.1. The Certification Board will be composed of the following:

4.1.1. Materials and Tests Engineer, Chairman (Position).

4.1.2. Assistant Chief Engineer (Appointed by Transportation Director).

4.1.3. Construction Engineer (Position).

4.1.4. Division Engineer (Appointed by Transportation Director).

4.1.5. Industry Member (Appointed by the Alabama Concrete Pipe Association).

5. Working Task Force

5.1. The Working Task Force shall be composed of the following:

5.1.1. Testing Engineer, Chairman (position).

5.1.2. Aggregate Engineer (position).

5.1.3. Division Materials Engineer (appointed by Materials and Tests Engineer).

5.1.4. Industry Member (appointed by the Alabama Concrete Pipe Association).

6. Recertification

6.1. Certification of a technician is good for three (3) years, after which the technicians must be recertified. Recertification can be accomplished as follows:

6.1.1. The technician may attend a seminar to update him/her on specification changes, procedures, etc., (if available);

6.1.2. The technician must complete BMT-134, "Application for Recertification", which provides a summary of work, education and training received since initial certification or last recertification;

6.1.3. The technician must complete and sign BMT-133, "Certified Technician Warrant"; and, all required documentation must be sent to the Working Task Force.

7. Decertification

7.1. Accusations of abuse or neglect of the Technician's rights and responsibilities shall be made to the Working Task Force. Charges and accusations shall be investigated by same. Penalties shall be implemented upon recommendation by the Working Task Force and approval by the Certification Board after a thorough review of all facts. Penalties shall range from a minimum 30 day suspension to permanent revocation.

ALDOT-378-92
ACCEPTING NEW NUCLEAR MOISTURE/DENSITY AND THIN LAYER GAUGES, AND RECALIBRATING/QUALITY CHECKING USED GAUGES

1. Scope

1.1. This method covers the procedures for the acceptance of new Nuclear Moisture/Density and Thin Layer Gauges and the recalibration and quality check of older gauges.

2. Applicable Documents

2.1. Manufacturers operating instruction manuals.

2.2. Materials and Tests-14 and -33 Specifications.

3. Apparatus

3.1. Standard density calibration blocks and standard moisture block.

Section A

4. Procedures for Acceptance of New Gauges

4.1. Using manufacturers' recommendations, establish a standard count for density and moisture.

4.2. Standard counts should be verified as being in acceptable tolerances utilizing ALDOT-222 Section 6, or a built-in calculation contained in the gauge software.

4.3. Density aspects of the gauge operated in normal mode are verified by taking one minute counts at each interval (BS thru 8 in. (200mm)) on a known standard mag/alum block of 150 lbs/ft^3 (2140 kg/m^3). Tolerances shall be within ± 1.5 percent of the known block density.

4.4. Moisture aspects of the gauge shall be determined by taking two one-minute counts and average. Counts are taken on a mag/poly block. This block simulates 40 lbs/ft^3 (628 kg/m^3) of moisture. The gauge must count within ± 2 lbs/ft^3 (32 kg/m^3) of the known 40 lbs/ft^3 (628 kg/m^3) of moisture.

4.5. Thin Layer aspects of the gauge are verified by taking ten one-minute calibration counts taken in the backscatter position. These counts are taken on a 1 in. (25 mm) thick mag/alum plate, placed on the mag/alum standard block. These counts are averaged and the difference is calculated between the gauge readings and the known mag/alum plate density of 133.5 lbs/ft^3 (2140 kg/m^3). This difference is utilized as a D-Bias/OFFSET entered into the gauge software to calibrate the gauge. With the gauge calibrated, four one-minute counts are taken under the same conditions that the calibration counts were taken. The counts are averaged and shall be within ± 1.5% of the 133.5 lbs/ft^3 (2140 kg/m^3).

4.6. When the requirements of the above procedures have been met, the gauge will be accepted for use on Alabama Department of Transportation construction projects.

Section B

5. Recalibration and Quality Check of Used Gauges

5.1. Gauges designed for Thin Layer Asphalt Density determinations only (Troxler 4640-A & 4640-B) shall be recalibrated according to the following procedures. The gauge shall be calibrated using the 3-block calibration procedure obtained from Troxler Electronic Labs, Inc. The data is accumulated, then entered into the computer program supplied by Troxler. This program generates calibration constants and gauge parameters to be manually input into the gauge. Once the gauge has been calibrated, procedure 4.5 (Section A) is utilized to verify and check the recalibration.

5.2. Moisture/Density and Dual Purpose gauges shall be recalibrated according to the calibration procedures used by Campbell-Pacific Nuclear Corp. This procedure has proven to be acceptable and reliable for Troxler and CPN gauges. These procedures consist of collecting count data on Magnesium, Aluminum, Mag/Alum and Mag/Poly Standard blocks. Four minute counts are taken at each interval and the data processed through the computer program supplied by Campbell-Pacific. This program generates calibration constants used to calibrate the gauge. Once the gauge has been calibrated, procedures of Section A, 4.3, 4.4, and if applicable, 4.5 are followed to establish a quality check of the recalibration.

ALDOT-380-93
FORMS AND EXAMPLES FOR SAMPLING AND COMPUTING PAY FACTORS FOR HOT MIX ASPHALT

1. Scope

1.1 This procedure shows how to sample Hot Mix Asphalt and calculate the pay factors as defined in Department Specification Section 106, Control of Materials.

2. Applicable Documents

2.1 Specification Section 106, Control of Materials.

2.2 BMT-19, Work Sheet Summary of Lot Test Results for Air Voids and AC Content.

2.3 BMT-20, Asphalt Plant Mixture Test Report.

2.4 BMT-135, Work Sheet to Determine Pay Factors when they Cannot be Determined from Verification Samples.

2.5 ALDOT-210, Selecting Samples by the Random Numbers Method.

2.6 ALDOT-353, Field Method for Determining Air Void Content and Marshall Stability and Flow of Bituminous Mixtures.

2.7 AASHTO R-11, Indicating Which Places of Figures are to be Considered Significant in Specified Limiting Values.

2.8 AASHTO R-18, Establishing and Implementing a Quality System for Construction Materials Testing Laboratories.

2.9 AASHTO T-168, Sampling Bituminous Paving Mixtures.

3. Procedure

3.1 Sampling and storage of the Hot Mix Asphalt by the contractor and the Department shall be in accordance with AASHTO T-168, Department Specifications Section 106, ALDOT-210, and ALDOT-353. Sample size of the mixture shall be adequate for each parameter required for each testing increment.

3.2 When notified by the Engineer, the contractor shall sample and test the HMA according to Department Specifications, Section 106.

3.3 The Department and the contractor shall compute and compare tests results according to the following examples.

3.3.1 EXAMPLE I (424 SLAG MIX).

Bulk Specific Gravities of Compacted Specimens.

Lot 1 Sub-lot 1		
2.468	2.476	2.481

(2.468 + 2.476 + 2.480) / 3 = 2.475

The average of the three specimens is 2.475. Because 2.481 is the furthest from the average, it is discarded (if by chance two values are equally distant from the average, discard both values or discard neither value). The remaining values are averaged.

(2.468 + 2.476) / 2 = 2.472

New Average = 2.472. This is the bulk specific gravity value used for this lot and sub-lot.

Both the State and contractor use this method when calculating slag mix bulk gravities.

3.3.2 EXAMPLE II.

Maximum (Rice) Specific Gravity Results.

Lot 1 Sub-lot 1	Lot 1 Sub-lot 2	Lot 1 Sub-lot 3	Lot 1 Sub-lot 4
2.575	2.562	2.561	2.570

Running Average Lot 1 Sub-lot 1
2.575 / 1 = 2.575

Running Average Lot 1 Sub-lot 2
(2.575 + 2.562) / 2 = 2.568

Running Average Lot 1 Sub-lot 3
(2.575 + 2.562 + 2.561) / 3 = 2.566

Running Average Lot 1 Sub-lot 4
(2.575 + 2.562 + 2.561 + 2.570) / 4 = 2.567

Lot 2 Sub-lot 1	Lot 2 Sub-lot 2	Lot 2 Sub-lot 3	Lot 2 Sub-lot 4
2.579	2.580	2.575	2.577

Running Average Lot 2 Sub-lot 1
2.562 + 2.561 + 2.570 + 2.579) / 4 = 2.568

Running Average Lot 2 Sub-lot 2
(2.561 + 2.570 + 2.579 + 2.580) / 4 = 2.572

Running Average Lot 2 Sub-lot 3
(2.570 + 2.579 + 2.580 + 2.575) / 4 = 2.576

Running Average Lot 2 Sub-lot 4
(2.579 + 2.580 + 2.575 + 2.577) / 4 = 2.578

Only the contractor uses a running average. The State uses individual rice gravity values.

3.3.3 EXAMPLE III (SLAG BULK RUNNING AVERAGES).

Bulk Specific Gravity of Laboratory Compacted Mix Results.

Using slag as an aggregate, the bulk specific gravity value used to compute air voids is from a running average of the last four bulk specific gravity determinations and is calculated like the running average of the maximum gravity in the proceeding example.

When using slag, only the contractor uses a running average. The State uses individual bulk gravity values.

3.3.4 EXAMPLE IV (AIR VOID CALCULATION)

Bulk Specific Gravity Values (From the running average if slag was used).

Sub-lot 1	Sub-lot 2	Sub-lot 3	Sub-lot 4
2.472	2.469	2.486	2.464

Maximum Specific Gravity Running Average Values

Sub-lot 1	Sub-lot 2	Sub-lot 3	Sub-lot 4
2.575	2.568	2.566	2.567

Air Voids Sub-lot 1
100 * (1 – 2.472 / 2.575) = 4.00 %

Air Voids Sub-lot 2
100 * (1 – 2.469 / 2.568) = 3.86 %

Air Voids Sub-lot 3
100 * (1 – 2.486 / 2.566) = 3.12 %

Air Voids Sub-lot 4
100 * (1 – 2.464 / 2.567) = 4.01 %

3.3.5 REFEREE TESTING (EXAMPLE V).

3.3.5.1 The parameter in question is air voids.

Testing Increment	1	2	3	4
Contractor	3.98	3.32	4.27	3.79

3.3.5.2 The Department randomly selects a time for the verification sample. This sample falls in testing increment two. The contractor chooses to sample enough to split with the Department.

3.3.5.3 The Departments' verification sample's result is 5.51.

This deviates more than 0.5 from the contractor's result. The contractor chooses to run the verification sample. The contractor's verification sample's result is 3.80. This result is for information only.

3.3.5.4 The contractor's original results and the referee samples are sent to the Materials and Tests central laboratory.

Testing Increment	1	2	3	4
Contractor	3.98	3.32	4.27	3.79
Materials & Tests	4.74	3.47	2.63	3.29

These results, air voids, are recorded on the lower left section of BMT-135.

3.3.5.5 The results of increment two and four are within tolerances; use contractor's results. Testing increments 1 and 3 are outside tolerance; use Materials & Tests results. The pay factor is computed as follows:

Testing Increment	1	2	3	4
Air Voids	3.98 (M&T)	3.96 (Contr.)	2.36 (M&T)	3.79 (Contr.)
Deviation	0.74	0.68	1.37	0.21

These results, air voids, are recorded on the lower right section of BMT-135.

These deviations are averaged and the appropriate pay factor from Table II of Article 410 is recorded.

BMT-19
REV. 5-8-00

ALABAMA DEPARTMENT OF TRANSPORTATION
WORK SHEET SUMMARY OF LOT TEST
RESULTS FOR AIR VOIDS AND AC CONTENT

Project No.	STPAA-208 (51)	Lot No.	1
County	Montgomery	Pay Item No.	416 A, B, C, AND D
Date	5-8-00	Mix No.	3

% AC CONTENT REQUIRED = 6.55

TESTING INCREMENT	CONTRACTOR	STATE	REFERENCE CONTRACTOR	REFERENCE STATE	DEVIATION
1	6.87				0.32
2	6.55	6.62			0.00
3	6.23				0.32
4	6.82				0.27
5					
				AVERAGE	0.23
				PAY FACTOR	1.00

Remarks ______________________________

% AIR VOIDS REQUIRED = 4.00

TESTING INCREMENT	CONTRACTOR	STATE	VERIFICATION CONTRACTOR	VERIFICATION STATE	DEVIATION
1	3.98				0.02
2	3.32	4.46	4.61	3.42	
3	4.27				0.27
4	3.79				0.21
5					
				AVERAGE	
				PAY FACTOR	

Remarks: ______________________________

BMT-19
REV. 5-8-00

NOTES: (1) If Pay Factor is determined on original state verification test, enter Pay Factor on QC/QA Form 1.

(2) If Pay Factor is determined on contractor verification test, enter Pay Factor on QC/QA Form 2; If not resolved on contractor verification test, use M & T referee tests and go to BMT-135 and ALDOT-380.

BMT-135
REV. 5-8-00

ALABAMA DEPARTMENT OF TRANSPORTATION
WORK SHEET TO DETERMINE PAY FACTORS WHEN
THEY CANNOT BE DETERMINED FROM VERIFICATION SAMPLES

Project No. STPAA-208 (51) Date 5-8-00 Lot No. __1__

% AC CONTENT REQUIRED = _________

TEST RESULTS (ORIGINAL/REFEREE)

TESTING INCREMENT	CONTRACTOR	STATE	M & T	USE TO COMPUTE PAY FACTOR TEST RESULTS/DEVIATION
1				
2				
3				
4				
5				
				AVERAGE DEVIATION =
				PAY FACTOR =

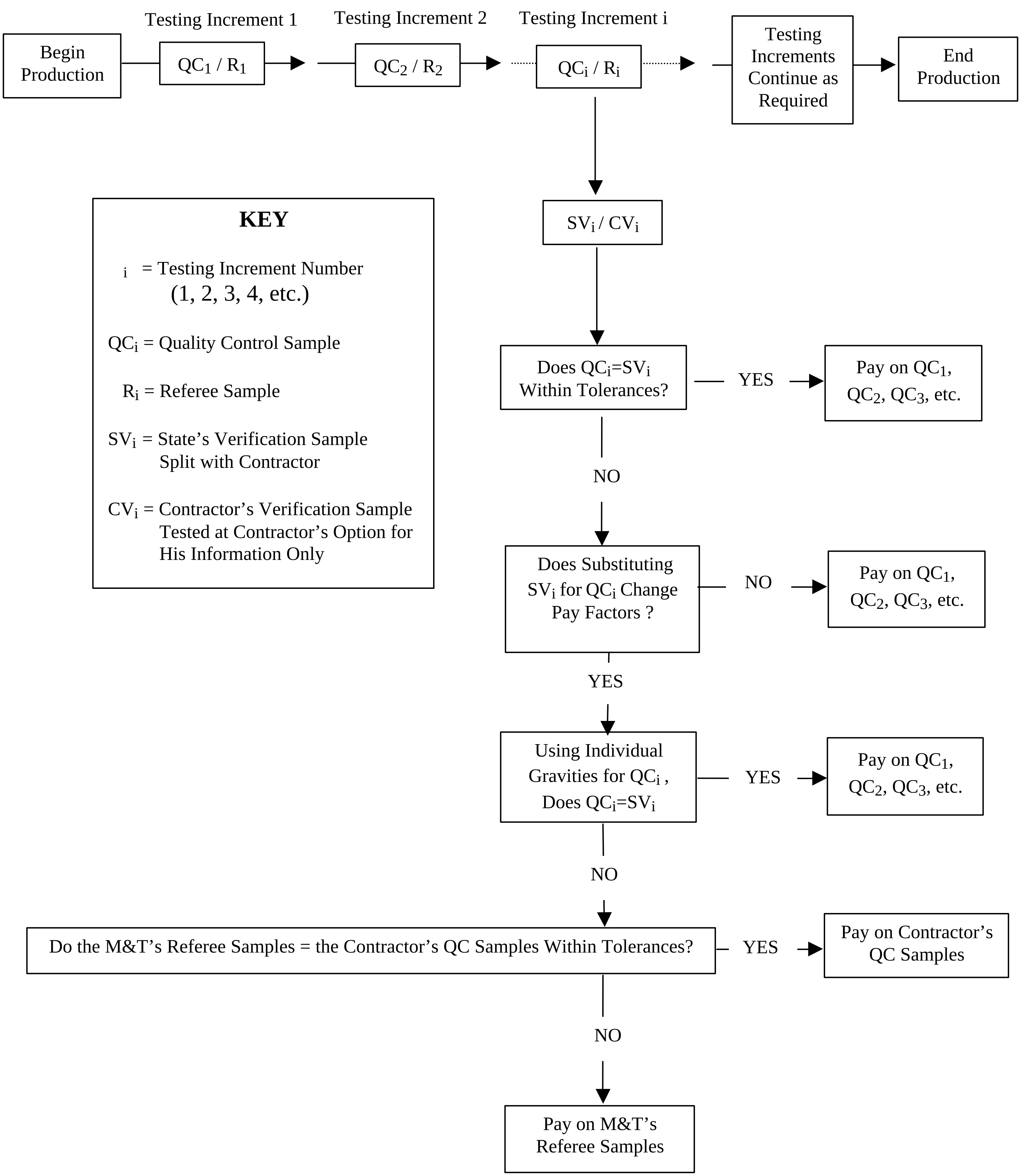
% AIR VOIDS REQUIRED = 4.00

TEST RESULTS (ORIGINAL/REFEREE)

TESTING INCREMENT	CONTRACTOR	STATE	M & T	USE TO COMPUTE PAY FACTOR TEST RESULTS/DEVIATION
1	3.98		4.74	4.74/0.74
2	3.32		3.47	3.32/0.68
3	4.27		2.63	2.63/1.37
4	3.79		3.29	3.79/0.21
5				
				AVERAGE DEVIATION = 0.75
				PAY FACTOR = 1.00

Note Engineer Pay Factor(s) on QC/QA Form 3

FLOW CHART FOR PAY FACTOR DETERMINATION



ALDOT-381-93
METHOD FOR CORRELATION OF MARSHALL HAMMERS

1. Scope

1.1. This procedure explains the Alabama Department of Transportation method for correlating all Marshall hammers used on Department quality control (QC) work. All contractor quality control hammers, all Division quality assurance (QA) hammers and all design hammers shall be calibrated to the Bureau of Materials and Tests' Marshall hammer.

2. Referenced Documents

2.1. AASHTO T-166 Bulk Specific Gravity of Compacted Bituminous Mixtures.

2.2. ALDOT-307 Design Method for Selecting Optimum Asphalt Cement Content of Bituminous Mixture by Means of The Marshall Apparatus.

2.3. ALDOT-375 Contractor Quality Control System for Hot Mix Asphalt.

3. Correlation Procedure

3.1. The Bureau of Materials and Tests' Marshall hammer is the standard to which all Marshall hammers performing Alabama Department of Transportation work shall be calibrated. The contractor assumes responsibility for beginning work if no correlation factor has been established and/or if there is no correlation history for either the contractor's QC hammer or the Divisions QA hammer. A job mix formula and the recommended compaction temperature must be included in every hammer correlation.

3.2. Mixture Design Hammer

3.2.1. The hammer calibration factor (HCF) will be developed from the data generated by the Department's one-point checks of the submitted mixture designs. The average bulk specific gravity (AASHTO T-166) of the Marshall specimens made by Materials and Tests will be divided by the uncorrected bulk specific gravity for the Contractor's mixture design Mar-shall specimens obtained from the plot of unit weight versus asphalt content at the design asphalt content.

$$\text{HCF} = \frac{\text{Materials and Tests Compacted Marshall SG}}{\text{Contractor Marshall SG from Data Curve}}$$

3.2.2. A HCF will be developed for all designs from a given hammer. A running average of the last 10 HCF will be maintained by the contractor. If less than 10 values are avail-able, the average shall include all data that is available. The current running average for HCF will be used to correct the actual test data for mixture design submitted and for calibrating the quality control hammer. If a new hammer is being used for mixture design, the procedures in Section 3.5 should be conducted in cooperation with the Bureau of Materials and Tests.

3.2.3. Every mix design submitted to the Bureau of Materials and Tests must include the uncorrected bulk gravity at the design asphalt content, the current running average of the hammer calibration factor, and the resulting corrected bulk specific gravity.

3.3. Quality Control Hammer

3.3.1. The contractor is responsible for the development of a QC-HCF for each quality control hammer. A new factor shall be developed at least every three months. This procedure can be conducted using the Materials and Tests' standard hammer or the Contractor's calibrated design hammer. Samples will be obtained and tested according to the procedures out-lined in section 3.5 of this procedure. The correction factor will be calculated as follows:

$$\text{QC-HCF} = \frac{\text{Calibrated Hammer Marshall SG}}{\text{Quality Control Hammer Marshall SG}}$$

3.3.2. A running average of the last 10 QC-HCF factors will be maintained by the Contractor. If less than 10 values are available, the average shall include all data that is available. The current running average of the QC-HCF shall be used to correct all field quality control data.

3.4. Quality Assurance Hammer

3.4.1. The Division is responsible for the development of a QA-HCF for each quality assurance hammer. A new factor shall be developed at least every three months. Samples will be obtained and tested according to the procedures outlined in Section 3.5 of this procedure. This procedure can be conducted in cooperation with the Materials and Tests standard hammer or the Contractor's calibrated design hammer. The quality assurance hammer can be calibrated at the same time the quality control hammer is calibrated. The correction factor will be calculated as follows:

$$\text{QA-HCF} = \frac{\text{Calibrated Hammer Marshall SG}}{\text{Quality Assurance Hammer Marshall SG}}$$

3.4.2. A running average of the last 10 QA-HCF will be maintained by the Division. If less than 10 values are available, the average shall include all data that is available. The current running average of the QA-HCF shall be used to correct all field quality assurance data.

3.5. Samples for Hammer Calibration

3.5.1. Samples of any Alabama Department of Transportation mixture may be used for hammer calibration, regardless of type mix or number of blows. The sample should be obtained in such a manner such that it is uniform throughout. If either the contractor's QC hammer and/or the Division's QA hammer does not have a correction factor the contractor has the responsibility to initiate this procedure.

3.5.2. The contractor must prepare sufficient mixture to supply each hammer to be correlated, possibly including the Materials and Tests' hammer, with four Marshall samples. Sufficient mixture is considered to be 10 per-cent in excess (110% or 1.10) of the amount required to produce a compacted specimen thickness of 3 in. +/- ½ in. (75 + 1 mm). Each sample shall be loaded into separate sample cans having a volume of approximately 1 qt. (1 L).

3.5.3. All of these samples for all hammers to be correlated shall be placed into one large group and then the four samples for each individual hammer shall be randomly selected from the large group. Place the four 1 qt. (L) cans containing the mix into an oven that has been preheated to 320°F (160ºC). Compact four pills when the mixture reaches 293 +/-10°F (145 +/- 5ºC)as close to 293°F (145°C) as practical (it normally takes 1 hour and 15 minutes for the mixture to reach 293°F (145ºC). If the recommended design compaction temperature is not 293°F (145ºC), use the design temperature recommended.

3.6. Each laboratory will report the four individual bulk specific gravities, the job mix formula, and the compaction temperature to the Materials and Tests' laboratory. The Materials and Tests' laboratory will average these bulk specific gravities, determining which, if any, bulk specific gravities are not to be included in the average due to a deviation from the other values. The laboratories' hammers will be calibrated by using the Materials and Tests' average bulk gravity as the standard.

3.7. A calibration factor will be determined for each specific hammer by dividing the Materials and Tests' results by the results of each laboratory's hammer. (This correction factor will be multiplied by the average compacted bulk specific gravity produced by the calibrated hammer. This gives a corrected bulk specific gravity which is used to determine air voids.) This procedure may be repeated as often as the engineer deems necessary.

3.8. When the Division is obtaining a QA-HCF (Quality Assurance Hammer Calibration Factor) based upon the contractor's calibrated design hammer (as allowed in Section 3.4.1) or the contractor is obtaining a QC-HCF (Quality Control Hammer calibration Factor) based upon the contractor's calibrated design hammer (as allowed in Section 3.3.1) The average of Marshall bulk specific gravities for the four (4) specimens will be used to compute the correction factor. If one or more of the individual specimens deviates by more than ± 0.015 from the average, discard the individual bulk specific gravity that deviates the most from the average of four, then recompute the average based on the remaining three specimens. If one of the remaining three values deviates by more than ± 0.015 from the new average, the entire set of results are considered suspect and a new set of specimens must be fabricated.

3.9. The running average of the calibration factors shall be documented and available at the site of the hammer and include the last ten individual calibration factors.

3.10. When either the Department or Contractor deems it necessary, Marshall hammers may be recalibrated, and, with the approval of Materials and Tests, a previous calibration factor or factors discarded (this may be necessary when a hammer is repaired).

Example:

A contractor has these last ten calibration factors: 0.997, 0.995, 0.994, 0.988, 0.999, 0.995, 0.991, 1.002, 0.996 and 0.993. This gives an average calibration factor of 0.995. During the mix design process all bulk specific gravities (to determine optimum asphalt content) will be multiplied by this calibration factor. At four percent air voids the corrected bulk specific gravity is 2.388.

Uncorrected Bulk Gravity	X	Correction Factor	=	Corrected Bulk Gravity
2.400	X	0.995	=	2.388

On all job mix formulas the contractor will report these three numbers.

Materials and Tests performs a one point check and obtains a bulk gravity of 2.382.

$$\text{HCF} = \frac{2.382}{2.400} = 0.992$$

The contractor, for future use of this hammer, uses 0.992 in the last ten HCF running average for a new HCF average of 0.994.

ALDOT-382-94
MINING, STOCKPILING, SAMPLING, AND TESTING CARBONATE STONE FROM SINGLE OR MULTIPLE FORMATIONS/LEDGES FOR DETERMINATION OF BPN9 VALUES

1. Scope

1.1. The purpose of this procedure is to establish a uniform set of guidelines necessary to establish British Polishing Numbers (BPN9) for carbonate stone and determine the extent to which different coarse carbonate stone will polish and to further determine the surface frictional properties of the carbonate stone.

2. Referenced Standards

2.1. ASTM D 3319, "Accelerated Polishing of Aggregate Using the British Wheel."

2.2. ASTM E 303, "Measuring Surface Frictional Properties Using the British Pendulum Tester."

2.3. AASHTO T 2, "Sampling Aggregates."

2.4. Alabama Department of Transportation Specifications.

2.5. ALDOT-175, "Method of Stockpiling Coarse Aggregate for All Purposes."

2.6. ALDOT-249, "Procedure for Acceptance of Fine and Coarse Aggregates."

3. Calibration and Testing Procedure for British Polish and Pendulum Testing

3.1. Pendulum Calibration

3.1.1. Two (2) sets of four (4) polish specimens each will be prepared and used to keep the British Pendulum Tester calibrated. The two (2) sets of specimens will have average BPN values of 20 and 35. At the beginning of each specimen fabrication-polishing-testing sequence for a set of 14 specimens, the calibration specimens will be tested. The British Pendulum Tester will be adjusted until the averages for each of the two (2) groups are within ± one (1) unit from the established averages of 20 and 35.

3.2. Specimen Preparation and Polish Calibration

3.2.1. Polish specimens will be prepared in accordance with procedures contained in ASTM D 3319. A minimum of six (6) specimens will be prepared for each aggregate source.

3.2.2. A control sample (approximately 1800 lbs. (800 kg) of ½ in (12.5 mm) to 3/8 in. (9.5 mm) aggregate) has been obtained from Vulcan Materials Company, Calera, Alabama (ID Number 0155). The aggregate has been sieved, washed, dried, and stored in plastic lined barrels. This aggregate will be used to develop consistency in specimen preparation and polishing. Two (2) specimens will be prepared and included (with 12 others) in each run of the British Polish Wheel. The average of the two calibration specimens BPN0 values tested in accordance with section 3.3 will be within ± two

(2.0) units of a bench mark BPN0 = 35 value. If this criteria is not met, all specimens prepared for the polish sequence will be discarded and new specimens prepared.

3.2.3. After polishing for nine (9) hours, the BPN9 values for the two calibration specimens will be measured in accordance with section 3.3. The average BPN9 value will be within ± one and one-half (1.5) units of the benchmark BPN9 = 25 value. If only one (1) calibration specimen survives the nine (9) hour polishing sequence it will be within ± two and one-half (2.5) units of the bench mark BPN9 = 25 value. If these criteria are not met, the results from the polish testing sequence will not be used. The fabrication-polishing-testing sequence for the complete wheel of 14 specimens will be repeated until the criteria for the calibration specimens are met.

3.2.4. Control charts will be prepared and maintained for calibration BPN0, and BPN9 values. The average of the two (2) values for each run will be plotted with bench mark values of BPN0, and BPN9.

3.3. Pendulum Testing and Reporting

3.3.1. Specimens will be tested according to procedures outlined in ASTM E 303. Broken specimens and specimens with stones missing in the slider or contact area will be discarded.

3.3.2. The reported values of BPN0 and BPN9 for any aggregate will be the average from a minimum of four (4) samples.

4. Sampling (Single Formations)

4.1. The producer shall construct stockpiles in accordance with ALDOT-175, "Method of Stockpiling Coarse Aggregate for All Purposes." Samples shall be taken in accordance with AASHTO T 2, "Sampling Aggregates."

4.2. After samples have been taken, tests shall be performed as per this procedure and BPN9 values established.

5. Sampling (Multiple Formations)

5.1. If a source contains multiple formations and the producer desires to mine each formation independently of the other, separate stockpiles shall be constructed for each formation in accordance with ALDOT-175. BPN9 values will be established for each different formation stockpile. The producer will be required to physically identify each stockpile as to the appropriate formation from which the material was taken. Stockpile identifiers must be used when shipping.

5.2. If the producer cannot or desires not to mine each formation independently of the others, conglomerate stockpiles may be constructed in accordance with ALDOT-175.

5.2.1. The producer will assist the Department in obtaining representative samples from each formation. BPN9 numbers will be established for each formation; however, the lowest BPN9 number will be assigned to the conglomerate stockpile.

6. Requirements

6.1. All producers of carbonate stone, that sell same for use on Department projects, must be an approved source meeting all requirements of ALDOT-249, "Procedure for Acceptance of Fine and Coarse Aggregates." New BPN9 values will be determined annually on each approved carbonate stone source. All sampling and testing for BPN9 values will be performed by Central Laboratory personnel.

ALDOT-384-95
MIX DESIGN PROCEDURE FOR SUPERPAVE LEVEL I

1. SCOPE

1.1 This procedure provides instructions for designing bituminous concrete paving mixtures using the Strategic Highway Research Program (SHRP) gyratory compactor for making hot mix asphalt specimens. This method is for use with mixtures with a gradation such that 100 percent of the aggregate passes the 63 mm sieve.

2. REFERENCED DOCUMENTS

2.1 AASHTO STANDARDS

2.1.1 AASHTO T-11, Materials Finer Than 75 µm Sieve in Mineral Aggregates by Washing

2.1.2 AASHTO T-27, Sieve Analysis of Fine and Coarse Aggregate

2.1.3 AASHTO T-37, Sieve Analysis of Mineral Filler for Road and Paving Materials

2.1.4 AASHTO T-84, Specific Gravity and Absorption of Fine Aggregates

2.1.5 AASHTO T-85, Specific Gravity and Absorption of Coarse Aggregates

2.1.6 AASHTO T-100, Specific Gravity of Soils

2.1.7 AASHTO T-166, Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens

2.1.8 AASHTO T-201, Kinematic Viscosity of Asphalts

2.1.9 AASHTO T-209, Maximum Specific Gravity of Bituminous Paving Mixtures

2.1.10 AASHTO T-228, Specific Gravity of Semi-Solid Bituminous Materials

2.1.11 AASHTO T-269, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures

2.1.12 AASHTO MP-1, Specifications for Performance-Graded Asphalt Binder

2.1.13 AASHTO TP-33, Test Method for Uncompacted Void Content of Fine Aggregate (As Influenced by Particle Shape, Surface Texture, and Grading)

2.1.14 AASHTO PP-19, Practice for Volumetric Analysis of Compacted Hot Mix Asphalt (HMA)

2.1.15 AASHTO TP-4, Method for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by means of the SHRP Gyratory Compactor

2.1.16 AASHTO TP-6, Test Method for the Measurement of Initial Asphalt Adsorption and Desorption in the Presence of Moisture

2.1.17 AASHTO TP-39, Test Method for Determining the Maximum Specific Gravity of Bituminous Paving Mixtures

2.1.18 AASHTO TP-48, Test Method for Viscosity Determinations of Unfilled Asphalts Using the Brookfield Thermosel Apparatus

2.1.19 AASHTO PP-2, Practice for Short and Long Term Aging of Hot Mix Asphalt (HMA)

2.2 ASTM STANDARDS

2.2.1 ASTM D-4402, Test Method for Viscosity Determinations of Unfilled Asphalts Using the Brookfield Thermosel Apparatus

2.2.2 ASTM D-4791, Test Method for Flat or Elongated Particles in Coarse Aggregate

2.3 STRATEGIC HIGHWAY RESEARCH PROJECT (SHRP) DOCUMENTS

2.3.1 SHRP-A-379, The Superpave Mix Design System Manual of Specifications, Test Methods, and Practices

2.3.2 SHRP A-407 Superpave Mix Design Manual for New Construction and Overlays, National Research Council, Washington, DC, 1993

2.4 ALDOT PROCEDURES

2.4.1 ALDOT-310, Method of Determining Percent of Fractured Particles in Coarse Aggregate

2.4.2 ALDOT-361, Resistance of Compacted Bituminous Mixtures to Moisture Induced Damage

2.4.3 ALDOT-386, Determination of Draindown Characteristics in Uncompacted Bituminous Mixtures

2.4.4 ALDOT-355, Materials, Sources, and Devices with Special Acceptance Requirements

2.5 OTHER DOCUMENTS

2.5.1 The Asphalt Institute Manual, SP-2, Superpave Level I Mix Design. The Asphalt Institute, Lexington, KY, Current Edition.

3. DEFINITIONS AND NOMENCLATURE

3.1 Asphalt binder is the liquid asphalt cement, with or without a modifier, used to cement the aggregates and other material into a structural mixture.

3.2 The air voids (Va) are the total volume of the small pockets of air between the coated aggregate particles throughout a compacted paving mixture, expressed as a percent of the bulk volume of the compacted paving mixture. Please see AASHTO T-269, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

3.3 The voids in the mineral aggregate (VMA) are the volume of intergranular void space between the aggregate particles of a compacted paving mixture that includes the air voids and the effective asphalt content, expressed as a percent of the total volume of the specimen.

3.4 The absorbed asphalt binder volume (Vba) is the volume of asphalt binder absorbed into the pore structure of the aggregate. Vba is the volume of asphalt binder in the HMA not accounted for by the effective asphalt content. Pba is the absorbed binder based on mass.

3.5 The asphalt binder content (Pb) is the percent by mass of asphalt binder in the total mixture, including the asphalt binder, the aggregate and other additives.

3.6 The effective asphalt binder content (Pbe) is the total asphalt binder content (by mass) which is not absorbed into the aggregate. Vbe is the effective binder based on volume.

3.7 The voids filled with asphalt binder (VFA) are the portion of the volume of inter-granular void space between the aggregate particles that is occupied by the effective asphalt. VFA represents the volume of the effective asphalt content.

3.8 The dust to asphalt ratio (D/A) is the percent by mass of aggregate passing the 75 μm sieve divided by the effective asphalt content percent by mass of total mix.

3.9 The specific gravity of asphalt binder (Gb) is the density of the asphalt cement binder as per AASHTO T-228, Specific Gravity of Semi-Solid Bituminous Materials.

3.10 The bulk specific gravity of compacted mixture (Gsb) is the density of the compacted specimen as in AASHTO T-166, Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens.

3.11 Theoretical maximum specific gravity (Gmm) is the ratio of the mass of a given volume of voidless mix at a 25°C to a mass of an equal volume of gas free distilled water at the same temperature.

3.12 The apparent specific gravity of the combined coarse and fine aggregates (Gsa) is the ratio of the mass in air of a unit volume of the impermeable portion of the aggregate at 25°C to the mass in air of an equal volume of gas-free distilled water at the same temperature.

3.13 The bulk specific gravity of the combined coarse and fine aggregates (Gsb) is the ratio of the mass in air of a unit volume of aggregate (including the permeable and impermeable voids in the particles, but not including the voids between particles) at 25°C to the mass in air of an equal volume of gas-free distilled water at the same temperature.

3.14 The effective specific gravity of the combined coarse and fine aggregate (Gse) is the ratio of the mass in air of a unit volume of aggregate excluding the voids permeable to asphalt in the particles, at 25°C to the mass in air of an equal volume of gas-free distilled water at the same temperature.

3.15 The percent aggregate (Ps) is the percent by mass of combined aggregates in the total mix including the asphalt binder and the aggregates.

3.16 The weight of aggregate per unit volume of mix (Ws) is the theoretical mass of aggregate in one cubic centimeter (one milliliter) of mix at a given air void content (used to calculate the initial trial asphalt cement binder content).

3.17 The initial trial asphalt binder content (Pbi) is the estimated asphalt binder content, based on the total mass of mixture, to achieve four percent air voids at the design number of gyrations.

3.18 The nominal maximum sieve size (Sn) is defined as one sieve size larger than the first sieve to retain more than 10% of the material.

3.19 The maximum sieve size (Sm) is defined as one sieve size larger than the nominal maximum size.

3.20 The initial number of gyrations (Ni) performed by the SHRP Gyratory Compactor to predict if the mix is tender. Ni is based on the projected traffic volume.

3.21 The maximum number of gyrations (Nm) performed by the SHRP Gyratory Compactor to predict if the mix will rut. Nm represents the maximum compactive effort the mix will undergo based on the projected traffic volume.

3.22 The design number of gyrations (Nd) performed by SHRP Gyratory Compactor to predict if the mix is subject to raveling or bleeding. Nd is based on the projected traffic volume.

3.23 The percent of mix maximum specific gravity (% Gmm) is the bulk specific gravity of a compacted specimen expressed as a percentage of the rice gravity.

4. APPARATUS

4.1 Gyratory Compactor - An electrohydraulic compactor, with a ram and ram heads that are restrained from revolving during compaction. The axis of the ram shall be perpendicular to the platen of the compactor. The ram shall apply and maintain a pressure 600 ± 18 kPa to a specimen cross section with a diameter of 150 mm (Note 1). The compactor shall tilt specimen molds at an angle of 22 ± 0.35 mrad (1.25 ± 0.02 degrees) and gyrate specimen molds at a rate of 30.0 ± 0.5 gyrations per minute throughout compaction. The compactor shall be designed to permit a 150 mm diameter mold to revolve freely on its tilted axis during gyration.

NOTE 1: This stress calculates to 10600 ± 320 N total force for 150 mm specimens.

4.1.1 Specimen Height Measurement and Recording Device - When specimen density is to be monitored during compaction, a means shall be provided to continuously measure and record the height of the specimen to the nearest 0.1 mm during compaction once per gyration.

4.2 Specimen Molds - Specimen Molds shall have steel walls that are at least 8.5 mm thick and are hardened to at least Rockwell C 48. The inside finish of the molds shall have a root mean square (rms) of 0.40 μm or smoother (Note 2). Molds shall have an inside diameter of 149.90 to 150.00 mm and be a least 250 mm high.

NOTE 2: Smoothness measurement is in accordance with ANSI B 46.1. One source of supply for a surface comparator, which is used to verify the rms value of 0.40 μm, is GAR Electroforming, Danbury, Connecticut.

4.3 Ram Heads and Mold Bottoms - Ram heads and mold bottoms shall be fabricated from steel with a minimum Rockwell hardness of C 48. The ram heads shall have a means for staying fixed to the ram and perpendicular to its axis. The platen side of each mold bottom shall be flat and parallel to its face. All ram and base plate faces (the sides presented to the specimen) shall be ground flat and shall have a diameter of 149.70 to 149.75 mm.

4.4 Thermometers - Armored, glass, or dial-type thermometers with metal stems for determining temperature of aggregates, asphalt and asphalt mixtures between 10°C to 232°C.

4.5 Balance - A balance meeting the requirements of M231, Class G5 for determining the mass of aggregates and asphalt.

4.6 Oven - A force draft oven, thermostatically controlled to ± 3°C for heating asphalt mix, asphalt mix components, and equipment as required. The oven or ovens shall have sufficient volume to accommodate as a minimum, two gyratory molds, two pans for gyratory pills and two pans for Rice Gravity. See paragraph 4.7 for pan sizes. The oven(s) shall be capable of maintaining the temperature required (135°C) for short term aging as per AASHTO PP2.

4.7 Miscellaneous - Flat bottom pans for heating asphalt mix, and asphalt mix components. As a minimum, four pans approximately 375 x 375 x 25 mm are required. Other miscellaneous equipment includes scoop, mixing bowls, mechanical mixer, beakers, containers for heating liquid asphalt binder, mixing spoons/spatulas, paper disks, lubricating oil, and insulated gloves.

5. PROCEDURE

5.1 Aggregate Structure Selection. In accordance with the specifications select an aggregate structure. Base the selection upon the following:

5.1.1 Determine whether the mix is for a wearing surface, binder, or base layer.

5.1.2 Determine the specified performance grade of asphalt binder by consulting the specifications, plans, and proposal.

5.1.3 Select fine and coarse aggregates from ALDOT approved sources. See "Materials, Sources, and Devices with Special Acceptance Requirements," List I-1, Sources of Coarse and Fine Aggregate.

5.1.4 Make sure the aggregate blend is within the gradation limits (the gradation may touch the control points but may not cross or exceed the control points) and outside the restricted zone (the gradation may not touch or cross the restricted zone), based on nominal maximum aggregate size, established on the sieve size raised to the 0.45 power curve (see Tables 2A - 2D of Article 424.02 and Article 424.03 of the specifications or SHRP-A-379, The Superpave Mix Design System Manual of Specifications, Test Methods, and Practices or SHRP Superpave Mix Design Manual for New Construction and Overlays, National Research Council, Washington, DC, 1993).

5.1.5 Determine the coarse aggregate angularity by BMTP-310, Method of Determining Percent of Fractured Particles in Coarse Aggregate.

5.1.6 Determine the fine aggregate angularity by AASHTO TP-33 (ASTM C-1252) Method A, Uncompacted Void Content of Fine Aggregate.

5.1.7 The net adsorption may be calculated, as determined by AASHTO TP-6, Measurement of Initial Asphalt Adsorption and Desorption in the Presence of Moisture to determine the aggregate's propensity to strip.

5.1.8 **NOTE**: Several different trial aggregate gradations may be necessary to find one that satisfies all the mix design requirements (i.e., VOIDS, VMA, VFA, D/A, etc.). Select three trial aggregate blends that meet gradation requirements for that particular mixture. Select a fine intermediate, and coarse composite gradation. These trial blends will be used to select a design aggregate structure.

5.2 Batching Aggregates

5.2.1 Dry the aggregates to a constant mass at 110 ± 5°C and separate each aggregate by dry sieving into these fractions:

63 to 50 mm	19.0 to 12.5 mm
50 to 37.5 mm	12.5 to 9.5 mm
37.5 to 25 mm	9.5 to 4.75 mm
25 to 19.0 mm	4.75 to 2.36 mm
	passing 2.36 mm

5.2.2 Prepare a minimum of five batches of aggregates for each trial gradation; two batches approximately 5000 g (for producing compacted specimens 150 mm in diameter and approximately 115 mm in height) and three batches according to the nominal maximum aggregate size from AASHTO T-11 or AASHTO T-209 (one batch for a wash gradation and two for maximum gravity tests).

5.2.3 Randomly select one of the three smaller batches to perform a washed gradation and sieve analysis by AASHTO T-11 and T-27 to confirm that the design gradation will pass between the control points and may touch the control points but will not touch or cross the restricted zone.

5.3 Determining Trial Asphalt Binder Content

NOTE: Designers with enough experience to know the range of trial asphalt contents for their aggregate blend may skip to section 5.4.

5.3.1 Estimate the effective specific gravity of the trial aggregate blend using this equation:

$$Gse = Gsb + 0.8\ (Gsa - Gsb)$$

The multiplier, 0.8, may be changed at the discretion of the designer. For example, absorptive aggregates may require a value of 0.6 or less. See section 6 for specific gravity computation.

5.3.2 Estimate the volume of the asphalt binder absorbed into the aggregate using this equation:

$$Vba = \frac{(Ps)(1 - Va)}{\left(\frac{Pb}{Gb} + \frac{Ps}{Gse}\right)} \ x \ \left(\frac{1}{Gsb} - \frac{1}{Gse}\right)$$

Va is always assumed to be 0.04, but Pb and Ps are changed at the discretion of the designer (usually 0.05 and 0.95 respectively).

5.3.3 Estimate the volume of the effective asphalt binder using this metric equation:

$$Vbe = 0.176 - 0.0675 \text{ Log } Sn$$

Sn = Sieve size in millimeters

5.3.4 Estimate the weight of aggregate per unit of mix using this equation:

$$Ws = \frac{(Ps)(1 - Va)}{\left(\frac{Pb}{Gb} + \frac{Ps}{Gse}\right)}$$

5.3.5 Estimate the initial trial asphalt binder content using this equation:

$$Pbi = 100\,[Gb\,(Vbe + Vba)] \,/\, [Gb\,(Vbe + Vba) + Ws]$$

5.4 Specimen Preparation (Mixing the Batches with Asphalt Binder)

5.4.1 The required mixing temperature is the temperature in Celsius (°C) where the asphalt binder has a viscosity that is between 0.15 to 0.19 Pascal-seconds (150 and 190 centiStokes) as determined by AASHTO T-201 or ASTM D-4402.

5.4.2 Dry mix the four remaining batches and heat them in an oven to at least the required mixing temperature and no more than 25°C above the required mixing temperature. Heat the asphalt binder to the desired mixing temperature. (Discard any binder held at mixing temperature more than one hour.)

5.4.3 Charge the mixing bowl with the heated aggregate and form a crater on the top of the aggregate (with one of the four batches).

5.4.4 Weigh into the crater the amount of preheated asphalt binder to obtain the initial trial asphalt binder content (Pbi) for the two compaction specimens (two of the four batches) and at 1% above Pbi and at 1% below Pbi (the remaining two batches).

5.4.5 Using a mechanical mixer and a bowl of sufficient size to handle at least 5000 g of materials, thoroughly mix and stir the sample until all aggregate is coated. Do this as quickly as possible to maintain the specified mixing temperature.

5.4.6 Age the four remaining specimens (two samples for compaction; two samples for maximum specific gravity) in a forced draft oven for two hours at the required compaction temperature. The required compaction temperature is the temperature in Celsius (°C) where the asphalt binder has a viscosity that is between 0.25 and 0.31 Pascal-seconds (250 and 310 centiStokes) as determined by AASHTO T-201 or ASTM D-4402.

In a flat pan, place the loose mix to a depth not to exceed the maximum aggregate size in the mix. This is to allow the binder to age and absorb into the aggregates. The loose mix should be stirred every hour. See AASHTO PP-2, Short and Long Term Aging of HMA.

5.4.7 Perform the theoretical maximum specific gravity of bituminous paving mixtures in accordance with AASHTO T-209 on the two theoretical maximum specific gravity samples, preferably on mixes at or near the optimum asphalt content and compute the average. The theoretical maximum specific gravity of the mixes with other asphalt contents can be computed as described in section 6.3.1. Compute the maximum specific gravity at the trial asphalt content. This is 100% Gmm.

5.5 Compaction of Specimen

5.5.1 Place a compaction mold and base plate in a compaction temperature oven at least 45 minutes prior to the estimated beginning of compaction.

5.5.2 When the compaction temperature is achieved, remove the paving mixture along with the heated mold and base plate from the oven. Place a paper disc on the bottom of the mold (for compactor and mold specifications see AASHTO TP-4). Then place the paving mixture in the mold.

5.5.3 Load the mold with paving mix into the compactor.

NOTE: No rodding of the mix is required, but the mix should be leveled or slightly rounded in the mold.

5.5.4 Apply the correct pressure and gyratory angle to the specimen and compact the specimen to the design number of gyrations (based on traffic loads in ESALs) in accordance with the specifications.

5.5.5 Remove the angle and pressure from the specimen. Extrude the specimen from the mold as soon as the tenderness of the mix will allow (**NOTE**: Most specimens can be extruded immediately, otherwise, cool mold in front of a fan).

5.5.6 Repeat (using heated molds) until all of the specimens are compacted.

5.5.7 Determine the bulk specific gravity of the compacted specimens according to AASHTO T-166. Calculated values shall be carried out to three decimal places.

5.5.8 Average the bulk specific gravities for all the compacted specimens of a given asphalt content and gradation.

5.6 Trial Design Analysis

5.6.1 The compactor will record the specimen height during compaction. From this data, the specific gravity of the specimen (reported as percent of maximum theoretical specific gravity or % Gmm) at selected gyrations can be determined. Use the measured bulk specific gravity at the design number of gyrations (Nd) to determine the actual % Gmm at the design number of gyrations (% Gmmd) and correct the % Gmm at the initial (% Gmmi) number of gyrations (Ni).

NOTE: In general there is a 1% - 4% difference between the measured % Gmm and the corrected % Gmm. This difference is due to the surface voids of the specimen.

5.6.2 Compute the air voids and voids in mineral aggregate at the design gyrations by the following equations:

Va = 100 - % Gmm
VMA = 100 - ((% Gmm) (100% Gmm) (Ps) / Gsb)

This VMA is the initial VMA (VMAi).

5.6.3 Estimate the asphalt binder content (Pbe) to produce the design air voids of four percent by the following equation:

Pbe = Pbi - (0.4 (4 - Va))

5.7 Estimate the Mix Properties at the New Binder Content

5.7.1 The VMA at this new binder content (VMAe) is estimated using the following equation:

VMAe = VMAi + C (4 - Va)

C is 0.1 if Va is less than 4%, 0.2 if Va is greater than 4%

5.7.2 The VFA at this new binder content (VFAe) is estimated using the following equation:

VFAe = 100 (VMAe - 4) / VMAe

5.7.3 The percent of maximum theoretical gravity at this new binder content (% Gmme) is estimated using the following equations:

For initial number of gyrations (Ni)
% Gmmie = % Gmmi - (4 - Va)

NOTE: For design number of gyrations, (Nd) % Gmmde = 96

5.7.4 The effective asphalt volume at this new binder content (Pbee) is estimated using the following equation:

$$Pbee = Pbe - \frac{(Ps)(Gb)(Gse - Gsb)}{(Gse)(Gsb)}$$

5.7.5 The dust to asphalt ratio at this new binder content (D/A) (effective asphalt content) is estimated using the following equation:

D / A = D / Pbee

Where: D is the percentage of aggregate passing the 75 µm sieve.

5.8 These estimated mix design properties (VMA, VFA, D/Pbee, % Gmm at Ni and Nd) for each trial blend, are compared against the specifications. If they fail to meet the requirements then the actual design mix will probably also fail. Select another aggregate structure as in paragraph 5.1 and repeat this procedure. If the estimates show that one or more of the trial blends will meet the requirements then proceed with the design.

5.9 As in paragraphs 5.4 through 5.5.8 prepare and compact a minimum of two specimens at each of the following asphalt contents: The estimated design asphalt content minus one half percent (Pbe - 0.5%), the estimated design asphalt content (Pbe), the estimated design asphalt content plus one half percent (Pbe + 0.5%), and the estimated design asphalt content plus one percent (Pbe + 1.0%). If the maximum percent gravity tests performed in paragraph 5.4.7 were not within 1% of the estimated design asphalt content (Pbe) prepare and test at least one other sample within 1% of the estimated design asphalt content (Pbe). As in paragraph 5.6.1, measure, correct, and record or calculate the percent theoretical maximum specific gravity (% Gmm) for each asphalt content for the initial and design number of gyrations and compute the average for each. When calculated results meet specifications for initial and design gyrations, mix two specimens at the design asphalt content and compact them to the maximum number of gyrations, according to the specifications. If their % Gmm (bulk specific gravity) meets specifications at Nm, proceed with design analysis.

6. DENSITY AND VOIDS ANALYSIS (AT DESIGN NUMBER OF GYRATIONS)

NOTE! Equations were taken from the Asphalt Institute Manual, SP-2, Superpave Level I mix design.

6.1 Aggregate Bulk and Apparent Specific Gravity Calculation

6.1.1 Calculate the bulk and apparent specific gravity of the coarse aggregate in accordance with AASHTO T-85 (See Note 1).

6.1.2 Calculate the Bulk and Apparent Specific Gravity of Fine Aggregate in accordance with AASHTO T-84 on the material retained on the 75 µm sieve after the material passing the 75 µm sieve has been removed by

washing (Assume that the 75 µm material washed from the sample has the same specific gravity as the material retained on the 75 µm sieve). (See Note 2.)

6.1.3 Calculate the bulk specific gravity (Gsb) of the total aggregate blend as follows:

$$Gsb = \frac{100}{\left(\frac{Percent\ Agg.1}{Gsb\ Agg.1}\right) + \left(\frac{Percent\ Agg.2}{Gsb\ Agg.2}\right) + \left(\frac{Percent\ Agg.n}{Gsb\ Agg.n}\right)}$$

6.1.4 Calculate the Apparent Specific Gravity (Gsa) of the total combined mineral aggregate as shown in paragraph 5.6.3 by substituting the Apparent Specific Gravity of the aggregate in the formula for the Bulk Specific Gravity (Gsb) (See Note 1).

NOTE 1: All test results shall be carried out to three decimal places.

NOTE 2: The Bulk Specific Gravity of mineral filler is difficult to determine. However, if the Apparent Specific Gravity of mineral filler is used instead, the error is usually negligible (refer to AASHTO T-37 and AASHTO T-100).

6.2 Effective Specific Gravity of Aggregate Calculations (Gse)

6.2.1 Calculate the Effective Specific Gravity of aggregate using average Gmm as determined in paragraph 5.4.7 or 5.9 as follows:

$$Gse = \frac{100 - Pb}{\frac{100}{Gmm} - \frac{Pb}{Gb}}$$

6.3 Maximum Specific Gravity of Bituminous Mixture with other Asphalt Contents Calculations (Gmm)

6.3.1 Compute Maximum Specific Gravity of bituminous mixtures at other asphalt contents at the design number of gyrations as follows:

$$Gmm = \frac{100}{\frac{Ps}{Gse} + \frac{Pb}{Gb}}$$

6.4 Percent Voids in Mineral Aggregate Calculations (VMA)

6.4.1 Calculate Percent Voids in Mineral Aggregate of the compacted bituminous mixture for each asphalt content at the design number of gyrations as follows:

$$VMA = 100 - \frac{(Gmb)(Ps)}{Gsb}$$

NOTE: Because Gmb = % Gmm @ design (Gmm) VMA may also be calculated by this equation:

VMA = 100 - ((% Gmm) (@ design Gmm) (Ps) / Gsb)

6.5 Percent Air Voids in Compacted Mixture Calculations (Va)

6.5.1 Calculate percent Air Voids of the compacted bituminous mixture at the design number of gyrations for each asphalt content as follows:

$$Va = 100 \ \frac{Gmm - Gmb}{Gmm}$$

NOTE: This equation simplifies to Va = 100 - % Gmm (at the design number of gyrations).

6.6 Percent Voids Filled in Compacted Mixture Calculations (VFA)

6.6.1 Calculate Voids filled in the compacted bituminous mixture at the design number of gyrations for each asphalt content as follows:

$$VFA = 100 \; \frac{VMA - Va}{VMA}$$

6.7 Asphalt Absorption Calculations (Pba)

6.7.1 Calculate the percent of asphalt absorption at the design number of gyrations as follows:

$$Pba = 100 \; \frac{(Gse - Gsb)}{(Gsb)(Gse)} \; Gb$$

NOTE: Gsb = % Gmm (Gmm) at the design number of gyrations.

6.8 Effective Asphalt Content Calculations (Pbe)

6.8.1 Calculate the effective asphalt content for bituminous mix at the design number of gyrations as follows:

$$Pbe = Pb - \frac{Pba}{100} Ps$$

6.9 Dust to Effective Asphalt Binder Content Calculations (D / A) or Dust Proportion

6.9.1 Calculate the dust to asphalt content for the bituminous mix as follows:

D / A = % passing 75 µm sieve / Pbe

7. SELECTING OPTIMUM ASPHALT BINDER CONTENT

7.1 Calculate the average density for each asphalt binder content at the design number of gyrations by multiplying by 1000 kg/m^3 and by 0.997 to correct for the density of water at 25°C.

7.2 Plot a graph for the following values:

Percent Maximum Gravity (Initial Gyrations) vs. Asphalt Content
Density (Design Gyrations) vs. Asphalt Content
Percent Air Voids (Design Gyrations) vs. Asphalt Content
Percent Voids Filled (Design Gyrations) vs. Asphalt Content
Percent VMA (Design Gyrations) vs. Asphalt Content

NOTE: In each graph connect the plotted values with a smooth curve that is the "best fit" for all values.

7.3 Optimum Asphalt Binder Content

7.3.1 The optimum asphalt content of the mix is the percent asphalt binder that yields the required percent air voids or percent maximum density (4.0% Va or 96.0% Gmm) at the design number of gyrations as specified for a particular mix.

7.3.2 Adjustments should be made in the bituminous mix if all the design criteria are not met by the optimum asphalt binder content. These criteria may be found in the specifications. In general these design criteria are:

% VMA
% VFA
D / A (based on effective asphalt content)
% Gmm at Initial Gyrations
% Gmm at Design Gyrations
% Gmm at Maximum Gyrations

7.4 Moisture Sensitivity

7.4.1 Use ALDOT-361, Resistance of Compacted Bituminous Mixtures to Moisture Induced Damage, to evaluate the mixture at the optimum binder content.

NOTE 1: 150 mm diameter specimens shall be used, compacted or sawed so that the specimen is less than 100 mm thick. If a polymer or other additive is present in the binder to significantly raise the binder viscosity, compact the specimens at a temperature where the binder has a viscosity between 2.5 and 3.1 Pascal-seconds (250 and 310 centiStokes). Otherwise follow ALDOT-361.

NOTE 2: A breaking head for 150 mm diameter specimens is required.

7.5 Excessive Drain Down of Asphalt Binder

7.5.1 Perform the Asphalt Binder Drain Down Test as per ALDOT-386. A new mix design with a gradation change or the addition of mineral fibers, cellulose fibers, polymers, etc. shall be performed if the drain down results are unsatisfactory.

8. DESIGN EXAMPLE FOR A 1 1/2" MAXIMUM SIZE MIX

8.1 As in the plans we know that the mix will be designed for 2.85 million ESAL's, that the gradation is based upon a 1 1/2" maximum aggregate size, and the aggregate properties are for a binder or surface mix (less than 100 mm from the surface). The plans will specify the binder performance grade to use.

8.2 Build an aggregate structure that meets the specifications for the designated mix.

1 1/2" MAXIMUM AGGREGATE SIZE

SIEVE SIZE		**GRADATION**	
(2 1/2")	63 mm	100	
(2")	50 mm	100	
(1 1/2")	37.5 mm	100	maximum size
(1")	25 mm	95.5	nominal maximum size
(3/4")	19 mm	89.4	
(1/2")	12.5 mm	74.1	
(3/8")	9.5 mm	57.6	
(No. 4)	4.75 mm	38.3	below restricted zone
(No. 8)	2.36 mm	25.5	coarser than restricted zone
(No. 16)	1.18 mm	16.9	below restricted zone
(No. 30)	0.60 mm	12.5	coarser than restricted zone
(No. 50)	0.30 mm	7.9	below restricted zone
(No. 100)	0.15 mm	4.1	
(No. 200)	0.075 mm	3.5	

8.3 The effective specific gravity (Gse) is estimated. Estimated effective specific gravity (Gsee):

$$Gsee = Gsb + 0.8 * (Gsa - Gsb)$$

$$Gsee = 2.701 + 0.8 * (2.767 - 2.701) = 2.754$$

8.4 The volume of asphalt binder absorbed (Vba) is estimated. Estimated volume of asphalt binder absorbed (Vbae):

$$Vbae = \{[(1 / Gsb) - (1 / Gsee)] [Ps (1 - Va)]\} / [(Pb / Gb) + (Ps / Gsee)]$$

$$Vbae = \{[(1 / 2.701) - (1 / 2.754)] [0.95 (1 - 0.04)]\} / [(0.05 / 1.02) + (0.95 / 2.754)]$$

$$Vbae = 0.0165 = 1.65\%$$

8.5 The volume of effective binder (Vbe) is estimated. Estimated volume of effective binder (Vbee):

$$Vbee = 0.176 - 0.0675 * (\text{logarithm base ten } (Sn))$$

$$Vbee = 0.176 - 0.0675 * (\text{logarithm } (25)) = 0.0816 = 8.16\%$$

NOTE: Sn is the nominal maximum size in millimeters.

8.6 The weight of aggregate per unit of mix (Ws) is estimated. Estimated weight of aggregate per unit of mix (Wse):

$$Wse = [Ps (1 - Va)] / [(Pb / Gb) + (Ps / Gsee)]$$

$$Wse = [0.95 (1 - 0.04)] / [(0.05 / 1.02) + (0.95 / 2.754)] = 2.315$$

8.7 The initial trial asphalt binder content (Pbi) is estimated. Estimated initial trial asphalt binder content (Pbie):

$$Pbie = 100 [Gb (Vbee + Vbae)] / [Gb (Vbee + Vbae) + Wse]$$

$$Pbi = 100 [1.02 (0.0816 + 0.0165)] / [1.02 (0.0816 + 0.0165) + 2.315] = 4.14\%$$

8.8 Two pills with the above gradation and 4.14% binder content are compacted with the gyratory compactor and a maximum specific (Rice) gravity test is performed on the mix. The bulk specific gravity of the pills at the design number of gyrations is performed and from the compaction curve generated by the gyratory compactor a correction factor is calculated. The bulk specific gravity of the pills is calculated using this correction factor at the initial number of gyrations from the compaction curve data. Using these bulk specific gravities the percent of maximum specific gravity at initial and design number of gyrations is computed.

8.9 The average percent of maximum specific gravity at the design number of gyrations is calculated to be 95.2%. Calculate the percent of air voids (Va) and the VMA at the design number of gyrations:

Va = 100 - % Gmm (corrected) at design gyrations

Va = 100 - 95.2 = 4.8%

VMA = 100 - ((% Gmm) (100% Gmm) (Ps) / Gsb)
This VMA is the initial VMA (VMAi).

VMAi = 100 - (95.2 * 2.568 * 0.955 / 2.701) = 13.56

8.10 Estimate the asphalt binder content (Pbe) to produce the design air voids of four percent:

Pbe = Pbi - (0.4 (4 - Va))

Pbe = 4.5 - (0.4 (4 - 4.8)) = 4.8

8.11 Estimate the VMA at this new binder content (VMAe):

VMAe = VMAi + C (4 - Va)

C is 0.1 if Va is less than 4%, 0.2 if Va is greater than 4%

VMAe = 13.5 + (0.2 (4.0 - 4.8)) = 13.3

A 1 1/2" maximum size mix must have a minimum VMA of 13.0, so the estimate looks good.

8.12 Estimate the VFA at this new binder content (VFAe).

VFAe = 100 (VMAe - 4) / VMAe

VFAe = 100 (13.3 - 4.0) / 13.3 = 69.9

A 2.85 million ESAL's mix should have between 65 and 78% VFA, so the estimate looks good.

8.13 Estimate the percent of maximum theoretical gravity at this new binder content (% Gmme)

For initial number of gyrations
% Gmmie = % Gmmi - (4 - Va)

NOTE: For design number of gyrations, % Gmmde = 96.0%

Initial
% Gmm = 86.3 - (4.0 - 4.8) = 87.1%

For a superpave mix the percent of maximum specific gravity at the initial number of gyrations must be below 89.0%, so the estimate looks good.

8.14 Estimate the effective asphalt content (Pbee):

Pbee = Pbe - [PsGb (Gse - Gsb) / GseGsb]

(Pbe is the estimated binder content from section 8.10.)

Pbee = 4.8 - [(95.3) (1.02) (2.754 - 2.701)] / (2.754) (2.701) = 4.1%

8.15 Estimate the dust to asphalt ratio at this new binder content (D/A).

D / A = D / Pbee

D / A = 3.5 / 4.1 = 0.85

The SP-2 manual refers to this as the Dust Proportion (DP). The percent of aggregate passing the 0.075 mm sieve by mass of aggregate (% 0.075) is divided by the effective binder content, percent by mass of total mixture (Pbe).

$$DP = \frac{\%\, 0.075\ mm}{Pbe}$$

DP = 3.5/4.1 = 0.85

For a coarse superpave mix the dust to asphalt ratio (the dust proportion) must be from 0.6 to 1.6, so the estimate looks good.

8.16 If these estimated values fail, then the mix will probably also fail. If the estimated % Gmmi is above 89.0% and % Gmmm is above 98.0% then the pills will probably close up during compaction which means that the mix will probably be tender and prone to rutting on the road. The same holds true for the estimated VMA, VFA, and D/A (DP). If these estimated values fail then a new gradation or different grade binder or other methods to strengthen the mix (like adding fibers or hydrated lime) should be tried to improve the mix.

8.17 If these estimates pass then the mix will probably also pass when compacted at the proper binder content to achieve 4.0% air voids (96.0% Gmm). Continue by compacting pills at four different binder contents as in the procedure.

9. REPORTING

9.1 The contractor shall submit a cover letter with the following information attached.

9.1.1 Source of all materials. All materials used shall be from an approved source.

9.1.2 Aggregate gradation and gravities.

9.1.3 .45 Power Chart.

9.1.4 Gyratory Compaction Data (Ni, Nd, and Nm).

9.1.5 Mix Properties (Plots from Section 7.2).

9.1.6 The Laboratory Density of the mix at the Optimum Asphalt Binder Content and the design number of gyrations.

9.1.7 Maximum theoretical specific gravity.

9.1.8 TSR Data.

ALDOT-385
DETERMINING ABSORPTION OF GRAVEL

1. Scope

1.1. This procedure modifies AASHTO T-85 to simulate long term absorption of gravel.

2. Applicable Documents

2.1. Alabama Department of Transportation Standard Specifications for Highway Construction, Section 801.

2.2. AASHTO T-85, Specific Gravity and Absorption of Coarse Aggregate.

2.3. AASHTO T-209, Maximum Specific Gravity of Bituminous Paving Mixtures.

3. Apparatus

3.1. All of the equipment listed in AASHTO T-85 is used. In addition, the following equipment from AASHTO T-209 is needed.

3.2. Container--The container may be either a glass or metal bowl, or a volumetric flask having a capacity of at least one liter. Containers shall be sufficiently strong to withstand a hard vacuum and shall have an airtight cover fitted with a hose connection to apply and measure the vacuum.

3.3. Vacuum Pump or Aspirator--A device capable of producing a vacuum of 30 mm Hg or less, measured in absolute pressure, is needed to remove the entrapped air from the gravel.

3.4. Hose and Manometer--This is needed to connect the container and the vacuum pump, and to insure that enough vacuum is applied.

4. Test Procedures

4.1. This test shall be run according to AASHTO T-85 with this addition to section 8.1 of AASHTO T-85.

4.1.1. Immediately prior to immersing the aggregate in water at room temperature for 15 to 19 hours perform the following. Place the gravel sample into the container and cover the sample with water at approximately room temperature. Remove entrapped air by subjecting the contents to a vacuum of 30 mm Hg or less absolute pressure for 13 to 17 minutes. Agitate the container and contents either continuously by mechanical device or manually by vigorous shaking at intervals of about two minutes. This is from sections 6.2 and 6.3 of AASHTO T-209. Minimize the gravel's exposure to air as the procedure continues according to AASHTO T-85, section 8.1.

ALDOT-386-95
DETERMINATION OF DRAINDOWN CHARACTERISTICS IN UNCOMPACTED BITUMINOUS MIXTURES

1. Scope

1.1. This test method covers the determination of the amount of draindown in an uncompacted bituminous mixture sample when the sample is held at elevated temperatures comparable to those encountered during the production, storage, transport, and placement of the mixture. The test is particularly applicable to mixtures such as porous asphalt (open-graded friction course) and Stone Matrix Asphalt (SMA).

1.2. The values stated in the gram-millimeter units are to be regarded as the standard.

1.3. This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1. AASHTO Standards:

2.1.1. T 245, Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.

2.1.2. M 92, Standard Specification for Wire-Cloth Sieves for Testing Purposes.

3. Definitions

3.1. Draindown - For the purpose of this test method, draindown is considered to be that portion of material, which separates itself from the sample as a whole and is deposited outside the wire basket during the test. The material, which drains, may be composed of either asphalt cement or a combination of asphalt cement and fine aggregate.

4. Summary of Method

4.1. A sample of the bituminous mixture to be tested is pre-pared in the laboratory or obtained from field production. The sample is placed in a wire basket, which is positioned on a pre-weighted dry plate. The sample, basket, and plate are placed in a forced air oven for one hour at a pre-selected temperature. At the end of one hour, the basket containing the sample is removed from the oven along with the plate and the plate is weighed to determine the amount of draindown that occurred.

5. Significance and Use

5.1. This test method can be used to determine whether the amount of draindown measured for a given bituminous mixture is within acceptable levels. The test also provides an evaluation of the draindown potential of an asphalt mixture produced in the field.

6. Apparatus

6.1. Oven, capable of maintaining the temperature in a range from 250 to 350°F (120 to 175°C). The oven should maintain the set temperature to within ± 4°F (2°C).

6.2. Plates of appropriate size. The plates used should be of appropriate durability to withstand the oven temperatures. Paper or metal plates (disposable or otherwise) are acceptable.

6.3. Standard basket meeting the dimensions shown in Figure 1. The basket shall be constructed using ¼ in (6.3mm) square openings.

6.4. Spatulas, trowels, mixer, and bowls as needed.

6.5. Balance accurate to 0.1 gram.

7. Sample Preparation

7.1. Laboratory Prepared Samples.

7.1.1. Number of Samples - For each mixture tested, the draindown characteristics shall be determined at three different temperatures. The three temperatures are the anticipated plant production temperature and 27°F (15°C) above and below. For each temperature, duplicate samples should be tested. Thus for one bituminous mixture, a mini-mum of six samples will be tested.

7.1.2. Dry the aggregate to constant mass and sieve it into appropriate size fractions as indicated in AASHTO T 245, section 3.2.

7.1.3. Determine the anticipated plant production temperature or select a mixing temperature in accordance with AASHTO T 245, section 3.3.1.

7.1.4. Weigh into separate pans for each test sample the amount of each size fraction required to produce completed mixture samples having a mass of 1200 grams. The aggregate fractions shall be combined such that the resulting aggregate blend has the same gradations as the job-mix-formula. Place the samples in an oven and heat to a temperature not to exceed the mixing temperature established in 7.1.3 by more than approximately 80°F (28°C).

7.1.5. Heat the asphalt cement to the temperature established in 7.1.3.

7.1.6. Place the heated aggregate in the mixing bowl. Add any stabilizers (Note 1) and thoroughly mix the dry components. Form a crater in the aggregate blend and add the required amount of asphalt. The amount of asphalt shall be that established in the job-mix-formula. At this point, the temperature of the aggregate and asphalt cement shall be within the limits of the mixing temperature established in 7.1.3. Mix the aggregate (and stabilizer if any) and asphalt cement quickly until the aggregate is thoroughly coated.

7.2. Plant Produced Samples.

7.2.1. Number of Samples - For plant produced samples, duplicate samples should be tested at the plant production temperature. Samples may be obtained during plant production by sampling the mixture at any appropriate location such as the trucks prior to the mixture leaving the plant or at the paver.

7.2.2. Samples obtained during actual production should be reduced to the proper test sample size by the quartering method.

8. Procedure

8.1. Transfer the laboratory produced or plant produced uncompacted mixture sample to a tared wire basket described in 6.3. Any aggregate that falls through the basket and onto the plate during the transfer should be removed and wasted. Place the entire sample in the wire basket. Do not consolidate or otherwise disturb the sample after transfer to the basket. Determine the mass of the sample to the nearest 0.1 gram.

8.2. Dry a plate, at the temperature listed below, for a minimum of 10 minutes. Immediately determine and record the mass of the plate to the nearest 0.1-gram. Place the basket on the paper plate and place the assembly into the oven at the temperature as determined in 7.1.1 or 7.2.1 for 1-hour ± 1 minute.

8.3. After the sample has been in the oven for 1-hour ± 1 minute, remove the basket and paper plate. Remove any pieces of aggregate, which may have passed through the sieve and onto the plate. Determine and record the mass of the plate plus drained asphalt cement to the nearest 0.1-gram.

9. Calculations

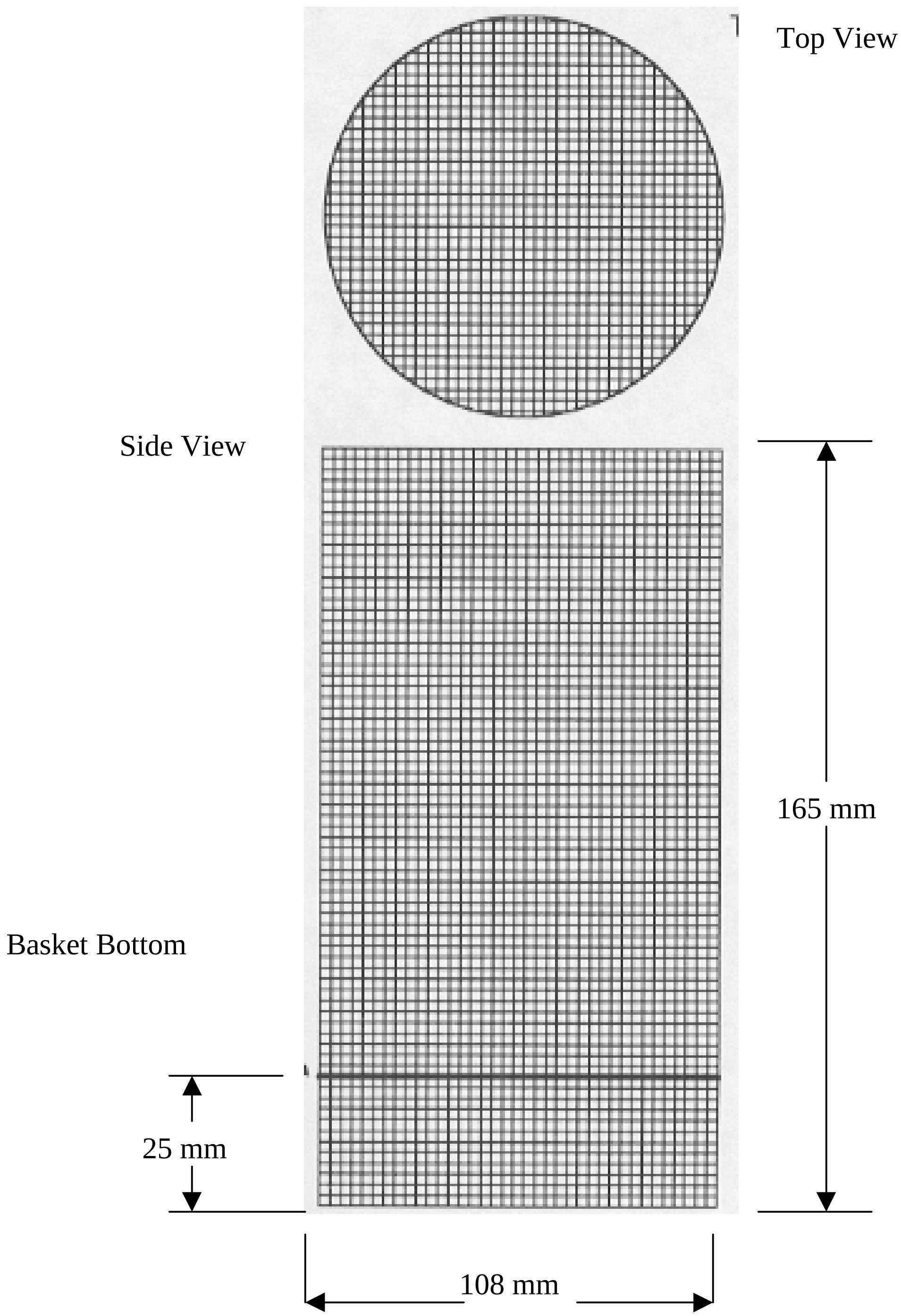
9.1. Calculate the percent of mixture which drained by subtracting the initial paper plate mass from the final paper plate mass and divide this by the initial total sample mass. Multiply the result by 100 to obtain a percentage.

10. Reporting

10.1. Report the average percent draindown at each of the test temperatures.

Note 1: Some types of stabilizers such as fibers or some polymers must be added directly to the aggregate prior to mixing with the asphalt cement. Other types must be added directly to the asphalt cement prior to blending with the aggregate. Also, some modifiers are preblended with asphalt cement.

Figure 1 - Wire Basket Assembly



ALDOT-388
SUPERPAVE VOLUMETRIC MIX DESIGN PROCEDURE USING RECLAIMED ASPHALT PAVEMENT

1. Scope

1.1. This procedure covers designing hot mix asphalt paving mixtures using reclaimed asphalt pavement (RAP) and should be used in conjunction with ALDOT-384. This method is for use with mixtures with a gradation such that one hundred percent of the aggregate passes the 2.5 in (63.0 mm) sieve and one hundred percent of the RAP passes the 2.0 in (50.0 mm) sieve.

2. Referenced Documents

2.1. AASHTO Standards

2.1.1. AASHTO T-49, Penetration of Bituminous Materials

2.1.2. AASHTO T-164, Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

2.1.3. AASHTO T-170, Recovery of Asphalt from Solution by Abson Method

2.1.4. AASHTO T-201, Kinematic Viscosity of Asphalts

2.1.5. AASHTO T-202, Viscosity of Asphalts by Vacuum Capillary Viscometer

2.1.6. AASHTO T-228, Specific Gravity of Semi-Solid Bituminous Materials

2.1.7. AASHTO MP1, Performance-Graded Asphalt Binder

2.2. ASTM Standards

2.2.1. ASTM D 4402, Standard Test Method for Viscosity Determinations of Unfilled Asphalts Using the Brookfield Thermosel Apparatus

2.3. ALDOT Procedures

2.3.1. ALDOT-258, Mechanical Analysis of Extracted Aggregate

2.3.2. ALDOT-372, Approval of RAP Stockpiles

2.3.3. ALDOT-384, Mix Design Procedure for Superpave Level One

2.4. Other Documents

2.4.1. The Asphalt Institute Manual, SP-1, Performance Graded Binder Specification and Testing, The Asphalt Institute, Lexington, KY, Current Edition.

2.4.2. The Asphalt Institute Manual, SP-2, Superpave Level 1 Mix Design, The Asphalt Institute, Lexington, KY, Current Edition.

2.4.3. The Asphalt Institute Manual, MS-2, Mix Design Methods for Asphalt Concrete, The Asphalt Institute, Lexington, KY, Current Edition.

3. Evaluate Reclaimed Asphalt Pavement

3.1. Sample and test the RAP stockpile according to ALDOT-372.

3.2. Determine the gradation of the extracted aggregate by ALDOT-258.

3.3. Recover approximately 100 g of binder by AASHTO T-170. If the binder can not be recovered from the RAP (i.e. the RAP contains less than 1% binder) treat the RAP as an aggregate.

3.4. Determine the viscosity of the reclaimed binder at 140°F (60°C) by AASHTO T-202. If possible, run three to five samples and take the average, however, one to two will suffice.

3.5. If the viscosity of the binder is too high to easily measure, measure penetration at 77°F (25°C) by AASHTO T-49 and viscosity at 135°C by AASHTO T-201; using the Asphalt Consistency Temperature Chart (Figure 1), estimate the viscosity at 140°F (60°C).

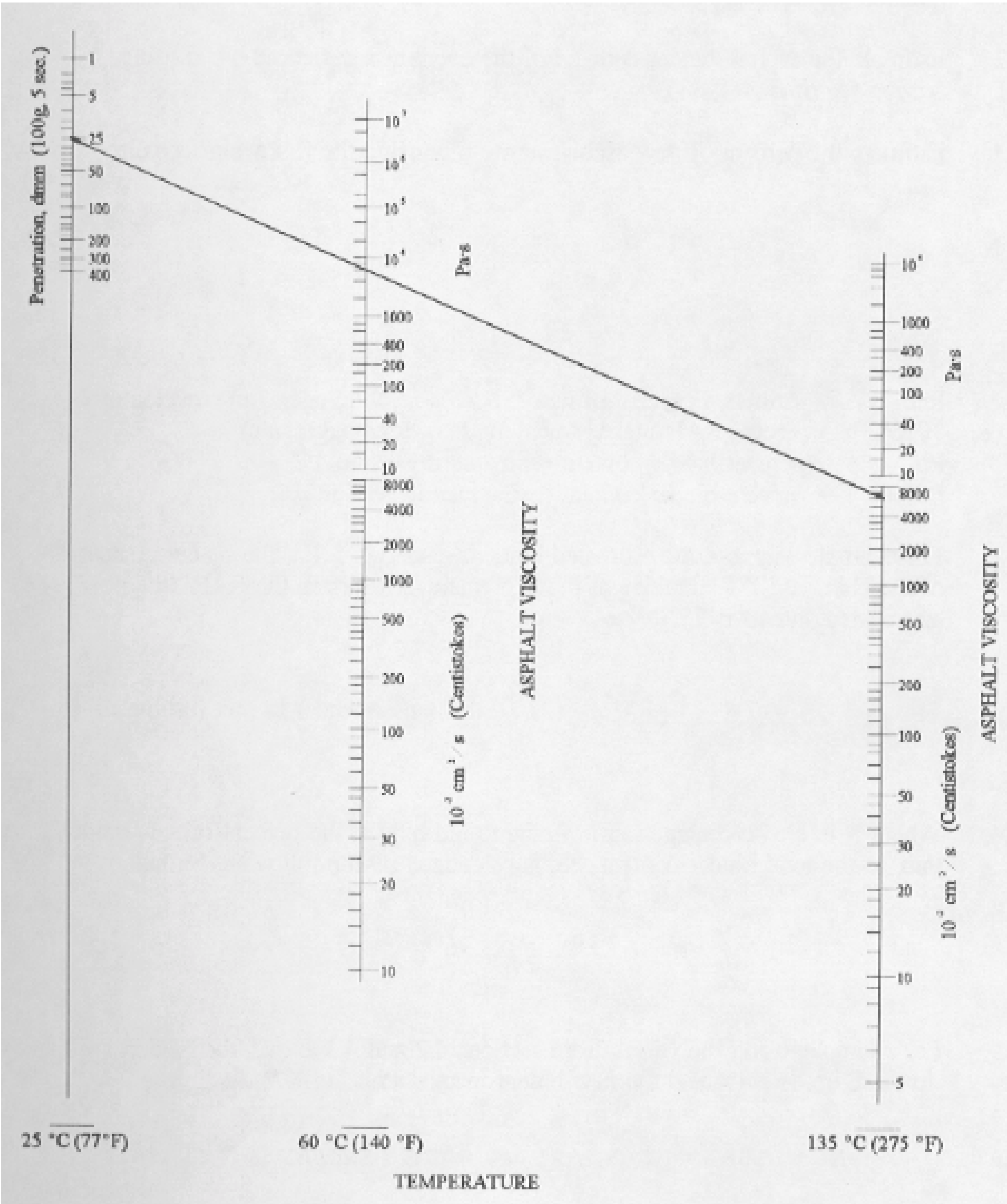
For example, suppose that at 77°F (25°C) the recovered binder has a penetration of 25, and at 275°F (135°C) the recovered binder has a viscosity of 4,500 centistokes. Using the Asphalt Consistency Temperature Chart, the viscosity at 140°F (60°C) estimated to be 6,000 pascal-seconds (60,000 poises).

NOTE: To convert the viscosity in centistokes to poises multiply the viscosity in stokes by the specific gravity of the binder (from AASHTO T-228). To convert the viscosity in poises to pascal-seconds divide the viscosity in poises by ten (10).

3.6. The average value of the viscosity of the recovered asphalt will later (see section 4.6) be plotted on the left vertical axis on Figure 2, "Viscosity Blending Chart."

Example 1, Figure 1

Asphalt Consistency – Temperature Chart



4. Estimate Rap Blend Properties (From MS-2)

4.1. Using the extracted RAP aggregates, estimate the percent of RAP to be used in the mixture to design an aggregate structure required in ALDOT-384 (the most practical amounts are 25% or less).

4.2. Estimate the asphalt binder demand of the combined aggregate blend using section 5.3 of ALDOT 384.

4.3. Estimate the percent of new asphalt in the mix using the following formula:

$$Pnb = Pb - \frac{Prb \ \ X \ \ \% \ RAP}{100}$$

Where:
Pnb = estimated percent of new binder (recycling agent) in recycled mix.
% RAP = percent RAP aggregate (by mass of total aggregate).
Pb = percent binder content estimated in section 4.2.
Prb = percent binder content determined in section 3.1.

For example, suppose the estimated binder demand is 5.4%, the binder content of the RAP is 4.7% and 25% of the aggregate comes from the RAP (the new aggregate content is 75%).

$$Pnb = 5.4\% - \frac{4.7\% \ X \ 0.25}{100} = 4.2\% \text{ new binder in mix (estimated)}$$

4.4. Where R is the percentage ratio of new to old binder, the percent of new binder, Pnb, to the total binder content, Pb, is calculated by the following formula:

$$R = \frac{100 \ X \ Pnb}{Pb}$$

For example, using the values from sections 4.2 and 4.3 above, the binder demand, Pb, is 5.4% and the new binder in mix, Pnb, is 4.7%.

$$R = 100 \ X \ \frac{4.2}{5.4} = 78 \text{ Percent}$$

4.5. Select the desired target viscosity of the final binder (check the specifications, this is usually 300 Pa-s or 3,000 Poises).

4.6. Use Figure 2, Asphalt Cement Blending Chart, to estimate the viscosity of the new binder (recycling agent) to be used. Plot the viscosity of the aged RAP binder on the left hand vertical scale from section 3.4 or 3.5. Draw a vertical line representing the percentage of new asphalt, R, from section 4.4 and determine its intersection with the horizontal line representing the target viscosity from section 4.5. Then draw a straight line from the RAP binder viscosity through this intersection point until it intersects the right vertical scale. The binder viscosity through this intersection point until it intersects the right vertical scale. The point on the right vertical scale is the estimated viscosity of the new binder (recycling agent) used to obtain the target viscosity in section 4.5.

For example, using the values from sections 3.5 and 4.4, suppose the aged RAP binder viscosity is 6,000 Pascal-seconds and 78 percent of the total binder in the mix will be new binder. Also assume the mix target viscosity is 300 Pascal-seconds. Using the Asphalt Cement Blending Chart the new binder used in the mix should have a viscosity of 130 Pa-s. If this recycling agent may not be used, according to the specifications, reduce the amount of RAP to be used and recalculate.

5. Modifications to ALDOT-384, Mix Design Procedure for Superpave Level I

5.1. Use ALDOT-384 with the following modifications, adding the same percentage of RAP to each batch while mixing.

5.2. Use the percentage of binder needed as estimated in step 4.2 as the estimate of the mix design content (from section 5.3 in ALDOT-384).

5.3. When drying the aggregates prior to bathing do not dry the RAP above 140°F (60°C). If possible, air dry the RAP to avoid further hardening.

5.4. When batching, do not mix the RAP with the other aggregates. Keep the RAP dry, in a separate container until mixing.

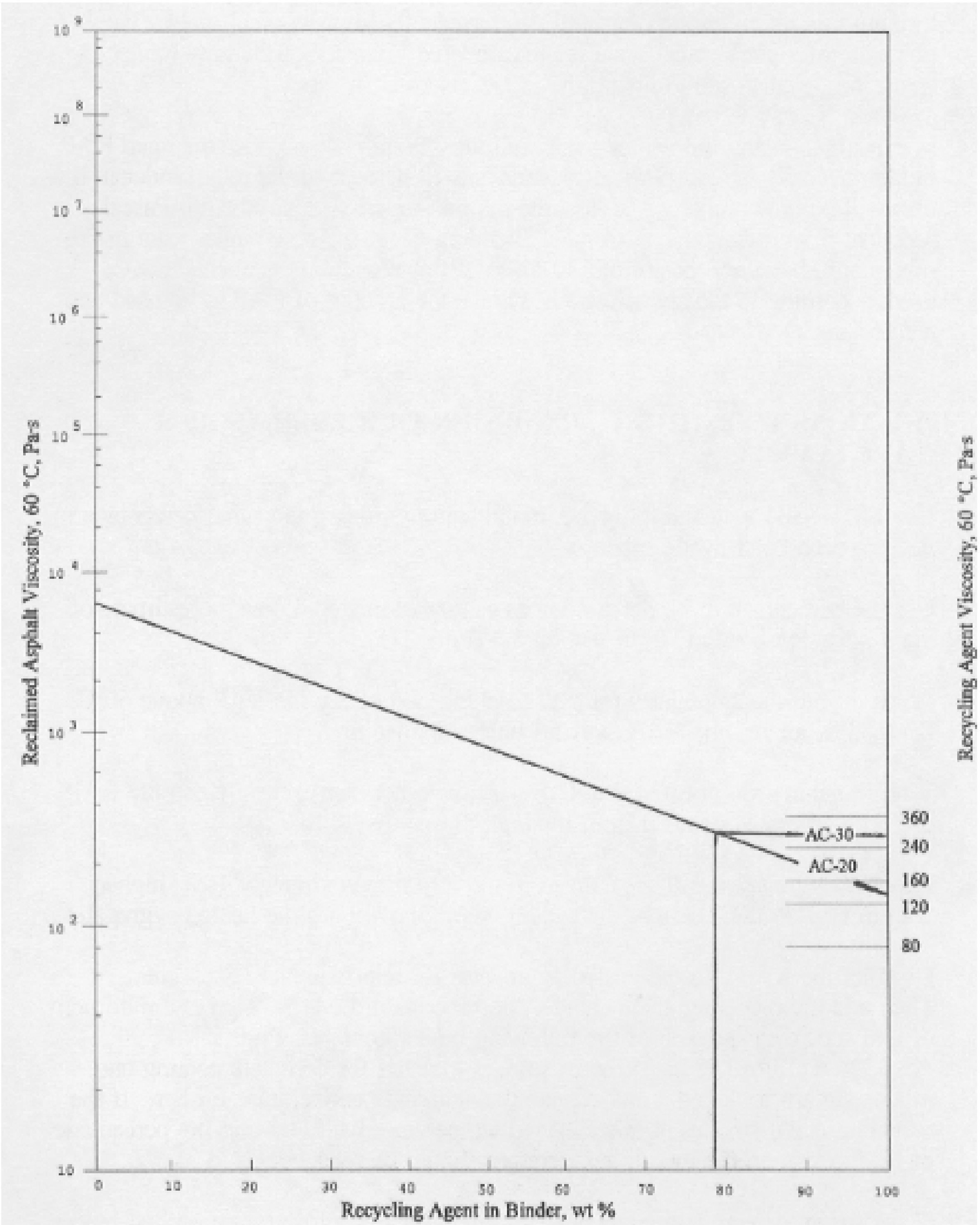
5.5. Heat the aggregates, still separate from the RAP, approximately 10°C higher than in ALDOT-384. Charge the heated mixing bowl with the heated aggregates.

5.6. Dry mix the RAP into the heated aggregates for approximately 30 seconds. Then add the recycling agent (binder) and mix as in ALDOT-384 (i.e. a mini-mum of two specimens at each of the following binder contents: Pb-0.5%, Pb, Pb+0.5% and Pb+1.0%). If the mixture is too stiff for complete coating and mixing, return to step 4.4 and elevate the aggregate temperature further. If the recycling agent smokes at this elevated temperature while mixing the percentage of RAP used and the mixing temperature should be reduced.

5.7. Compaction, density and voids analysis, and selection of optimum asphalt binder content are as in ALDOT-384.

Example 2, Figure 2

Viscosity Blending Chart



6. Viscosity, Dust Proportion, and Fine Aggregate Angularity

6.1. Make at least one batch of at least 5,000 g according to section 4 of this procedure at the optimum binder content as determined by ALDOT-384.

6.2. Extract and recover the asphalt binder by AASHTO T-164 and T-170. Save the remaining aggregate. Determine the viscosity of the recovered asphalt binder using AASHTO T-202.

6.3. Determine if this viscosity meets the specifications.

6.4. Check the aggregate properties of the aggregate (saved in step 5.2) to determine if they meet the specifications. Particularly check the dust to effective asphalt ratio (dust proportion) and the fine aggregate angularity (uncompacted voids analysis).

6.5. If step 6.3 fails to meet the specifications use a lower viscosity recycling agent or reduce the percentage of RAP. If step 6.4 fails to meet the specifications the aggregate structure (percentage RAP or RAP source) must be changed.

Figure 1

Asphalt Consistency – Temperature Chart

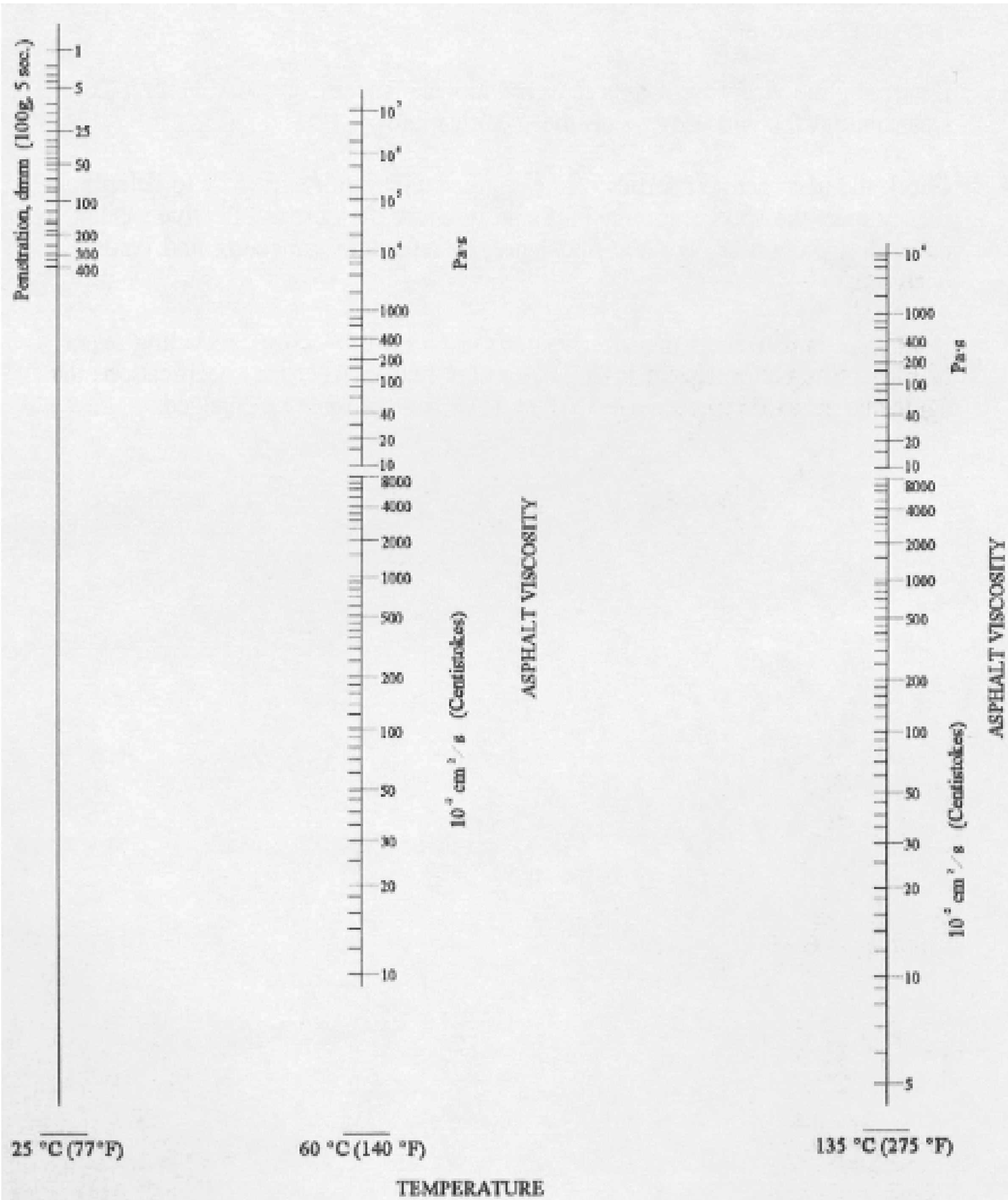
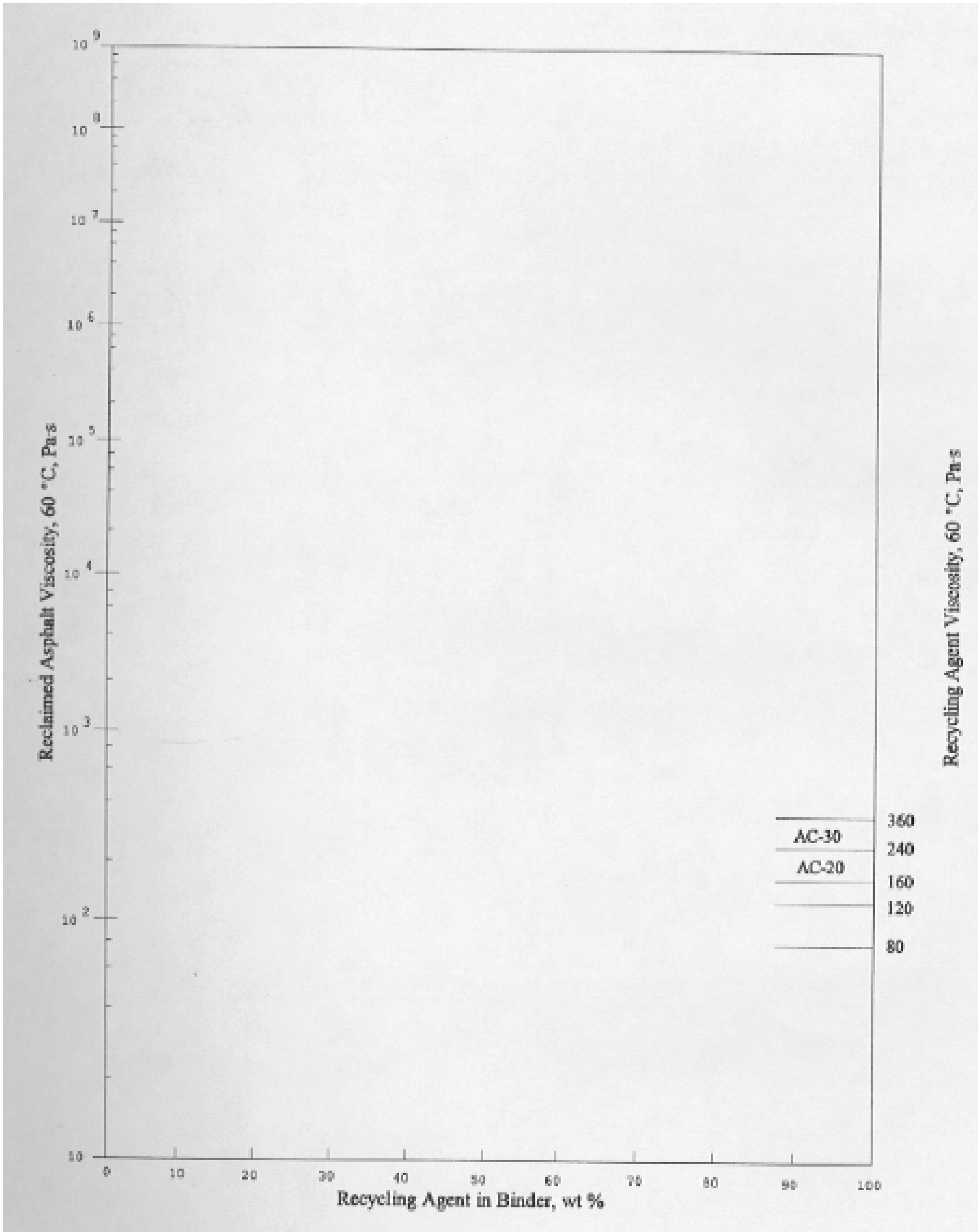


Figure 2

Viscosity Blending Chart



ALDOT-389
EVALUATION OF SEGREGATED AREAS IN HOT MIX ASPHALT PAVEMENT

1. Scope

1.1. The objective of this procedure is to quantify areas of unacceptable segregation. Segregation in hot mix asphalt is the non-uniform distribution of aggregate with different sizes. Thus, segregation involves a concentration of coarse materials in a specific area and fines in another area.

2. Referenced Documents

2.1. Alabama Department of Transportation Specifications

2.2. ALDOT-258, "Mechanical Analysis of Extracted Aggregates"

2.3. AASHTO TP 53, "Standard Test Method for Determining the Asphalt Content of Hot Mix Asphalt (HMA) by Ignition Method"

3. Summary of Procedure

3.1. This procedure identifies unacceptable segregation by evaluating the gradation analysis and asphalt content of 6 in (150mm) diameter cores taken anytime visual observation indicates segregated areas.

3.2. Observations should be made and cores should be taken as soon as possible after mat compaction; however, cores may be taken anytime prior to covering with an overlying layer, or, in case of wearing surface layer, upon completion of the hot mix pay items. Anytime visual observations indicate obvious or suspected unacceptable segregation, cores shall be taken no later than the next working day. The asphalt content and gradation analysis of the core will be used in determining deviations from the Job Mix Formula (JMF) and specification tolerances.

3.3. All areas determined to be beyond specification limits shall be marked and referenced for removal.

4. Determination of Test Locations

4.1. Segregation may be present in isolated areas or may be in continuous longitudinal strips along the roadway. By visual observance, all suspicious or obvious segregation shall be marked and referenced for testing. Coarse areas and fine areas shall be marked separately.

5. Test Procedure

5.1. Within isolated marked areas, select the two most segregated spots (points), at least 20 in (0.5m) apart, and extract one core at each point.

5.2. Within continuous longitudinal strips, select the two most segregated spots (points) within a 150 ft (50 m) section, and extract one core at each point.

5.3. See Figure 1 showing examples of sampling points.

5.4. The percent asphalt content of the two cores should be determined in accordance with AASHTO TP 53 (ignition oven). Once the asphalt content has been determined, utilize ALDOT-258 to obtain a gradation analysis of the remaining aggregates. Aggregates from both cores should be combined before per-forming a gradation analysis.

5.5. When coring, each core shall be taken completely through the layer to be tested. The layer to be tested shall be separated from other layers in the laboratory by sawing or other suitable means.

5.6. All testing of the cores shall be performed by Department or contractor technicians using an ignition oven and testing laboratory. Contractor testing will be witnessed by Department technicians; likewise, Department testing may be witnessed by contractor technicians.

5.7. The location of cores taken shall be determined by the Department inspector.

6. Evaluations

6.1. Segregated areas will be evaluated by comparing the percent asphalt content and gradation analysis of two cores to the design information found on the job mix formula.

6.2. Compute the deviation between the percent asphalt content of the cores deter-mined by the ignition method to the design percent asphalt content from the job mix formula. Average the two deviations. If the average deviation is in excess of ± 0.50 percentage points from the design amount, then the area is considered segregated.

6.3. Determine the maximum size aggregate utilized in the mix from the Job Mix Formula (JMF) and use Table 1 to determine which sieves to use in the evaluation process.

Table I

Determination of Sieves Utilized In Segregation Evaluation	
Maximum Size Aggregate	**Sieves Utilized**
1.5 in (37.5 mm)	½ in and No. 4 (12.5 mm and 4.75 mm)
1.0 in (25.0 mm)	3/8 in and No. 4 (9.5 mm and 4.75 mm)
¾ in (19.0 mm)	No. 4 and No. 8 (4.75 mm and 2.36 mm)
½ in (12.5 mm)	No. 8 (2.36 mm)

6.4. Compare the gradation of the selected sieves to the design gradation from the Job Mix Formula. If the deviation for either sieve varies ± 10 percentage points or more from the design gradation, the area is considered segregated.

6.5. If either asphalt content or gradation analysis of any selected sieves are deter-mined to exceed the allowable tolerances found in Table 2, the area will be considered segregated.

Table II

Test	Allowable Tolerances
Asphalt Content	± 0.50 % Deviation of Design Percent AC
Gradation Analysis	± 10 % Deviation from Job Mix Formula

7. Report

7.1. The following information shall be included on a report for each segregated area or section. See Figure 2 for a sample report form.

7.1.1. Project Number and County

7.1.2. Production Lot and Date Produced

7.1.3. Location of Cores (Station and Offset)

7.1.4. Copy of Approved JMF

7.1.5. Percent AC from JMF

7.1.6. Percent AC from Ignition Method

7.1.7. Average Deviation of Core Percent AC to the Percent AC from JMF

7.1.8. Maximum Aggregate Size and Select Sieves Utilized

7.1.9. Gradation Analysis of Combined Cores on Selected Sieves

7.1.10. JMF - Percent Passing Selected Sieves

7.1.11. Deviation of the Combined Gradation Analysis of the two Cores on Selected Sieves to the Percent Passing from JMF

7.1.12. Signatures of Certified Technicians

Figure 1

Examples of Hot Mix Asphalt Segregation Areas

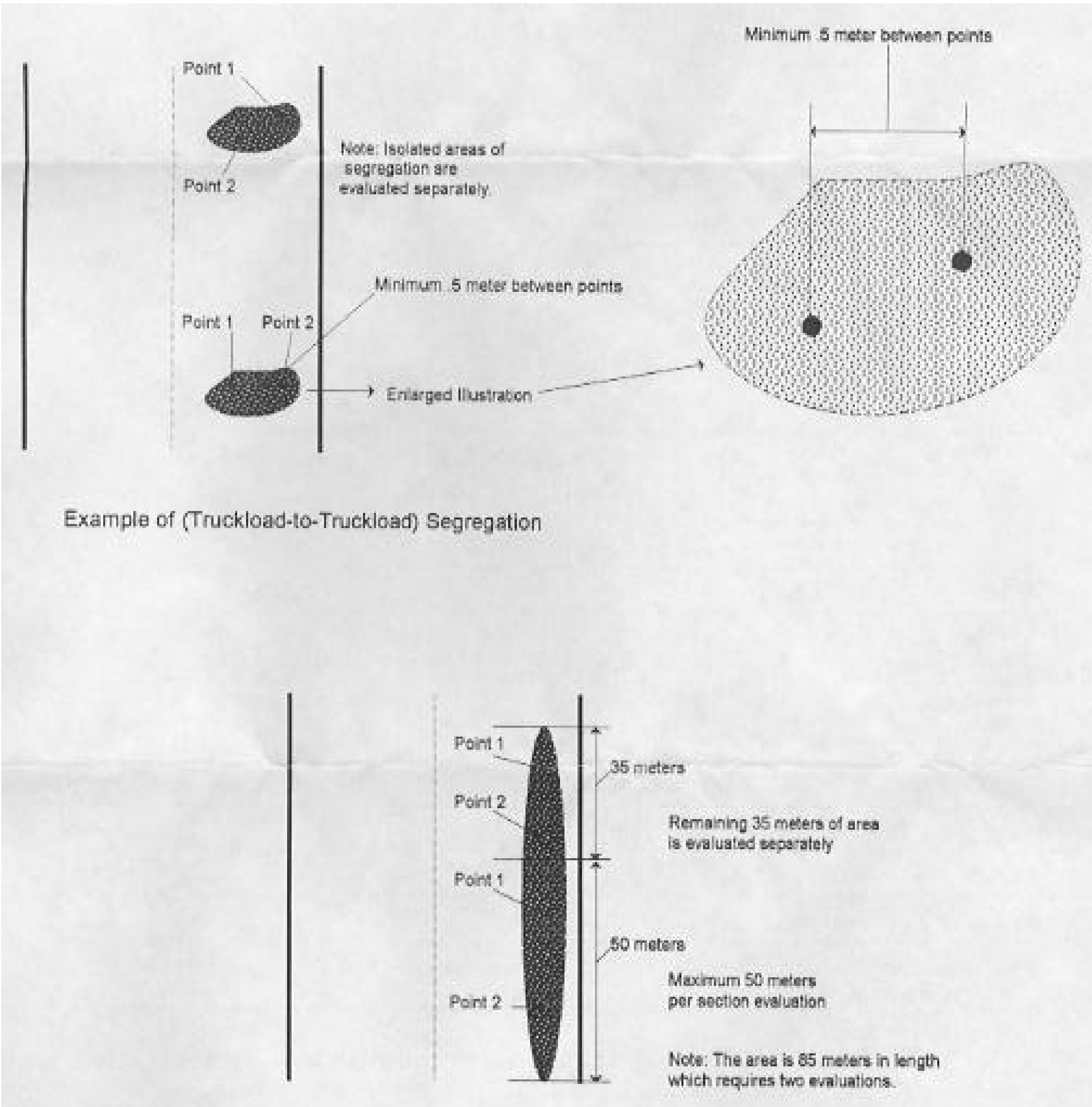


Figure 2

Segregation Evaluation Report

Copies:
District Engineer
Project Engineer
File

Project Number: ____________________
County: ____________________
Date: ____________________

Layer Tested: ________________ Layer Thickness: ______________ Date Placed: ________________

Evaluation Site Information	
Production Lot Number	
Location of Evaluation Site (Station)	
Location of Evaluation Site (Offset)	

Asphalt Content Evaluation		
Design % AC (A)		
% AC of Core 1 / Core 2		
Average % AC of Cores (B)		
Absolute Difference between Average % AC of Cores and Design % AC* (A – B)		

* Allowable Tolerance = 0.50% Maximum

Gradation Analysis Information		
Input the Selected Sieve Sizes	mm	mm
Design Percent Passing (JMF)		
Sample Gradiation % Passing		
Absolute Difference between Sample and Design % Passing**		

** Allowable Tolerance = 10% Maximum (Each Sieve)

______________________________ Contractor Certified Technician

______________________________ ALDOT Certified Technician

ALDOT-395
STONE MATRIX ASPHALT MIX DESIGN

1. Scope

1.1. This procedure covers the design of stone matrix asphalt (SMA) using either the SHRP gyratory compactor or the Marshall hammer. The design is based on the volumetric properties of the SMA including air voids, voids in the mineral aggregate, stone on stone contact, and mortar properties.

2. Referenced Documents

2.1. AASHTO Standards

2.1.1. AASHTO MP1, Specification for Performance Graded Asphalt Binder

2.1.2. AASHTO T-19, Unit Weight and Voids in Aggregate

2.1.3. AASHTO T-27, Sieve Analysis of Fine and Coarse Aggregates

2.1.4. AASHTO T-84, Specific Gravity and Absorption of Fine Aggregate

2.1.5. AASHTO T-85, Specific Gravity and Absorption of Coarse Aggregate

2.1.6. AASHTO TP1, Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)

2.1.7. AASHTO TP5, Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer (DSR)

2.2. ALDOT Documents

2.2.1. Materials, Sources, and Devices with Special Acceptance Requirements manual

2.2.2. ALDOT-307, Design Method for Selecting Optimum Asphalt Cement Content of Bituminous Mixtures by Means of the Marshall Apparatus

2.2.3. ALDOT-361, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage

2.2.4. ALDOT-384, Mix Design Procedure for Superpave Level 1

2.2.5. ALDOT-386, Determination of Draindown Characteristics in Uncompacted Bituminous Mixtures

2.2.6. ALDOT-399, Testing of HMA Mortars

3. Definitions And Nomenclature

3.1. SMA - stone matrix asphalt - SMA is a hot mix asphalt consisting of two parts - a coarse aggregate skeleton and an asphalt rich mortar. The aggregate skeleton must have stone on stone contact and the mortar must possess good rheometric properties as in the specifications.

3.2. SMA mortar - The mixture of polymerized liquid asphalt binder, mineral dust (mineral filler), and fiber.

3.3. Voids in the Coarse Aggregate (VCA) - The volume in between the coarse aggregate particles. This volume includes the mineral filler, the fine aggregate, air voids, polymerized liquid asphalt binder, and fiber.

4. Procedures

4.1. Determine if the mix is for a wearing layer. Select an aggregate structure (gradation) and performance grade liquid asphalt binder based upon the specifications, plans, and proposal.

4.2. Select fine and coarse aggregates (reclaimed asphalt pavement is not allowed in SMA) from ALDOT approved sources (see Materials, Sources, and Devices with Special Acceptance Requirements manual, List I-1). Select a mineral filler that meets the specifications.

4.3. Dry aggregates to a constant weight (mass) at approximately 230°F (110°C) and separate each aggregate into the following size fractions:

1 1/2 to 1"	(37.5 to 25.0 mm)
1 to 3/4"	(25.0 to 19.0 mm)
3/4 to 1/2"	(19.0 to 12.5 mm)
1/2 to 3/8"	(12.5 to 9.5 mm)
3/8" to No. 4	(9.5 to 4.75 mm)
No. 4 to No. 8	(4.75 to 2.36 mm)
Passing No. 8	(2.36 mm)

4.4. Combine the aggregates in a blend that falls within the master ranges specified. These ranges are based on percent passing by volume. These gradations based on volume are converted to weight (mass) for mixture design and control. It is recommended that at least three trial blends be evaluated.

4.5. In general, the mixing temperature is the temperature where the liquid asphalt binder has a viscosity of 170 ± 20 cSt and the compaction temperature is the temperature where the liquid asphalt binder has a viscosity of 280 ± 30 cSt; however, since the liquid asphalt binder contains polymer the mixing and compaction temperatures may be different, so the manufacturer's recommendations and guidelines should be followed to determine mixing and compaction temperatures.

4.6. Using a mechanical mixer, an initial batch shall be mixed to coat the mixing bowl and stirrers (this is usually referred to as "buttering"). This batch shall be emptied after mixing and the sides of the bowl and stirrers scraped clean with a limber spatula. Do not clean the bowl and stirrer with solvents unless the liquid asphalt binder or aggregate source is changed (in which case, re-butter the bowl and stirrers).

4.7. Weigh into separate containers for each test specimen the amount of each size fraction required to produce a batch of aggregate that will result in a compacted specimen of the correct size. For Marshall compaction this is 2 1/2" (63.5 mm) and approximately 1200 grams. Up to four Marshall specimens may be batched at once, but care must be taken not to segregate the mixture. For Superpave compaction this is 4 1/2" (115 mm) and approximately 4500 grams. The amount of aggregate in each batch shall be adjusted to produce compacted specimens of the correct height (within 5 percent is usually accurate enough).

4.8. Mix the aggregate in each container and place in an oven and heat to no more than 500°F (280°C) above the mixing temperature established in section 4.5. Heat the liquid asphalt binder to the mixing temperature. The stabilizing fiber shall be added to and mixed with the aggregates prior to the addition of the liquid asphalt binder. If the fiber is not thoroughly mixed with the aggregate prior to the liquid asphalt binder, the fiber will clump and the results will be invalid.

4.9. Form a crater in the dry blended aggregate and fiber and pour into the crater the required amount of liquid asphalt binder. At or above the mixing temperature, mix the aggregate, liquid asphalt binder, and fiber until the aggregate and fiber are thoroughly coated.

4.10. Age and compact the specimens according to ALDOT-307 (Marshall) or ALDOT-384 (Superpave) and the specifications. Use the procedures in ALDOT-307 (Marshall) or ALDOT-384 (Superpave) to determine the optimum asphalt content for each trial blend.

4.11. Evaluate the trial blends for air voids (Va) and voids in the mineral aggregate (VMA) using the equations in ALDOT-307 (Marshall) or ALDOT-384 (Superpave). Evaluate the trial blends for voids in the coarse aggregate of the mix (VCA_{MIX}) using the equations found in Section 6, Examples, in this procedure.

4.12. Evaluate the tensile strength ratio (TSR) and drain down properties of the best trial gradation at the optimum asphalt content using ALDOT-361 and ALDOT-386.

Note: It may be difficult to obtain more than 7 percent Va for the TSR test; as long as the Va is equal to or greater than 6 percent the results will still be valid.

4.13. Evaluate the mortar properties of the best trial gradation using ALDOT-399. If the equipment to perform the evaluation is not available, the Liquid Asphalt Section of the Bituminous Laboratories will evaluate the mortar.

4.14. At least 200 grams of the filler composing the mortar must be proportioned and provided in a separate container. The correct amount of liquid asphalt binder to be added to 100 g of the filler must be shown in the report or included with the filler.

4.15. The mortar is tested at the high temperature of the PG grade using the Dynamic Shear Rheometer (TP5) in accordance with MP1.

4.16. The mortar is tested at the low temperature of the PG grade using the Bending Beam Rheometer (TP1) in accordance with MP1.

5. Mixture Adjustments

5.1. The Air Void content may be adjusted by changing the asphalt content. If changing the asphalt content drops the VMA or asphalt content below the minimum in the specifications, the air voids must be adjusted by changing the gradation.

5.2. The VMA may be raised by increasing the percentage of coarse aggregate. Changing the aggregate source may also help raise VMA.

5.3. The VCA_{MIX} may be lowered by changing the gradation (typically by increasing the percentage of coarse aggregate) or by changing the aggregate source.

5.4. The drain down may be lowered by increasing the amount of fibers used or by changing the source of the fibers.

5.5. The mortar may be adjusted by changing the type and/or amount of filler, fiber, and/or polymer used in the mortar.

6. Examples

6.1. Percent Passing By Volume: With SMA the specific gravities of different aggregate components are not always similar enough to blend based upon weight (mass); this is especially true when comparing mineral fillers to the other aggregates. Therefore, SMA gradation bands are based upon percent passing by volume. If the bulk specific gravities of the different aggregates (including the mineral filler) vary by less than 0.025, gradations based on weight (mass) may be used.

6.2. Perform gradation testing by AASHTO T-27. Determine the bulk specific gravity of the aggregates by AASHTO T-84 and T-85. Table 1 gives the results.

Table 1

Sieve Size	**Percent Passing Based Upon Weight (Mass) and Bulk Specific Gravity**			
	Aggregate A	**Aggregate B**	**Aggregate C**	**Mineral Filler**
1" (25 mm)	100.0	100.0	100.0	100.0
3/4" (19 mm)	95.0	100.0	100.0	100.0
1/2" (12.5 mm)	66.0	71.0	97.4	100.0
3/8" (9.5 mm)	43.0	46.0	84.6	100.0
# 4 (4.75 mm)	9.0	6.0	48.9	100.0
# 8 (2.36 mm)	5.0	4.5	27.8	100.0
# 16 (1.18 mm)	2.9	4.0	16.6	100.0
# 30 (0.60 mm)	2.5	3.4	10.7	100.0
# 50 (0.30 mm)	2.0	3.0	7.6	96.0
# 100 (0.15 mm)	1.5	2.5	6.5	83.0
# 200 (0.075 mm)	1.0	1.5	4.6	72.5
Gsb	2.616	2.734	2.736	2.401

6.3. The second step is to determine the percent by weight (mass) retained on each individual sieve. For a given sieve this is calculated by subtracting the percent passing the given sieve from the percent passing the next larger sieve. For example, the percent retained on the No. 4 (4.75 mm) sieve for aggregate A is 43 - 9 = 34. This is not a cumulative weight (mass) retained, it is the weight (mass) retained on the individual sieve. Table 2 shows the percent by weight (mass) retained for each individual sieve. The calculations may be checked by totaling each column to 100.

Table 2

	Percent by Weight (Mass) Retained for Each Individual Sieve			
Sieve Size	**Aggregate A**	**Aggregate B**	**Aggregate C**	**Mineral Filler**
1" (25 mm)	0.0	0.0	0.0	0.0
3/4" (19 mm)	5.0	0.0	0.0	0.0
1/2" (12.5 mm)	29.0	29.0	2.6	0.0
3/8" (9.5 mm)	23.0	25.0	12.8	0.0
# 4 (4.75 mm)	34.0	40.0	35.7	0.0
# 8 (2.36 mm)	4.0	1.5	21.1	0.0
# 16 (1.18 mm)	2.1	0.5	11.2	0.0
# 30 (0.60 mm)	0.4	0.6	5.9	0.0
# 50 (0.30 mm)	0.5	0.4	3.1	4.0
# 100 (0.15 mm)	0.5	0.5	1.1	13.0
# 200 (0.075 mm)	0.5	1.0	1.9	10.5
Pan (-0.075 mm)	1.0	1.5	4.6	72.5
Total ($\sum$)	100	100	100	100

6.4. Because each column totals to 100 percent, we can assume 100 g of each aggregate source and know that the amount in grams retained on each individual sieve is equal to the percent retained on each individual sieve. Using this information and the aggregate's bulk specific gravity we can calculate the volume of aggregate on each individual sieve.

6.5. Where γw is the unit weight of water (in g/cm^3), the volume of aggregate retained on each individual sieve can be determined from the following equation:

$$\text{volume of aggregate retained} = \frac{\text{mass of aggregate retained in grams on each individual sieve } (cm^3)}{\text{specific gravity of aggregate} * \gamma w}$$

6.6. The following shows how the volume is calculated for the aggregate retained on the No. 4 (4.75 mm) sieve for aggregate C.

$$\text{Volume} = 35.7 \text{ g} / (2.736 * 1 \text{ g/cm3}) = 13.05 \text{ cm}^3$$

The volume for all sieves is shown in Table 3.

Table 3

	Volume Retained on Each Individual Sieve			
Sieve Size	**Aggregate A**	**Aggregate B**	**Aggregate C**	**Mineral Filler**
1" (25 mm)	0.0	0.0	0.0	0.0
3/4" (19 mm)	1.91	0.0	0.0	0.0
1/2" (12.5 mm)	11.09	10.61	0.95	0.0
3/8" (9.5 mm)	8.79	9.14	4.68	0.0
# 4 (4.75 mm)	13.00	14.63	13.05	0.0
# 8 (2.36 mm)	1.53	0.55	7.71	0.0
# 16 (1.18 mm)	0.80	0.18	1.09	0.0
# 30 (0.60 mm)	0.15	0.22	2.16	0.0
# 50 (0.30 mm)	0.19	0.15	1.13	1.67
# 100 (0.15 mm)	0.19	0.18	0.40	5.41
# 200 (0.075 mm)	0.19	0.37	0.69	4.37
Pan (-0.075 mm)	0.38	0.55	1.68	30.20
Total ($\sum$)	38.22	36.58	36.54	41.65
Gsb	2.616	2.734	2.736	2.401

6.7. The values provided in Table 3 are used to blend the different stockpiles to meet the desired gradation based on volumes. In this procedure the aggregate is blended by weight (mass), then the gradation based on volume is determined. This is a trial and error process. To perform the blending, select the estimated percent-ages by weight (mass) of the different stockpiles to be used. For this example, the following percentages will be tried first.

Stockpile	% Blend by Weight (Mass)
Aggregate A	30
Aggregate B	30
Aggregate C	30
Mineral Filler	10

6.8. The percentages above are based on weight (mass). This indicates that the volume represented by 30 percent by weight (mass) of aggregate A will be used in blending the stockpiles based on volumes. The percent of each stockpile in the blend is multiplied by the volume retained on a given sieve for each stockpile to determine the total volume retained on that sieve. For the No. 4 (4.75 mm) sieve, using the volumes from Table 3 and the above percentages, the total volume retained on the No. 4 (4.75 mm) sieve is calculated as follows:

Total Volume Retained = (0.3 * 13.00) + (0.3 * 14.36) + (0.3 * 13.05) + (0.1 * 0.0) = 12.20 cm^3

6.9. This calculation is performed for each sieve in the gradation. Table 4 shows the volume retained for each sieve in the gradation.

Table 4

Sieve Size	Volume Retained per Sieve, cm^3
1" (25 mm)	0.00
3/4" (19 mm)	0.57
1/2" (12.5 mm)	6.80
3/8" (9.5 mm)	6.78
# 4 (4.75 mm)	12.20
# 8 (2.36 mm)	2.31
# 16 (1.18 mm)	1.52
# 30 (0.60 mm)	0.76
# 50 (0.30 mm)	0.61
# 100 (0.15 mm)	0.77
# 200 (0.075 mm)	0.81
Pan (-0.075 mm)	3.80
Total (∑)	36.93

6.10. Now, based on the total volume retained per sieve and the summed total volume of the blended aggregates, the percent retained per sieve by volume can be deter-mined for the blend. This is accomplished for a given sieve by dividing the volume retained on that sieve by the total volume of the blend. The following equation illustrates this calculation for the No. 4 (4.75 mm) sieve.

% Volume Retained on the No. 4 (4.75 mm) sieve = 12.20 / 36.93 = 33.04 %

6.11. Table 5 shows the percent retained by volume for each individual sieve and converts this to percent passing by volume. Percent passing by volume is calculated by subtracting the cumulative percent retained from 100.

Table 5

Sieve Size	Volume Retained per Sieve, cm^3	Percent Retained per Sieve	Cumulative Percent Retained	Percent Passing by Volume
1" (25 mm)	0.00	0.0	0.0	100
3/4" (19 mm)	0.57	1.54	1.54	98
1/2" (12.5 mm)	6.80	18.41	19.95	80
3/8" (9.5 mm)	6.78	18.36	38.31	62
# 4 (4.75 mm)	12.20	33.03	71.34	29
# 8 (2.36 mm)	2.94	6.26	77.96	22
# 16 (1.18 mm)	1.52	4.12	81.72	18
# 30 (0.60 mm)	0.76	2.06	83.78	16
# 50 (0.30 mm)	0.61	1.65	85.43	15
# 100 (0.15 mm)	0.77	2.09	87.52	12
# 200 (0.075 mm)	0.81	2.19	89.71	10
Pan (-0.075 mm)	3.80	10.29	100	0.0
Total (∑)	36.93	100		

6.12. Next, compare the blend's percent passing by volume to the specifications. In Table 6, a typical 1 in (25 mm) maximum aggregate size gradation is used.

Table 6

Sieve Size	25mm Maximum Gradiation Band	Percent Passing by Volume
1" (25 mm)	100	100
3/4" (19 mm)	90-100	98
1/2" (12.5 mm)	50-74	80*
3/8" (9.5 mm)	25-60	62*
# 4 (4.75 mm)	20-28	29*
# 8 (2.36 mm)	16-24	22
# 16 (1.18 mm)	13-21	18
# 30 (0.60 mm)	12-18	16
# 50 (0.30 mm)	12-15	15
# 100 (0.15 mm)	8-15	12
# 200 (0.075 mm)	8-10	10.3*

6.13. The asterisks show the blend as too fine on four sieves. Too correct this, remove 1 1/2 percent of the mineral filler, and 20 percent of the fine aggregate (aggregate C), add 6 percent to the coarse aggregate (aggregate B) and 15 1/2 percent to the most coarse aggregate.

Stockpile	**% Blend by Weight (Mass)**
Aggregate A	45 1/2
Aggregate B	36
Aggregate C	10
Mineral Filler	8 1/2

Table 7

Sieve Size	**Volume Retained per Sieve, cm^3**	**Percent Retained per Sieve**	**Cumulative Percent Retained**	**Percent Passing by Volume**
1" (25 mm)	0.00	0.0	0.0	100
3/4" (19 mm)	0.87	2.30	2.30	98
1/2" (12.5 mm)	8.96	23.73	26.03	74
3/8" (9.5 mm)	7.76	20.55	46.58	53
# 4 (4.75 mm)	12.49	33.07	79.65	20
# 8 (2.36 mm)	1.67	4.42	84.07	16
# 16 (1.18 mm)	0.84	2.22	86.29	14
# 30 (0.60 mm)	0.36	0.95	87.24	13
# 50 (0.30 mm)	0.40	1.06	88.30	12
# 100 (0.15 mm)	0.65	1.72	90.02	10
# 200 (0.075 mm)	0.66	1.75	91.77	8.2
Pan (-0.075 mm)	3.11	8.23	100.00	0.0
Total ($\sum$)	37.77	100		

6.14. Table 8 shows the job mix formula by volume compared to the gradation band and the job mix formula percent passing by weight (mass).

Table 8

Sieve Size	25mm Maximum Gradiation Band	Percent Passing by Volume	Percent Passing by Weight (Mass)
1" (25 mm)	100	100	100
3/4" (19 mm)	90-100	98	98
1/2" (12.5 mm)	50-74	74	74
3/8" (9.5 mm)	25-60	53	53
# 4 (4.75 mm)	20-28	20	20
# 8 (2.36 mm)	16-24	16	15*
# 16 (1.18 mm)	13-21	14	13
# 30 (0.60 mm)	12-18	13	12
# 50 (0.30 mm)	12-15	12	11*
# 100 (0.15 mm)	8-15	10	9
# 200 (0.075 mm)	8-10	8.2	7.6*

6.15. The percent passing by weight (mass) is used for mix design and job control. The asterisks show why computing percent passing by volume is needed for SMA mixes.

6.16. Voids in the Coarse Aggregate - Dry-Rodded Condition (VCA_{DRC}): Determine the VCA_{DRC} of the coarse aggregate fraction of the mix according to AASHTO T-19.

6.17. Since the gradation is a 1in (25 mm) maximum (3/4in or 19 mm nominal), the VCA_{DRC} was determined for aggregate retained on the No. 4 (4.75 mm) sieve. The sieve to use as the break point sieve is shown in Table 9.

Table 9

Maximum Aggregate Size	Nominal Aggregate Size	Break Point Sieve
1 1/2" (37.2 mm)	1" (25 mm)	# 4 (4.75 mm)
1" (25 mm)	3/4" (19 mm)	# 4 (4.75 mm)
3/4" (19 mm)	1/2" 12.5 mm	# 4 (4.75 mm)
1/2" (12.5 mm)	3/8" (9.5 mm)	#8 (2.36 mm)
3/8" (9.5 mm)	# 4 (4.75 mm)	#16 (1.18 mm)

6.18. The calculation for VCA_{DRC} for the blend is shown below.

$$VCA_{DRC} = 100 * (Gca * \gamma w - \gamma s) / (Gca * \gamma w)$$
$$VCA_{DRC} = 100 * (2.616 * 998 - 1610) / (2.616 * 998) = 38.33 \%$$

Where,
γs - unit weight of the dry rodded coarse aggregate fraction (kg/m^3)
γw - unit weight of water (998 kg/m^3)
Gca - bulk specific gravity of the coarse aggregate

6.19. Next, the percent VCA of the compacted mix (VCA_{MIX}) is calculated. The calculation for the percent VCA is shown below. A liquid asphalt binder content of 6.5 percent and a bulk specific gravity of 2.168 for the compacted specimens are used in this example.

Pbp = Ps * Pabp
Pbp = 93.5 * 0.80 = 74.8 %
VCA = 100 - Pbp * Gmb / Gca
VCA = 100 - 74.8 * 2.168 / 2.616 = 38.01

Where,
Pbp - percent (by weight [mass] total mix) aggregate retained on the breakpoint sieve (4.75 mm)
Ps - percent (by weight [mass] total mix) aggregate in the mix
PAbp - percent (by weight [mass] aggregate) aggregate retained on the breakpoint sieve (4.75 mm)
Gmb - bulk specific gravity of the compacted specimens
Gca - bulk specific gravity of the coarse aggregate

6.20. The VCA_{MIX} is compared to the VCA_{DRC}. The VCA_{MIX} is less than VCA_{DRC}, so this is a good mix.

$VCA_{MIX} = 38.01 < 38.33 = VCA_{DRC}$

7. Reporting

7.1. For Marshall designed mixes, report as required in ALDOT-307. For Superpave designed mixes, report as required in ALDOT-384.

7.2. In addition, include in the report the gradation by volume as compared to the gradation by weight (mass), the results of the HMA Mortar tests at the high and low temperatures, the drain down results, and the comparison of the VCA_{MIX} to the VCA_{DRC}.

ALDOT-399
TESTING OF HOT MIX ASPHALT MORTARS

1. Scope

1.1. This method covers the blending and specimen preparation of hot mix asphalt (HMA) mortars to predetermine the physical characteristics of mortars used in HMA.

2. Referenced Documents

2.1. AASHTO Standards

2.1.1. M231, Weighing Devices used in the Testing of Materials

2.1.2. PP1, Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)

2.1.3. TP1, Determining the Flexural Creep Stiffness of an Asphalt Binder Using the Bending Beam Rheometer (BBR)

2.1.4. TP5, Determining the Rheological Properties of an Asphalt Binder Using the Dynamic Shear Rheometer (DSR)

2.1.5. T240, Effect of Heat and Air on a Moving Film of Asphalt (RTFO)

2.2. ASTM Standards

2.2.1. D4402, Viscosity Determinations of Unfilled Asphalts Using theBrookfield Thermosel Apparatus

2.2.2. D4753, Evaluating, Selecting, and Specifying Balances and Scales for use in Soil and Rock Testing

2.2.3. E11, Wire-Cloth Sieves for Testing Purposes

2.3. ALDOT PROCEDURES

2.3.1. ALDOT-395, Stone Matrix Asphalt Mix Design

3. Apparatus for Preparation

3.1. Balance, 2-kg capacity, sensitive to 0.1 g. The balance shall conform to the requirement of ASTM D4753, class GP2 or AASHTO M231, class G2.

3.2. Oven, capable of maintaining the needed temperature within ± 10^{o}F (5^{o}C).

3.3. Hot plate, at least 700-W capacity with adjustable temperature control.

3.4. Sample containers, capable of holding at least 100 g of filler and 200 g of liquid asphalt binder. A 6 oz. (0.18 L) seamless ointment tin is recommended.

3.5. Mixing tools, wooden tongue depressors, spatulas, and spoons.

3.6. Insulated gloves, for handling hot samples and equipment.

4. Procedure

4.1. Dry respective aggregate fractions containing material passing the No. 200 (0.075 mm) sieve (as per ASTM E11) to constant weight (mass) at 230 ± 10^{o}F (110 ± 5^{o}C). Dry sieve these aggregates and collect the dust from each aggregate. Blend the fillers to meet the percent by volume on the job-mix-formula. An example of how to blend by volume can be found in ALDOT-395.

4.2. Place a quart can of pre-aged liquid asphalt binder into an oven set at 330 ± 10^{o}F (165 ± 5^{o}C) (see paragraph 5.1).

4.3. Weigh 100 ± 0.1 g of minus No. 200 (0.075 mm) blended filler into the 6 oz. (0.18 L) seamless ointment tin and place into a 350 ± 10^{o}F (175 ± 5^{o}C) oven. The material should remain in the oven for at least 30 minutes.

4.4. Weigh into the filler the proper amount of liquid asphalt binder to the nearest 0.1 g.

4.5. Place the tin on the hot plate and hand mix with a spatula. Slowly add the proper amount of fiber (weighed to the nearest 0.1 g) and continue mixing until the mortar is homogeneous.

4.6. When asphalt-fiber pellets are used, either use loose fiber of the same type to create the mortar or use a high-shear mixer. Asphalt-pellet fibers will not blend into the filler under low-shear mixing conditions.

5. Testing of Mortars

5.1. When performing Superpave Liquid Asphalt Binder testing of the mortar, the liquid asphalt binder should be aged following AASHTO T240 and/or PP1 prior to blending with fillers and fibers.

5.2. Follow ASTM D4402; except that readings should be taken as soon as the temperature stabilizes because the fillers will sink to the bottom over time.

5.3. Follow AASHTO TP5; except use a higher preheat temperature of 136°F (58°C). This is to insure that the specimen will adhere strongly to both plates.

5.4. Follow AASHTO TP1; except, using aluminum molds:

5.4.1. Place the mold over the corner of the warm hot plate so that the mold is on the hot plate and the rubber O-rings are not.

5.4.2. Using a wooden tongue depressor, gently tamp the mortar into the mold. A light coating of release agent (glycerin and talc) will assist in this procedure.

5.4.3. Repeat step 5.4.2 until the mold is full of mortar.

5.4.4. Continue according to TP1.

6. Reporting

6.1. Report as required in ALDOT-395.

ALABAMA DEPARTMENT OF TRANSPORTATION
BUREAU OF MATERIALS AND TESTS
ALDOT-401

RUTTING SUSCEPTIBILITY DETERMINATION OF ASPHALT PAVING MIXTURES USING THE ASPHALT PAVEMENT ANALYZER

1. SCOPE

1.1 This method describes a procedure for testing the rutting susceptibility of asphalt-aggregate mixtures using the Asphalt Pavement Analyzer (APA).

1.2 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health standards and determine the applicability of regulations prior to use.

2. REFERENCED DOCUMENTS

2.1 AASHTO STANDARDS

2.1.1 AASHTO T-166, Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens

2.1.2 AASHTO T-169, Standard Practice for Sampling Bituminous Paving Mixtures

2.2.3 AASHTO T-209, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixture

2.2.4 AASHTO T-269, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Mixtures

2.2.5 AASHTO MP-2, Standard Specification for Superpave Volumetric Mix Design

2.2.6 AASHTO PP-35, Practice for Evaluation of Superpave Gyratory Compactors (SGCs)

3. APPARATUS

3.1 Asphalt Pavement Analyzer (APA) - A thermostatically controlled device designed to test the rutting susceptibility of asphalt-aggregate mixtures by applying repetitive linear loads to compacted test specimens through three pressurized hoses via wheels.

3.1.1 The APA shall be thermostatically controlled to maintain the test temperature and conditioning chamber at any set point between 4° and 72°C (40° and 160°F) within 1°C (2°F).

3.1.2 The APA shall be capable of independently applying loads up to 534 N (120 lbs) to the three wheels. The loads shall be calibrated to the desired test load by an external force transducer.

3.1.3 The pressure in the test hoses shall be adjustable and capable of maintaining pressure up to 830 kPa (120 psi).

3.1.4 The APA shall be capable of testing six cylindrical specimens simultaneously.

3.1.5 The APA shall have a programmable master cycle counter which can be preset to the desired number of cycles for a test. The APA shall be capable of automatically stopping the test at the completion of the programmed number of cycles.

3.1.6 The hoses shall be Gates 77B Paint Spray and Chemical 3/4 inch (19.0 mm), 750 psi (5.17 MPa) W.P. GL 07148. The hoses should be replaced when any of the outer rubber casing has worn through and threads are exposed. Follow the APA manufacturer's instructions for the technique on replacing hoses.

3.2 Balance, 12,000 gram capacity, accurate to 0.1 gram.

3.3 Mixing utensils (bowls, spoon, spatula).

3.4 Ovens for heating aggregate and asphalt binder.

3.5 Superpave gyratory compactor and molds.

4. PREPARATION OF TEST SPECIMENS

4.1 Number of Test Specimens - Six cylindrical (150 mm diameter x 75 mm) specimens.

4.2 Roadway Core Specimens

4.2.1 Roadway core specimens shall be 150 mm diameter with all surfaces of the perimeter perpendicular to the surface of the core within 5 mm. Cores shall be trimmed with a wet masonry saw to a height of 75 ± 3 mm. If the core has a height of less than 75 ± 3 mm, plaster-of-Paris may be used to achieve the proper height. Testing shall be conducted on the uncut face of the core.

4.3 Plant Produced Mixtures

4.3.1 Samples of plant produced mixtures shall be obtained in accordance with AASHTO T 169. Mixture samples shall be reduced to the appropriate test size and compacted to the appropriate number of gyrations as determined in AASHTO MP-2 while the mixture is still hot. Reheating of loose plant mixture should be avoided.

4.4 Laboratory Prepared Mixtures

4.4.1 Mixture proportions are batched in accordance to the desired Job Mix Formula.

4.4.2 The temperature to which the asphalt binder must be heated to achieve a viscosity of 170 ± 20 cSt shall be the mixing temperature. For modified asphalt binder use the mixing temperature recommended by the binder manufacturer.

4.4.3 Dry mix aggregates and hydrated lime (when lime is used) first, then add optimum percentage of asphalt cement. Mix the materials until all aggregates are thoroughly coated.

4.4.4 Test samples shall be aged two hours at compaction temperature or in accordance with the short-term aging procedure in AASHTO PP2.

4.4.5 The temperature to which the asphalt binder must be heated to achieve a viscosity of 290 ± 30 cSt shall be the compaction temperature. For modified asphalt binders, use the compaction temperature recommended by the binder manufacturer. The mixture shall not be heated at the compaction temperature for more than two hours.

4.5 Laboratory Compaction of Specimens

4.5.1. A Superpave gyratory compactor approved in accordance with AASHTO PP-35 shall be used to compact samples. The gyratory compactor shall have passed the Standard Protocol for the Evaluation of Superpave Gyratory Compactors.

4.5.2 Laboratory prepared specimens shall be compacted to the design number of gyrations ($N_{\mathbf{des}}$) as determined in AASHTO MP-2 with a final height of 115 ± 5 mm. If the APA does not accommodate 115 mm high compacted specimens, the specimens shall be sawed to a height of 75 ± 1 mm. Only the bottom portion of the compacted specimens should be sawed off. The uncut side of the specimen shall be tested.

4.5.3 Compacted specimens should be left at room temperature (approximately 25°C (77°F) for a minimum of 3 hours to allow the entire specimen to cool.

5. DETERMINING THE AIR VOID CONTENTS

5.1 Determine the bulk specific gravity of the test specimens in accordance with AASHTO T 166.

5.2 Determine the maximum specific gravity of the test mixture in accordance with AASHTO T 209.

5.3 Determine the air void contents of the test specimens in accordance with AASHTO T 269.

6. SELECTING THE TEST TEMPERATURE

6.1 The test temperature shall be set to the high temperature of the standard Superpave binder Performance Grade for the specifying agency. For circumstances where the binder grade has been bumped, the APA test temperature will remain at the standard PG high temperature. This is currently 67°C (146°F) for Alabama.

7. SPECIMEN PREHEATING

7.1 Place the specimens in the molds.

7.2 Specimens shall be preheated in the temperature calibrated APA test chamber or a separate calibrated oven for a minimum of 6 hours. Specimens should not be held at elevated temperatures for more than 24 hours prior to testing.

8. PROCEDURE

8.1 Set the hose pressure gap reading to 700 ± 35 kPa (100 ± 5 psi). Set the load cylinder pressure reading for each wheel to achieve a load of 445 ± 22 N (100 ± 5 lb.).

8.2 Stabilize the testing chamber temperature at the temperature selected in Paragraph 6.

8.3 Secure the preheated, molded specimens in the APA. The preheated APA chamber should not be open more than six minutes when securing the test specimens into the machine. Close the chamber doors and allow 10 minutes for the temperature to restabilize prior to starting the test.

8.4 Apply 25 cycles to seat the specimens before the initial measurements. Make adjustments to the hose pressure as needed during the 25 cycles.

8.5 Open the chamber doors, unlock and pull out the sample holding tray.

8.6 Place the rut depth measurement template over the specimen. Make sure that the rut depth measurement template is properly seated and firmly rests on top of the testing mold.

8.7 Zero the digital measuring gauge so that the display shows 0.00 mm with the gauge completely extended. The display should also have a bar below the “inc.” position. Take initial readings at each of the four outside locations on the template. The center measurement is not used for cylindrical specimens. Measurements shall be determined by placing the digital measuring gauge in the template slots and sliding the gauge slowly across each slot. Record the smallest measurement for each location to the nearest 0.01 mm.

8.8 Repeat steps 8.6 and 8.7 for each set of cylinders in the testing position. All measurements shall be completed within six minutes.

8.9 Push the sample holding tray in and secure. Close the chamber doors and allow 10 minutes for the temperature to equalize.

8.10 Set the PRESET COUNTER to 8000 cycles.

8.11 Start the test. When the test reaches 8000 cycles, the APA will stop and the load wheels will automatically retract.

8.12 Repeat steps 8.5 through 8.8 to obtain final measurements.

NOTE: Some APA’s have been equipped with automatic measurement systems that make steps 8.5 through 8.12 unnecessary. Some APA users have reported significant differences in rut depths between the automatic measurements and manual measurements.

9. CALCULATIONS

9.1 The rut depth at each location is determined by subtracting the final measurement from the initial measurement.

9.2 Determine the overall average rut depth for each test position. Use the average of all twelve measurements to calculate the average rut depth.

9.3 Calculate the average rut depth from the three test positions. Also, calculate the standard deviation for the three test positions.

9.4 Outlier evaluation - If the standard deviation of the set is greater than or equal to 2.0 mm, then the position with the rut depth farthest from the average may be discarded. The testing procedure, device calibration, and test specimens should be investigated to determine the possible causes for the excessive variation.

9.5 The APA rut depth for the mixture is the average of the six cylindrical specimens at 8000 cycles.

10. REPORTING

10.1 The test report shall include the following information:

10.1.1 The laboratory name, technician name, and date of test.

10.1.2 The mixture type and description.

10.1.3 Average air void content of the test specimens.

10.1.4 The test temperature.

10.1.5 The average rut depth, to the nearest 0.1 mm, at 8000 cycles.

11. PRECISION AND BIAS

11.1 Work is underway to develop a precision statement for this standard.

ANNEX

MANDATORY INFORMATION

1. CALIBRAT1ON

NOTE: The following items should be checked for calibration no less than once per year: (1) preheating oven, (2) APA temperature, (3) APA wheel load, and (4) APA hose pressure. Instructions for each of these calibration checks are included in this section.

1.1. Temperature calibration of the preheating oven.

1.1.1 The preheating oven must be calibrated with a NIST traceable thermometer (an ASTM 65°C calibrated thermometer is recommended) and a metal thermometer well to avoid rapid heat loss when checking the temperature.

1.1.2 Temperature Stability

1.1.2.1 Set the oven to the chosen temperature (e.g., 67°C). Place the thermometer in the well and place them on the center of the shelf where the samples and molds will be preheated. It usually takes an hour or so for the oven chamber, well and thermometer to stabilize. After one hour, open the oven door and read the thermometer without removing it from the well. Record this temperature. Close the oven door.

1.1.2.2 Thirty minutes after obtaining the first reading obtain another reading of the thermometer. Record this temperature. If the readings from step 1.1.2.1 and 1.1.2.2 are within 0.4°C, then average the readings. If the readings differ by more than 0.4°C then continue to take readings every thirty minutes until the temperature stabilizes within 0.4°C on two consecutive readings.

1.1.3 Temperature Uniformity

1.1.3.1 To check the uniformity of the temperature in the oven chamber, move the thermometer and well to another location in the oven so that they are on a shelf where samples and molds will be preheated, but as far as possible from the first location. Take and record readings of the thermometer at the second location every thirty minutes until two consecutive readings at the second location are within 0.4°C.

1.1.3.2 Compare the average of the two readings at the first location with the average of the stabilized temperature at the second location. If the average temperatures from the two locations are within 0.4°C, then the oven temperature is relatively uniform and it is suitable for use in preheating APA samples. If the average of the readings at the two locations differ by more than 0.4°C then you must find another oven that will hold this level of uniformity and meets calibration.

1.1.4 Temperature Accuracy

1.1.4.1 Average the temperatures from the two locations. If that average temperature is within 0.4°C of the set point temperature on the oven, then the oven is reasonably accurate and calibration is complete.

1.1.4.2 If the set point differs from the average temperature by more than 0.4°C, then adjust the oven set point appropriately to raise or lower the temperature inside the chamber so that the thermometer and well will be at the desired temperature (e.g., 67°C).

1.1.4.3 Place the thermometer and well in the center of the shelf. At thirty-minute intervals, take readings of the thermometer. When two consecutive readings are within 0.4°C, and the average of the two consecutive readings are within 0.4°C of the desired test temperature (e.g., 67°C), then the oven has been properly adjusted and calibration is complete. If these two conditions are not met, then repeat steps 1.1.4.2 and 1.1.4.3.

1.2 APA Temperature Calibration

1.2.1 The APA must be calibrated with a NIST traceable thermometer (an ASTM 65°C calibrated thermometer is recommended) and a metal thermometer well to avoid rapid heat loss when checking the temperature.

1.2.2 Temperature Stability

1.2.2.1 Turn on the APA main power and set the chamber temperature controller so that the inside the testing chamber is at anticipated testing temperature (e.g., 67°C). Also, set the water temperature controller to achieve the anticipated testing temperature. (**NOTE**: Experience has shown that the temperature controller on the APA is not always accurate. The thermometer should always be considered chamber temperature.) Place the thermometer in the well and place them on the left side of the APA where the samples and molds will be tested. (**NOTE**: It may be helpful to remove the hose rack from the APA during temperature calibration to avoid breaking the thermometer.)

1.2.2.2 It usually takes about five hours for the APA to stabilize. After the temperature display on the controller has stabilized, open the chamber doors and read the thermometer without removing it from the well. Record this temperature. Close the chamber doors.

1.2.2.3 Thirty minutes after obtaining the first reading obtain another reading of the thermometer. Record this temperature. If the readings from step 1.2.2.2 and 1.2.2.3 are within 0.4°C, then average the readings. If the readings differ by more than 0.4°C then continue to take readings every thirty minutes until the temperature stabilizes within 0.4°C on two consecutive readings.

1.2.3 Temperature Uniformity

1.2.3.1 To check the uniformity of the temperature in the APA chamber, move the thermometer and well to the right side of the APA, where the samples are tested. Take and record readings of the thermometer at the second location every thirty minutes until two consecutive readings at the second location are within 0.4°C.

1.2.3.2 Compare the average of the two readings obtained in 1.2.2.3 and 1.2.3.1. If the average temperatures from the two locations are within 0.4°C, then the APA temperature is relatively uniform and it is suitable for use. If the average of the readings at the two locations differ by more than 0.4°C then consult with the manufacturer on improving temperature uniformity.

1.2.4 Temperature Accuracy

1.2.4.1 Average the temperatures from the two locations. If that average temperature is within 0.4°C of the desired test temperature (e.g., 67°C), then the APA temperature is reasonably accurate and calibration is complete.

1.2.4.2 If the average temperature differs from the desired test temperature (e.g., 67°C) by more than 0.4°C, then adjust the APA temperature controller so that the thermometer and well will be at the desired test temperature. (**NOTE**: It is advisable to keep the water bath set at the same temperature as the test chamber.)

1.2.4.3 Place the thermometer and well in the center of the shelf. At thirty minute intervals, take readings of the thermometer. When two consecutive readings are within 0.4°C, and the average of the two consecutive readings are within 0.4°C of the desired test temperature, then the APA temperature has been properly adjusted and calibration at that temperature is complete. Record the current set points on the temperature controllers for later reference. If these two conditions are not met, then repeat steps 1.2.4.2 and 1.2.4.3.

1.3 APA Wheel Load calibration of the air cylinders at the three test positions.

1.3.1 The APA wheel loads will be checked with the calibrated load cell provided with the APA. The loads will be checked and adjusted one at a time while the other wheels are in the down position and bearing on a dummy sample or wooden block of approximately the same height as a test sample. Calibration of the wheel loads should be accomplished with the APA at room temperature. A sheet is provided to record the calibration loads.

1.3.1.1 Remove the hose rack from the APA.

1.3.1.2 Jog the wheel carriage until the wheels are over the center of the sample tray when the wheels are in the down position.

1.3.1.3 Raise and lower the wheels 20 times to heat up the cylinders.

1.3.1.4 Adjust the bar on top of the load cell by screwing it in or out until the total height of the load cell-load bar assembly is 105 mm.

1.3.1.5 Position the load cell under one of the wheels. Place wooden blocks or dummy samples under the other two wheels.

1.3.1.6 Zero the load cell.

1.3.1.7 Lower all wheels by turning the cylinder switch to CAL.

1.3.1.8 If the load cell is not centered left to right beneath the wheel, then raise the wheel and adjust the position of the load cell. To determine if the load cell is centered front to back beneath the wheel, unlock the sample tray and move it SLOWLY until the wheel rests in the indentation on the load cell bar (where the screw is located).

1.3.1.9 After the load cell has been properly centered, adjust the pressure in the cylinder to obtain 445 ± 5 N (100 ± 1lbs.). Allow three minutes for the load cell reading to stabilize between adjustments. Record the pressure and the load.

1.3.1.10 With the wheel on the load cell remaining in the down position, raise and lower the other wheels one time. Allow three minutes for the load cell reading to stabilize. Record the pressure and the load.

1.3.1.11 With the other wheels remaining in the down position, raise and lower the wheel over the load cell. Allow three minutes for the load cell reading to stabilize. Record the pressure and the load.

1.3.1.12 Repeat steps 1.3.1.5 through 1.3.1.11 for each wheel/cylinder.

1.3.1.13 Return the load cell to the first wheel and repeat steps 1.3.1.5 through 1.3.1.11.

1.3.1.14 Place the load cell under the second wheel and repeat steps 1.3.1.5 through 1.3.1.11.

1.3.1.15 Place the load cell under the third wheel and repeat steps 1.3.1.5 through 1.3.1.11. The current cylinder pressures will be used to set wheel loads to 445 N (100 lbs.).

1.4 Replacement of the APA hoses

1.4.1 New hoses shall be placed in service in accordance with 2.1.6.

1.4.1.1 Remove the hose rack from the APA.

1.4.1.2 Remove the used hoses from the hose rack. Place the new hose on the barbed nipples and secure with the hose clamps.

1.4.1.3 Position the hoses in the rack such that the hose curvature is vertical. Tighten the nuts at the ends of the hoses only until the hoses are secure. Over-tightening will effect the contact pressure and hose life.

1.4.1.4 Place the hose rack back into the APA and make sure that the hoses are aligned beneath the wheels.

1.4.1.5 Prior to testing, break in the new hoses by running 8000 cycles on a set of previously tested samples at a temperature of 55°C (131°F) or higher.

1.5 APA Hose Pressure Check

1.5.1 The air pressure in the APA test hoses shall be checked with a NIST traceable test gauge or transducer with a suitable range. The check shall be made while the APA is operating Since the hoses are connected in series, it is satisfactory to connect the test gauge to the end of the right-most hose. The pressure should not fluctuate outside of the range of 690 ± 35 kPa (100 ± 3 psi) during normal operation. Adjust the pressure as necessary with the hose pressure regulator.

NOTE: The Ashcroft test gauge model 450182As02L200# has been found to be satisfactory for this purpose. This gauge may be available through Grainger (Stock No. 2F008).

ALDOT-403
ROADWAY CORE BULK SPECIFIC GRAVITY DETERMINATION IN THE FIELD

1. Scope

1.1 This method describes a procedure for testing roadway cores in the field using portable scales for calibrating the nuclear density gauges.

1.2 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health standards and determine the applicability of regulations prior to use.

2. Referenced Documents

2.1 AASHTO Standards

2.1.1 AASHTO T-166, Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens

2.2 ASTM Standards

2.2.1 ASTM D 2726-96a, Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures

3. Procedure

3.1 AASHTO T 166, Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry (SSD) Specimens, is followed as usual with the following additional precautions taken:

3.2 The underwater weight and SSD weight may be taken first to expedite the process. When the dry weight of the sample is determined, care must be taken to ensure that the sample is completely dry. Do not heat the sample until it becomes malleable (T 166, Method C), as the samples are to be re-tested at the laboratory. Fans and low heat (less than 130°F (55°C)) may be used to dry the sample.

3.3 Calibration weights lighter and heavier than the average core sample shall be used to check the calibration of the scales every time the scales (or the vehicle hauling the scales) are moved. These weights must be traceable to the National Institute of Standards and Technology (NIST). A shift test shall be performed as part of the calibration check (shifting the weights to the edge of the weighing platform) to ensure that the scales are level. The scales shall be accurate to within 0.2 grams or 0.1% of the weight of the sample. If the scales do not meet this level of accuracy, they must be calibrated until they do. In any case, the scales shall be calibrated by a reputable scale company every six months.

3.4 The temperature of the sample weighed and the temperature of the water bath shall be equal. As per ASTM D 2726, if the specimen's temperature is different from the bath's temperature by more than 3.6°F (2°C), the specimen shall be soaked in the bath until the temperatures are equal (10 to 15 minutes).

3.5 If the sample and/or water bath have a temperature that is not 77 +/- 1.8°F (25 +/- 1°C), the temperature correction factors found in ASTM D 2726 shall be applied to correct the Bulk Specific Gravity value (see appendix A for this table). If the bath is at 77°F (25°C), no correction need be applied.

3.6 As soon as practical, the samples shall be tested in a laboratory (AASHTO accredited, M&T certified, or Division approved). The Bulk Specific Gravity in the field shall be used unless the Bulk Specific Gravity in the laboratory differs by more than 0.012 from the Bulk Specific Gravity in the field; in which case, the laboratory value shall be substituted for the field value.

4. Reporting

4.1 Note the field value and the laboratory value, and indicate which value was used in the report. Send a copy of the report including project number, county, mix type, and placement rate to the State Bituminous Engineer.

TABLE 1 ABSOLUTE DENSITY OF WATER AND CONVERSION FACTOR "K" FOR VARIOUS TEMPERATURES

Temperature °F	Temperature °C	Absolute Density of Water	Correction Factor K
50.0	10	0.999728	1.002661
51.8	11	0.999634	1.002567
53.6	12	0.999526	1.002458
55.4	13	0.999406	1.002338
57.2	14	0.999273	1.002204
59.0	15	0.999129	1.002060
60.8	16	0.998972	1.001903
62.6	17	0.998804	1.001734
64.4	18	0.998625	1.001555
66.2	19	0.998435	1.001364
68.0	20	0.998234	1.001162
69.8	21	0.998022	1.000950
71.6	22	0.997801	1.000728
73.4	23	0.997569	1.000495
75.2	24	0.997327	1.000253
77.0	25	0.997075	1.000000
78.8	26	0.996814	0.999738
80.6	27	0.996544	0.999467
82.4	28	0.996264	0.999187
84.2	29	0.995976	0.998898
86.0	30	0.995678	0.998599

The Bulk Specific Gravity at 77 °F (25°C) = K * measured Bulk Specific Gravity

This calculation is valid if the temperature of the water is between 71.6 – 82.4°F (22 – 28°C). For temperatures outside this range, a correction to the amount of water displaced shall also be made using the following equation:

Correction = (25°C – water temperature) * ($6*10^{-5}$ mL/mL/°C) * (B-C)

Where (B-C) is the volume of water displaced in mL and ($6*10^{-5}$ mL/mL/°C) is the coefficient of cubical thermal expansion for bituminous concrete.

ALDOT-405-01
CERTIFICATION AND QUALIFICATION PROGRAM FOR CONCRETE TECHNICIANS AND CONCRETE LABORATORIES

1. Scope

1.1. This program establishes the compliance requirements for concrete certifications required for personnel inspecting, testing, and managing the production, placement, finishing, and quality control of concrete operations for the Alabama Department of Transportation, herein referred to as ALDOT or as the Department.

1.2. This program will also establish the requirements necessary for the qualification of private concrete laboratories to design concrete mixes and to sample and test concrete materials used on ALDOT projects.

1.3. This procedure will outline the requirement for two levels of concrete certifications and three concrete laboratory qualifications.

1.3.1. Concrete Technician Certifications:

1.3.1.1. Concrete Technician.

1.3.1.2. Concrete Strength Testing Technician.

1.3.2. Concrete Laboratory Qualifications:

1.3.2.1. Class A Laboratory.

1.3.2.2. Class B Laboratory.

1.3.2.3. Class C Laboratory.

2. Referenced Documents

2.1. AASHTO Standards:

2.1.1. T-22 Compressive Strength of Cylindrical Concrete Specimens.

2.1.2. T-24 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

2.1.3. T-67 Standard Practices for Force Verification of Testing Machines.

2.1.4. T-119 Slump of Hydraulic Cement Concrete.

2.1.5. T-121 Weight per Cubic Foot {Mass per Cubic Meter}, yield, and Air Content (Gravimetric) of concrete.

2.1.6. T-126 Making and Curing Concrete Test Specimens in the Laboratory.

2.1.7. T-141 Sampling Freshly Mixed Concrete.

2.1.8. T-152 Air Content of Freshly Mixed Concrete by the Pressure Method.

2.1.9. T-197 Time of Setting of Concrete Mixtures by Penetration Resistance.

2.1.10. T-231 Capping Cylindrical Concrete Specimens.

2.1.11. M-201 Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes.

2.2. ASTM Standards:

2.2.1. C-1064 Temperature of Freshly Mixed Portland Cement Concrete.

2.2.2. C-1231 Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders.

3. Program Administration

3.1. A Certification Board (CB) and a Working Task Force (WTF) will administer the certification program and qualification program for concrete technicians and concrete laboratories.

3.1.1. Certification Board:

3.1.1.1. Membership of the Certification Board will consist of the following.

3.1.1.1.1. State Materials and Tests Engineer, Chairman.

3.1.1.1.2. An Assistant Chief Engineer appointed by the Transportation Director.

3.1.1.1.3. State Construction Engineer.

3.1.1.1.4. A Division Engineer appointed by the Transportation Director.

3.1.1.1.5. Industry Representative appointed by the Alabama Concrete Industries Association.

3.1.2. Working Task Force:

3.1.2.1. Membership of the Working Task Force will consist of the following.

3.1.2.1.1. State Concrete Engineer.

3.1.2.1.2. State Bridge Construction Engineer.

3.1.2.1.3. Industry Representative appointed by the Alabama Concrete Industries Association.

3.2. Members of the Certification Board and Working Task Force will meet a minimum of once a year. The Working Task Force will meet any time disciplinary actions have to be taken.

4. Definitions

4.1. Concrete Technician Certifications:

4.1.1. Concrete Technician.

4.1.1.1. Required for Department, its consultants, and industry personnel responsible for inspecting and testing concrete.

4.1.1.2. The technician shall be qualified to inspect concrete operations and to perform quality control testing on concrete.

4.1.1.3. The technician shall be knowledgeable of basic concrete technology.

4.1.1.4. Industry personnel certified as Concrete Technicians are qualified to batch concrete for the Department.

4.1.2. Concrete Strength Testing Technician.

4.1.2.1. Required for Department, its consultants, and industry personnel responsible for testing concrete specimens for compressive and flexural strength.

4.1.2.2. The technician shall be knowledgeable and have the ability to properly perform, record, and report the results of testing compressive strength of cylindrical concrete specimens and flexural strength of concrete beam specimens.

4.1.2.3. The technician shall be knowledgeable on capping cylindrical concrete specimens and unbonded caps for concrete cylinders.

4.2. Concrete Laboratory Qualifications:

4.2.1. Class A Laboratory.

4.2.1.1. Required for industry laboratories performing concrete mix designs and concrete testing for use on Department projects.

4.2.1.2. It shall be capable of performing laboratory concrete mix designs.

4.2.1.3. It shall be capable of handling, storing, and curing concrete specimens.

4.2.1.4. It shall be capable of performing compressive strength tests on concrete specimens.

4.2.2. Class B Laboratory.

4.2.2.1. Required for industry laboratories performing concrete mix designs for use on Department projects.

4.2.2.2. It shall be capable of performing laboratory concrete mix designs.

4.2.3. Class C Laboratory.

4.2.3.1. Required for industry laboratories performing concrete testing as required by the Department.

4.2.3.2. It shall be capable of handling, storing, and curing concrete specimens.

4.2.3.3. It shall be capable of performing compressive strength tests on concrete specimens.

4.2.3.4. It shall be, if requested by the laboratory at the time of the qualification process, capable of obtaining, preparing and testing cores drilled from concrete.

5. Technician Certification Requirements

5.1. Concrete Technician:

5.1.1. Prerequisite: Applicants for certification as Concrete Technicians shall pass a practical examination approved by the Department. Examples of approved practical examinations are ACI Level I Technician and PCI Technician.

5.1.2. Training: Successful completion of classroom training on concrete technology.

5.1.3. Testing: Successfully passing a written examination administered by the Department.

5.2. Concrete Strength Testing Technician:

5.2.1. Training: Successful completion of classroom training on concrete compressive and flexural strength testing.

5.2.2. Testing: Successfully passing a written and performance examinations.

6. Laboratory Qualification Requirements

6.1. General Requirements:

6.1.1. Request for Laboratory Qualification shall be done in writing to the Bureau of Materials and Tests Engineer, attention Concrete Section.

6.1.2. Inspection: personnel of the Bureau of Materials and Tests will inspect Laboratories every two years. The inspection will cover documentation, equipment, and procedures.

6.1.3. Documentation: All laboratories shall maintain the following minimum documentation.

6.1.3.1. Manual of standard operating procedures to include.

6.1.3.1.1. Quality control and quality assurance.

6.1.3.1.2. Procedure for handling technical complaints.

6.1.3.2. Record of personnel's training, evaluations, and experience.

6.1.3.3. Inventory of all testing equipment to include the following.

6.1.3.3.1. Equipment descriptions.

6.1.3.3.2. Equipment brand names.

6.1.3.3.3. Equipment identification numbers.

6.1.3.3.4. Equipment calibration and verification records.

6.1.3.3.5. Equipment maintenance records.

6.1.3.4. A current library of AASHTO and ASTM test methods.

6.1.3.5. Laboratory test reports with the following minimum information.

6.1.3.5.1. Name and address of the laboratory.

6.1.3.5.2. Identification of test report.

6.1.3.5.3. Date test is performed.

6.1.3.5.4. Date report is issued.

6.1.3.5.5. Identification of specimen(s) tested.

6.1.3.5.6. Identification of the standard test method used.

6.1.3.5.7. Notation of all known deviations from the standard test method.

6.1.3.5.8. Requirements of the standard test method not performed by the laboratory.

6.1.3.5.9. Technician name and certification number.

6.1.3.6. A system of records that permits verification of any issued report.

6.2. Class A Laboratory:

6.2.1. Class A laboratories shall meet the requirements for Class B and Class C laboratories.

6.3. Class B Laboratory:

6.3.1. Personnel: Class B laboratories shall have at least one Concrete Technician certified by the Department.

6.3.2. Equipment: The following equipment will be inspected during the laboratory inspection process.

6.3.2.1. Concrete mixer.

6.3.2.2. Type “B” pressure meters.

6.3.2.3. Slump cone molds.

6.3.2.4. Unit weight measure.

6.3.2.5. Penetration needles and loading apparatus.

6.3.2.6. Temperature measuring devices.

6.3.2.7. Wire sieves.

6.3.2.8. Cylinder molds.

6.3.2.9. Mortar container.

6.3.2.10. Weighing balances.

6.3.2.11. Tamping rods.

6.3.2.12. Strike off bars and plates.

6.3.2.13. Hand tools (mallet, trowel, scoops, etc).

6.3.3. Procedure: The following procedures will be observed during the laboratory inspection process. Concrete Technicians certified by the Department shall perform the procedures.

6.3.3.1. AASHTO T-119.

6.3.3.2. AASHTO T-121.

6.3.3.3. AASHTO T-126.

6.3.3.4. AASHTO T-141.

6.3.3.5. AASHTO T-152.

6.3.3.6. AASHTO T-197.

6.3.3.7. ASTM C-1064.

6.4. Class C Laboratory

6.4.1. Personnel: Class C laboratories shall have at least one certified Concrete Strength Testing Technician.

6.4.2. Equipment: The following equipment will be inspected during the laboratory inspection process.

6.4.2.1. Compressive strength testing machine.

6.4.2.2. Moist cabinets, moist rooms, and water storage tanks for curing cylinders.

6.4.2.3. Capping plates.

6.4.2.4. Alignment devices.

6.4.2.5. Melting pots for sulfur mortars.

6.4.2.6. Unbonded caps.

6.4.2.7. Core drill. *

6.4.2.8. Core barrels. *

6.4.2.9. Rebar locator. *

6.4.2.10. Saw. *

6.4.3. Procedure: The following procedures will be observed during the laboratory inspection process. Concrete Strength Testing Technicians shall perform the procedures.

6.4.3.1. AASHTO T-22.

6.4.3.2. AASHTO T-24. *

6.4.3.3. AASHTO T-67.

6.4.3.4. AASHTO T-231.

6.4.3.5. AASHTO M-201.

6.4.3.6. ASTM C-1231.

6.4.4. Extra Qualification: Items marked with an asterisk (*) in 5.42 and 5.43 are not required to Qualify as Class C laboratory. If the laboratory will obtain, prepare, and test cores drilled from concrete for Department projects, the equipment and procedure shall be required and will be inspected at the time of the inspection process. All the other requirements for Class C laboratory will also apply. This procedure will be added to the qualification certificate issued by the Department to the laboratory.

7. Certification and Qualification

7.1. Concrete Certifications

7.1.1. Personnel meeting all the qualifications for any of the two types of concrete certifications will be certified as such upon recommendation by the Working Task Force and approval by the Certification Board.

7.1.2. Concrete certifications are valid for a period of five years.

7.2. Laboratory Qualifications

7.2.1. Laboratories meeting all the qualifications for any of the three types of concrete laboratories will be certified as such upon recommendation by the Working Task Force and approval by the Certification Board.

7.2.2. Laboratory qualifications are valid for a period of two years.

8. Decertification and Disqualification

8.1. Abuse or neglect of the responsibilities of concrete certification or laboratory qualifications is grounds for disciplinary action.

8.2. Charges or accusations shall be made in writing to the Working Task Force, which will investigate them.

8.3. Disciplinary actions will be implemented upon recommendation of the Working Task Force and approval of the Certification Board.

8.4. Disciplinary actions will range from written reprimand to suspension of certification or qualification.

8.5. Suspension will be a minimum of six months, plus six months probation, to permanent revocation of certification or qualification rights.

8.6. Falsification of records will result in permanent revocation of certification or qualification.

8.7. Laboratories with non-working equipment or improper procedures will have their qualification temporarily suspended until corrections to the equipment or procedures are made.

9. Recertification and Requalification

9.1. Personnel seeking recertification shall meet the requirements of Section 5 of this procedure.

9.2. Laboratories seeking requalification shall meet the requirements of Section 6 of this procedure.

ALDOT-407-01
CALIBRATION VERIFICATION OF TRUCK MOUNTED WATER METERS

1. Scope

1.1. This procedure will outline the requirements necessary to verify the calibration of truck mounted water meters used in all Alabama Department of Transportation, herein referred to as ALDOT or as the Department, projects.

1.2. This procedure will also establish the verification frequency for truck mounted water meters.

2. Required Equipment

2.1. The following equipment shall be supplied by the concrete producer:

2.1.1. A 1000 lb {454 kg} platform scale.

2.1.2. Standard test weights {masses}to verify scale accuracy.

2.1.3. A 55-gallon {210 L}drum reserved for calibration verification.

3. Calibration Verification Procedure

3.1. The concrete producer’s Concrete Technician, certified by the Department, shall perform the calibration verification procedure in the presence of an ALDOT representative.

3.2. Verify that the calibration of the scale does not exceed six months.

3.2.1. If the last calibration exceeds six months, the scale shall be re-calibrated before proceeding with the calibration verification of the truck mounted water meters.

3.3. Determine the scale accuracy by weighing 500 lb {227 kg} of the standard test weights {masses}. Note any deviation for later adjustments.

3.4. Place drum on scale and determine its tare weight {mass}.

3.5. Discharge 25 gallons {94.6 L} of water into the drum through the meter and record the weight {mass}.

3.6. Adjust the weight {mass} for any deviation obtained in step 3.3 and record as total weight {mass}.

3.7. The total weight {mass} recorded shall be 208.63 lb {94.63 kg} ± 1%

3.8. If the total weight {mass} recorded is not within 1% of 208.63 lb {94.63 kg} the concrete producer shall adjust the meter in accordance with the manufacturer’s recommendations.

3.9. After the meter is adjusted repeat steps 3.4 through 3.7

4. Calibration Verification Frequency

4.1. The verification of the calibration of truck mounted water meters shall be performed every twelve months or when the Engineer suspects inaccuracy in the meter readings.

4.2. A record of the calibration verification will be maintained by the Department on BMT-172, *"Record of Calibration Verification of Truck Mounted Water Meters"*.

NUMERICAL INDEX of BMT FORMS and WORKSHEETS

BMT Number	Title
BMT-1-B	Inspectors Daily Report Compaction Sand Cone Method
BMT-3	Traffic Marking Materials Certificate of Compliance
BMT-4	Plant Mix Daily Placement Report
BMT-5	Soils and Base Course Analysis
BMT-6	Field Inspectors Material Report
BMT-7	Report on Analysis of Performance Graded Asphalt Binders
BMT-10	Notice Stamp for Acceptance
BMT-16	General Test Report (Non-Specific)
BMT-17	Check Test
BMT-19	Work Sheet Summary of Lot Test Results for Air Voids and AC Content
BMT-20-G	Asphalt Plant Mixture Test Report (Gyratory)
BMT-20-M	Asphalt Plant Mixture Test Report (Marshall)
BMT-21	QC/QA MAT Density Report
BMT-30	Soil / Hydrometer Worksheet
BMT-33	Aggregate Work Sheet and Test Report
BMT-38	Summary of Tests
BMT-45	Annual Certification and Guarantee for Precast Concrete Products
BMT-47	Concrete Pipe and Culvert Test and Inspection Report
BMT-53	Precast Manhole Precast Box Culvert and Miscellaneous Precast Inspection Report
BMT-55	Inspectors Daily Report Thin Layer Gauge Compaction
BMT-57	Inspector's Daily Report Roadway Compaction Nuclear Probe
BMT-58	Proctor Density Compaction Sheet
BMT-58A	Proctor Density Laboratory Vibrated Density Compaction Sheet

BMT Number	**Title**
BMT-146	Bituminous Material Certificate of Compliance
BMT-153	Hot Mix Design by the Marshall Method
BMT-154	Summary of Independent Assurance Samples and Tests Coring Report
BMT-164	Agreement for Participation in Certified Acceptance and Quality Control of Asphalt Materials Program
BMT-168	Notification to Suspend Shipments of Asphalt Materials on BMT-146, Asphalt Certificate of Compliance
BMT-169	Certified Technician Warrant
BMT-170	Guardrail Submittal Form
BMT-171	Evaporation Rate Record
BMT-172	Record of Calibration Verification of Truck Mounted Water Meters

INSPECTORS DAILY REPORT COMPACTION SAND CONE METHOD

Copies:
- Division Engineer
- Project Engineer
- County Engineer
- File

Project Number: ____________________
County: ____________________
District: ____________ Division: ________
Date: ____________________
Report Number: ____________________

____Base Course
____Subbase Course
____Embankment

____Shoulder Material
____Improved Roadbed
____Finished Roadbed
____Modified Roadbed

Project Location: ______________________________ Contractor: ______________________________

Field test no.					
Station of test					
Location from C.L.					
Roadway					
Meters below subgrade or layer thickness					
Base plate and cone calibration:					
1. Original weight of sand and apparatus		lb (kg)			
2. Final weight of sand and apparatus		lb (kg)			
3. Weight of sand in cone	(1 - 2)	lb (kg)			
Test hole volume determination:					
4. Weight of sand and apparatus at start		lb (kg)			
5. Weight of sand and apparatus at end		lb (kg)			
6. Weight of sand used	(4 - 5)	lb (kg)			
7. Weight of sand in cone	(same weight as no. 3)	lb (kg)			
8. Weight of sand to fill hole	(6 - 7)	lb (kg)			
9. Pouring weight of sand		lb/ft^3 (kg/m^3)			
10. Volume of test hole	(8 ÷ 9)	ft^3 (m^3)			
11. Wet weight of sample removed from hole		lb (kg)			
12. Initial weight of moisture sample		(g)			
13. Dry weight of moisture sample		(g)			
14. Moisture	(12 - 13)	(g)			
15. % Moisture	(14 ÷ 13) x 100				
16. Optimum moisture	"M"				
17. Dry weight of sample	[11 ÷ (100 + 15)] x 100	lb (kg)			
18. Dry weight per cubic meter	(17 ÷ 10)	lb/ft^3 (kg/m^3)			
19. Maximum dry density	(P.D.)				
20. % Compaction	(18 ÷ 19) x 100				
21. Minimum % compaction required					

Verified

Inspector   Remarks on Back   Project Engineer

TRAFFIC MARKING MATERIALS CERTIFICATE OF COMPLIANCE

Original: Bureau of Materials and Tests
Copies: Division Materials Engineer
Project Engineer

Project Number: ____________________ County: ____________________

Consignee: ____________________ Destination: ____________________

Manufacturer	* Description	** Pay Item #	Batch No.	Quantity lbs or LF [Kg or M]

* Note: The following items are to be used for the "Description" column: the type Reflective (R) or Non-Reflective (NR), the color, Yellow (Y)or White (W) then Paint (P), Thermoplastic (T), Class 2T (2T), Inverted Profile (IP), Profiled (P), Tape (3T), or 3W Tape (3WT), Paint for Markings and Legends (PM&L), Thermoplastic for Markings and Legends (TM&L), then Broken or Solid. For glass beads; Glass Beads.

** Note: For Pay Item #'s, see Contract and Sections 701, 702 and 703 of the Specifications.

I certify that this material does meet all the applicable requirements of the Alabama Department of Transportation.
I further certify that the quantities listed above are true and accurate and were used on this project.

____________________ Name of Company

____________________ Address of Company

____________________ Signature of Authorized Representative

____________________ Date

NOTARY PUBLIC Subscribed and sworn to before me, this __________day of __________________, 20_______.

____________________ Signature of Notary

PLANT MIX DAILY PLACEMENT REPORT

Copies: Division
File

Project Number:__________
County: __________
Division: __________
District Number: __________
Date: __________

Location of Project __________
Contractor __________ Total Tons in Contract __________
Producer __________ Weather Today __________
Temperature: Today _____ °F (°C), Low _____ °F (°C), High _____ °F (°C), Surface _____ °F (°C)

Tack Coat

Tack Placed Today Sta. __________ to Sta. __________ Width __________ Yds^2 (m^2)__________
Gals (Liters) Used Today __________ Gals/Yd^2 (L/m^2)__________
From Previous Report: __________ Gallons (Liters) __________ Yd^2 (m^2)
Gals (Liters) Used to Date __________ Yds.^{2} (m^2) to Date__________
Tack Coat Placed to Date: Sta. __________ to Sta.__________

Plant Mix

Tons (t) Placed Today __________ x 2000 =lbs. (x 1000 = kg.) Placed Today__________
From Previous Report: __________ Delivery Temp._____ °F (°C) _____ °F (°C) _____ °F(°C) _____ °F(°C)
Total Tons (t) Placed to Date __________ x 2000 = Total lbs. (x 1000 = Total kg.) Placed to Date __________
Pay Item No. __________ Mix No.__________ Lot No.__________

Yield Each 5000 Yds^2 (m^2) (Approximate) This Date

Spread	Station	Station	Width	Length	Yd^2 (m^2)	Tons (t)	Lbs (kg)	Rate	Required
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Remarks __________
Inspector __________ Project Engineer__________
Certification Expiration Date __________

SOILS AND BASE COURSE ANALYSIS

Copies:
District Engineer
Project Engineer
File

Project Number: ____________________
County: ____________________
Division: ____________________
Date: ____________________

Report of Analysis on Sample of ____
Specification Selection Number ____
Source of Material ____________________ Producer ____________________
Sampled by ____________________ Submitted by ____________________
Date Sampled ______________ Date Received ______________ Date Tested ______________

Laboratory No.
Marks
Source
Location
Quantity
Total Passing %
3 in.(75 mm) Sieve
2.5” (63 mm ″
2” (50 mm) ″
1.5”(37.5 mm) ″
1” (25 mm) ″
¾”(19 mm) ″
½’(12.5 mm ″
3/8”(9.5 mm ″
No. 4(4.75 mm ″
No. 8 (2.36 mm ″
No. 10(2.00 mm) ″
No 16 (1.18 mm) ″
No. 40(425 µm) ″
No. 50 (300 µm) ″
No. 200 (75 µm) ″

Material Passing No. 8 (2.36 mm)
Clay
Silt
Total Sand
Mat'l. Pass. No. 40(425 µm)

Mat'l. Pass. No. 200 (75 µm)
Atterburg Limits
Liquid Limit
Plastic Limit
Plasticity Index
Group
Crushed Particle Count

__________ sample(s) meet(s) the requirements of the Alabama Department of Transportation Specifications for Section __________
Remarks ____
____

____
Inspector

FIELD INSPECTORS MATERIAL REPORT

Lab Number: ________________
Copies:
Lab
Division Engineer
District Engineer
Project Engineer

Project Number: ______________
County: ____________________
Division: ___________________
Date: ______________________

Material ________________________________ Source ________________________________
Material ________________________________ Source ________________________________
Date ________________________________

Initial Car No.										
No. 100(50mm)	.	.	.	.	.	.	.	.	.	.
No.50 (300 mm)	.	.	.	.	.	.	.	.	.	.
No. 30 (600 mm)	.	.	.	.	.	.	.	.	.	.
N. 16(1.18 mm)	.	.	.	.	.	.	.	.	.	.
No.8(2.36 mm)	.	.	.	.	.	.	.	.	.	.
No. 4(4.75 mm)	.	.	.	.	.	.	.	.	.	.
3/8 (9.5 mm)	.	.	.	.	.	.	.	.	.	.
½(12.5 mm)	.x	.x	.x	.x	.x	.x	.x	.x	.x	.x
¾ (19.0 mm)	.	.	.	.	.	.	.	.	.	.
1” (25.0 mm)	.x	.x	.x	.x	.x	.x	.x	.x	.x	.x
1 ½”(37.5 mm)	.	.	.	.	.	.	.	.	.	.
2” (50 mm)	.x	.x	.x	.x	.x	.x	.x	.x	.x	.x
F.M.	.	.	.	.	.	.	.	.	.	.
W.F.M.	.	.	.	.	.	.	.	.	.	.
Difs.	-. +.	-. +.	-. +.	-. +.	-. +.	-. +.	-. +.	-. +.	-. +.	-. +.

Deleterious substance approved by visual inspection. Yes_______No________

Note: Figures show percent total passing / retained on square screens.

Screens marked “x” not to be added in for the F.M.

This sample _______________ meet the requirements of the Alabama Department of Transportation Specifications for ____

____

____
Inspector

REPORT ON ANALYSIS OF PERFORMANCE GRADED ASPHALT BINDERS

Producer ______________________

Location ______________________ Material Grade ______________________

Date Sampled ______________________ Tank Number ______________________

Week Ending ______________________

Test results as per AASHTO PP6, “Practice for Grading or Verifying the Performance Grade of an Asphalt Binder”, following specification guidelines as per AASHTO MP1, “Specification for Performance Graded Asphalt Binder.”			
Tests on Original Binder:			
	$G^*/\sin\delta$	AASHTO TP5 (1.00 kPa minimum)	
	Rotational Viscosity	AASHTO TP48 (3Pa•s maximum)	
	Flash Point	AASHTO T48 (235° C minimum)	
Tests on Rolling Thin Film Oven (RTFO) Residue :			
	$G^*/\sin\delta$	AASHTO TP5 (2.20 kPa minimum)	
	Mass Loss	AASHTO 240 (1.00% maximum)	
Tests on Pressure Aging Vessel (PAV) Residue:			
	$G^*\cdot\sin\delta$	AASHTO TP5 (5000 kPa maximum)	
	Stiffness, S	AASHTO TP1 (300 MPa maximum)	
	Slope, m	AASHTO TP1 (0.300 minimum)	
	Direct Tension Failure Strain	AASHTO TP3 (1.0% minimum)	
** Record Temperature of Test…			

Remarks:

This sample <u>does / does not</u> meet the requirements of the ALDOT Specifications for ____________________.

____
Company Representative Signature

NOTICE STAMP FOR ACCEPTANCE

I hereby certify that this shipment of aggregate is from approved Source No.*__________ and meets the specifications for this project and the weight shown is true and accurate.

Signed ________________________________
Weighmaster/Authorized
Representative

*Note: Appropriate Source Number is assigned.

GENERAL TEST REPORT (NON-SPECIFIC)

Lab Number: ____________________

Project Number: ________________
County: ______________________
Division: _____________________
Date: ___________________________

{Inspection Report of} Analysis on Sample of: ______________________________________
Producer: ______________________________________ Date Received: ____________
Identification Marks: ______________________________ Date Tested: ______________
Source of Material: ____
Quantity (Represented): ____
Sampled by: ___________________________________ Date: _________________
Submitted by: __________________________________ Date: _________________

Test Results

This sample meet the requirements of the Alabama Department of Transportation Specifications for ____
____
____
____

____
Testing Engineer

CHECK TEST

LIQUID LIMIT			PLASTIC LIMIT
____ . ____	____ . ____	____ . ____	____ . ____
____ . ____	____ . ____	____ . ____	____ . ____
____ . ____	____ . ____	____ . ____	____ . ____
____ . ____	____ . ____	____ . ____	____ . ____
____ . ____	____ . ____	____ . ____	____ . ____
____ . ____	____ . ____ %	____ . ____ %	____ . ____ %

CAN + SAMPLE (WET)	____ . ____	____ . ____	____ . ____
CAN + SAMPLE (DRY)	____ . ____	____ . ____	____ . ____
CAN NO. ____	____ . ____	____ . ____	____ . ____
SAMPLE DRY	____ . ____	____ . ____	____ . ____
LOSS	____ . ____	____ . ____	____ . ____
BLOWS	____ . ____	____ . ____	____ . ____

PLASTIC LIMIT

____ . ____	CAN + SAMPLE (WET)
____ . ____	CAN + SAMPLE (DRY)
____ . ____	CAN NO. ____
____ . ____	SAMPLE DRY
____ . ____	LOSS ____ . ____ %

SOIL ANALYSIS

LIQUID LIMIT	____ . ____
PLASTIC LIMIT	____ . ____
PLASTICITY INDEX	____ . ____

LABORATORY NO. ____________

INFORMATION TO ACCOMPANY SAMPLE FOR TESTING

Project Number ______________________________ Marks __________
Division ______________________________ County __________
Material ______________________________
Section No. ______________________________
Producer ______________________________
Source ______________________________
Quantity Represented ______________________________
Producer Reference No. ______________________________
Sampled by ______________________________ Date __________
Submitted by ______________________________
____
____
Form BMT-18 Rev. (Oct.94) ______________________________

BMT-19
Revision: 10/27/97

ALABAMA DEPARTMENT OF TRANSPORTATION

WORK SHEET SUMMARY OF LOT TEST RESULTS
FOR AIR VOIDS AND AC CONTENT

Project Number: ____________________
County: ____________________
Date: ____________________
Lot Number: ____________________
Pay Item Number: ____________________
Mix Number: ____________________

% AC Content Required =					
Testing Increment	**Contractor**	**State**	**Reference**		**Deviation**
			Contractor	**State**	
1					
2					
3					
4					
5					
				Average	
				Pay Factor	

Remarks: ____

% Air Voids Required =					
Testing Increment	**Contractor**	**State**	**Referee**		**Deviation**
			Contractor	**State**	
1					
2					
3					
4					
5					
				Average	
				Pay Factor	

Remarks: ____

Notes:

1. If Pay Factor is determined on original state verification test, enter Pay Factor on QC/QA Form 1.

2. If Pay Factor is determined on contractor verification test, enter Pay Factor on QC/QA Form 2; If not resolved on contractor verification test, use M & T referee tests and go to BMT-135 and ALDOT-380.

BMT-20-G
Revision 2/26/03

ALABAMA DEPARTMENT OF TRANSPORTATION

ASPHALT PLANT MIXTURE TEST REPORT (Gyratory)

Copies:
HMA Lab
Division
Project Engineer
File

Contractor Testing ________
Department Testing ________

Project Number: ____________________
County: ____________________
Division: ____________________
Lab. Number: ____________________

Pay Item No. __________ Mix No. ________ Lot No. ________ Date(s) Sampled: __________
Producer: ______________________________ Date(s) Tested: __________
Tons Produced: (This Report) ____________________ JMF Number: __________
Prime Contractor: ____________________ Paving Contractor: ____________________

Analysis

Sample Number		1	2	3	4	5	6
Production Ton Sampled							
Loading Temp.							
Truck Number							
Sieve	JMF						
37.5 mm (1 ½”)							
25.0 mm (1”)							
19.0 mm (3/4”)							
12.5 mm (1/2”)							
9.5 mm (3/8”)							
4.75 mm (No. 4)							
2.36 mm (No. 8)							
1.18 mm (No. 16)							
0.600 mm (No. 30)							
0.300 mm (No. 50)							
0.150 mm (No. 100)							
0.075 mm (No. 200)							
% AC Required							
% AC Actual							
Dust/Asphalt Ratio							
Rice Gravity							
% Air Voids at Ndes							
VMA at Ndes							
% Gmm at Nini							
% Gmm at Ndes							

Comments: ____
____

Certified Technician ______________________________

Expiration Date of Certification ____________________ Page _____ of _____ Pages

BMT-20-M
Revision 2/26/03

ALABAMA DEPARTMENT OF TRANSPORTATION

ASPHALT PLANT MIXTURE TEST REPORT (Marshall)

Copies:
HMA Lab
Division
Project Engineer
File

Contractor Testing __________
Department Testing__________

Project Number: ______________________________
County: ______________________________
Division: ______________________________
Lab. Number: ______________________________

Pay Item No. __________ Mix No. __________ Lot No. _______ Date(s) Sampled: ______________________
Producer: ____ Date(s) Tested: ______________________
Tons Produced: (This Report) ______________________________ JMF Number: ______________________
Prime Contractor: ____________________________ Paving Contractor: ______________________________

Analysis

Sample Number		1	2	3	4	5	6
Production Ton Sampled							
Loading Temp.							
Truck Number							
Sieve	JMF						
37.5 mm (1 ½”)							
25.0 mm (1”)							
19.0 mm (3/4”)							
12.5 mm (1/2”)							
9.5 mm (3/8”)							
4.75 mm (No. 4)							
2.36 mm (No. 8)							
1.18 mm (No. 16)							
0.600 mm (No. 30)							
0.300 mm (No. 50)							
0.150 mm (No. 100)							
0.075 mm (No. 200)							
% AC Required							
% AC Actual							
% Air Voids							
Dust/Asphalt Ratio							
Rice Gravity							
VMA (%)							
Crushed Particles (%)							
Stability lbs. (kg)							
Flow 0.01” (0.3 mm)							

Comments: ____
____

Certified Technician ____
Expiration Date of Certification __________________________________ Page ______ of _____ Pages

BMT-21
ALABAMA DEPARTMENT OF TRANSPORTATION Revision: 2/26/03

QC/QA MAT DENSITY REPORT

Copies:
Division
Project Engineer
File

Project Number: ______________________
County: ______________________
Division: ______________________

Contractor Testing: ______________________
Department Testing: ______________________

Date: ______________________
JMF Number: ______________________

Pay Item Number: ______________________
Lot Pay Factor (from BMT-97): ______________
English: ____________ Metric: ____________
Beginning Station: ______________________

Lot Number: ______________________
Mix Number: ______________________
Layer Tested: ______________________
Ending Station: ______________________

Gauge Information

Gauge Manufacturer: ______________________
Model Number: ______________________
Density Standard: ______________________
Moisture Standard: ______________________

Radioactive Source: ______________________
Serial Number: ______________________
D-Bias or Offset: ______________________
Gauge Certified Date: ______________________

Sub-Lot Number								
Station of Test								
Location of Test								
Layer Thickness								
	Counts	Density	Counts	Density	Counts	Density	Counts	Density
Test Number 1								
Number 2								
Number 3								
Number 4								
Average of Test								
Max Spec.Gravity								
% Density								
Core Bulk Gravity								
% Dens. from Core								

Certified Technician: ______________________
Expiration Date of Certification: ______________

Page ______ of ______ Pages

SOIL / HYDROMETER WORKSHEET

Attach Sample Card

HYDROMETER REPORT	Specification No.:			Test Number:	
> 2 mm	Date Begun:			Date Completed:	
2.0--0.42 mm	Date Reported:			Laboratory No.:	
.42--0.074 mm	Total Sample Wt.:	(kg)		Circle	Total Sample
074--0.002 mm	Wt. Retained	Wt. Passing	Spec.	Sieve Size	Passing %
<.002 mm				75 mm	.
<.001 mm				63 mm	.
Hydrometer Analysis				50 mm	.
<0.02 mm				37.5 mm	.
<0.002 mm				25 mm	.
<0.001 mm				19 mm	.
Mechanical Analysis				12.5 mm	.
% Passing 425 µm				4.75 mm	.
% Passing 75 µm				2.36 mm	.
Ret. 1.18 mm g				2.00 mm	.
Ret. 1.18 mm %	Ret. 75 µm			g	Total Sample %
Pass 1.18 %	Ret. 75 µm			%	Multiply Passing
Ret. 425 µm g	Pass. 75 µm			%	(2.36 mm)% x Sieve
Ret. 425 µm %	Total Sand			%	passing %
Pass.425 µm %	Mat'l Pass. 1.18 mm			%	
Ret. 300 µm g	Mat'l Pass 425 µm			%	
Ret. 300 µm %	Mat'l Pass. 300 µm			%	
Pass 300 µm %	Mat'l Pass. 75 µm			%	

AGGREGATE WORK SHEET AND TEST REPORT

Lab Number: ____________________
Copies:
- Lab
- Division Engineer
- District Engineer
- Project Engineer

Project Number: ____________________
County: ____________________
Division: ____________________
Date: ____________________

Plant Name:				Lab No.:				Report No.:
Agg. Size No.:	Description:				Agg. Size No.:	Description:		
Sieve	Weight Retained	% Retained	% Passing		Sieve	Weight Retained	% Retained	% Passing
No. 200(75 mm)					No.200(75 mm)			
2 ½(63 mm)					21/2(63 mm)			
2 (50 mm)					2 (50 mm)			
1 ½(37.5 mm)					11/2(37.5 mm)			
1 (25 mm)					1 (25 mm)			
¾ (19 mm)					¾ (19 mm)			
½(12.5 mm)					½ (12.5 mm)			
3/8(9.5 mm)					3/8(9.5mm)			
No. 4(4.75 mm)					No. 4 (4.75 mm)			
No. 8(2.36 mm)					No. 8 (2.36 mm)			
No. 16(1.18 mm)					No. 16(1.18 mm)			
No. 30(600 µm)					No. 30(600 µm)			
No. 50 (300 µm)					No. 50(300 µm)			
No. 100(150 µm)					No. 100(150 µm)			
No.200(75 µm)					No. 200(75 µm)			
F.M.					F.M.			
W.F.M.					W.F.M.			
Difs	- +	- +	- +		Difs	- +	- +	- +

Total Weight of Sample: ____________________
Source: ____________________

Remarks: ____________________

Total Weight of Sample: ____________________
Source: ____________________

Remarks: ____________________

____
Batcher/Technician/Inspector

SUMMARY OF TESTS

Project No.: ______________________________ County: ________________________________
Contractor: ____

Laboratory numbers and quantities of all tested materials incorporated in this project are listed below under the item in which they were used. This report covers all items in which tested materials are required.

Type of Material: _______________ ____________________ ____________________

Project Engineer Division Engineer

Lab No.	**Quantity**	**Lab No.**	**Quantity**	**Lab No.**	**Quantity**

Show quantities for each item. Page _____ of ______

SUMMARY OF TESTS

Type of Material: ____

Lab No.	**Quantity**	**Lab No.**	**Quantity**	**Lab No.**	**Quantity**

Show quantities for each item.

Page _____ of ______

ANNUAL CERTIFICATION AND GUARANTEE FOR PRECAST CONCRETE PRODUCTS

The undersigned guarantees that all precast products covered by ALDOT-364-89 furnished by

____________________ in the forthcoming twelve months from its' plant located in ____________________
Company City

for use on Department of Transportation projects in the State of Alabama, has been manufactured under quality control and will meet the applicable Alabama Department of Transportation Specifications, AASHTO Specifications and Special Drawings. Any products will be replaced without cost to purchaser and the State of Alabama when not found in conformity with any of the specified requirements.

We certify that we accept full responsibility for determining the applicable Alabama Department of Transportation Specifications, AASHTO Specifications and Special Drawings for each order and further certify that all material furnished will meet the specifications which apply to each order.

____________________ will comply with the Department's ALDOT-364 for Quality Control of Precast
Company

Concrete Products used by the State of Alabama.

____
Company

____
Company Officer’s Signature

____
Title

____
Date

____
Notary Public

Sworn to and subscribed before me, this __________ day of ____________ __________ .
Day Month Year

CONCRETE PIPE AND CULVERT TEST AND INSPECTION REPORT

Copies: Aggregate Engineer
Division Engineer

Producer: ______________________ Location: ______________________

Raw Materials	Type or Size	Material Supplier	Location
Cement			
Fine Aggregate			
Coarse Aggregate			
Steel			
Steel			

Concrete Pipe and Precast Culvert Tested

Size	Class	Lot No.	Length of Section	* Total Load to Produce .1"(0.3 mm) Crack	* Total Ultimate Loads-kg.	Type Wall	Reinforcement Area	Percent Absorption

*If Core Or Cylinder Tests Are Applicable, Use These Two Columns.

Concrete Pipe and Precast Culvert Inspected

Size	Class	Date Made	Length of Section Ft (m)	Section Inspected	Section Stamped DOT	Section Rejected	Total Length Stamped Ft (m)

Remarks:

____
Concrete Pipe Technician

____
Date

PRECAST MANHOLE, PRECAST BOX CULVERT AND MISCELLANEOUS PRECAST INSPECTION REPORT

Producer: ______________________ Location: ______________________

Raw Materials	Type or Size	Material Supplier	Location
Cement			
Fine Aggregate			
Coarse Aggregate			
Steel			
Steel			

Precast Material	Lot No	Test Results	Dia. In. (mm)	Length ft. (m)	Sections Inspected	Sections Stamped	Sections Rejected	Total Length or Units Stamped ft. (m)

____
Concrete Precast Technician, DOT #

____
Date

INSPECTORS DAILY REPORT
THIN LAYER GAUGE COMPACTION

Copies: Division
Project Engineer
File

Project Number: ____________________
County: ____________________
Division: ____________________
Contractor: ____________________
Report No. ____________________
Date: ____________________

Begin Station: ____________________ End Station: ____________________

Project Location: ____________________ Layer Tested: ____________________
Specification Section No. ____________________ Mix Number: ____________________

Gauge Information

Gauge Manufacturer: ____________________ Energy Source: ____________________
Model Number: ____________________ Serial Number: ____________________
Special Calibration Number: ____________________
Daily Reference Value: ____________________ Daily Reference Value This Date: ____________________

Field Test Number							
Station of Test							
Location of Test							
Layer Thickness							
Counts No. 1							
No. 2							
No. 3							
No. 4							
Average of Counts							
Max. Specific Gravity							
% Density							
Core Data							
% Density from Core							

Certified Technician: ____________________
Expiration Date of Certification: ____________________ Page ________ of ________ Pages

INSPECTOR'S DAILY REPORT ROADWAY COMPACTION NUCLEAR PROBE

Copies:
- Division Engineer
- District Engineer
- File

Project Number: ____________________
County: ____________________
Begin Station: ____________________
End Station: ____________________
Report Number: ____________________
Date: ____________________

Equipment Manufacturer:

Type Transmission

(Circle one)

Direct   Back-Scatter   ____________________ Other

Density Probe	**Moisture Probe**
Energy Source: ______	Energy Source: ______
Model No.: ______ Serial No.: ______	Model No.: ______ Serial No.: ______
Mfg.'s Std. Count: ______	Mfg.'s Std. Count: ______
Check Count this Date: ______	Check Count this Date: ______
Count # 1 ______	Count # 1 ______
# 2 ______	# 2 ______
# 3 ______	# 3 ______
# 4 ______	# 4 ______
# 5	# 5
Average ______	Average ______

Project Location: ____________________ Contractor: ____________________
Layer Tested: ____________________ Specification Section No.: ____________________

Field Test Number					
Station of Test					
Location of Test					
Elevation or Thickness					
Density Probe Count					
Density Count Ratio					
Wet Density- .lbs/ft³ (kg/m³)					
Specific Gravity					
(Bituminous Mixes)					
Moisture Probe Count					
Moisture Count Ratio					
H^20-.lbs/ft³ (kg/m³)					
Dry Density- .lbs/ ft³ (kg/m³)					
% Moisture (Soil Dry Basis)					
Laboratory Standard					
Optimum Moisture					
% Comparative Compaction					
% Compaction Required					

____________________ Inspector

____________________ Project Engineer

PROCTOR DENSITY
COMPACTION SHEET

Sample No. ______________________ Lab No. ______________________
Operator ______________________ Date ______________________
A-Total Mass of Sample ______________________ Type Proctor Density. ______________________
B-Mass of Aggregate Retained No.4 (4.75 mm) ______________ Dry Mass .lbs/ft³ (kg/m³) ______________________
C-Mass of Aggregate Retained ¾ (19.0) mm ______________ % Optimum Moisture ______________________
Total Mass of Aggregate ______________________ Total Mass of Sample ______________________
Mass of Aggregate Retained ¾ (19.0 mm) _______ . _______ %
$\frac{B + C}{A}$ = % of Aggregate Passing ¾" (19.0 mm) Sieve to be Replaced in Sample
Mass of Aggregate Retained No. 4 (4.75 mm) _______ . _______ %
Total Mass of Aggregate _______ . _______ %

Can No.						
1. Can + Sample Wet						
2. Can + Sample Dry						
3. Can Mass						
4. Loss in Grams (1 - 2)						
5. Dry Mass of Sample (2 - 3)						
6. % of Loss (4 ÷ 5)						
7. Wet Mass of Molded Sample						
8. Dry Mass of Molded Sample [7 ÷ (6 + 100)]						
9. Dry Mass 8 ÷ Vol. of Mold						
10. Dry Mass .lbs/ft.3 (kg/m^{3}) (9 ÷ 0.0333 ft^{3})						

PROCTOR DENSITY
LABORATORY VIBRATED DENSITY
COMPACTION SHEET

Sample No. ______________________________

Operator ______________________________

Lab No. ______________________________

Date ______________________________

Type Proctor Density ______________________________

Dry Mass .lbs/ft^3 (kg/m^3) ______________________________

% Optimum Moisture ______________________________

Specific Gravity of Aggregate ______________________________

Sol. Vol. of Aggregate ______________________________

Porosity ______________________________

Can No.						
1. Can + Sample Wet						
2. Can + Sample Dry						
3. Can Mass						
4. Loss in Grams (1 - 2)						
5. Dry Mass of Sample (2 - 3)						
6. % of Loss (4 / 5)						
Wet Mass of Molded Sample X 453.6						
7. Dry Mass of Molded Sample [7 ¸ (6 + 100)]						
8. Dry Mass 8 ¸ Vol. of Mold						
9. Dry Mass/ .lbs/ft^3 (kg/m^3) (8/ ______________) / 1000 vol. mold						

PROJECT ENGINEER'S CHECK LIST FOR FINAL FIELD INSPECTION OF CORRUGATED METAL PIPE

Copies
Division Engineer
Project Engineer

Project Number: ____________________
County: ____________________
Division: ____________________
Date: ____________________

Instructions

The purpose of this form is to call your attention to necessary items of inspection with convenient places for you to check prior to accepting an order of pipe for installation on the project.

Make inspection for each load as soon as the pipe arrives on the project and in all cases before it is laid. If there is any question about any feature checked, consult your Division Engineer.

This form is written to cover a broad variety of pipe. Therefore, all blanks may not fit your situation. Only check those which apply to your pipe.

Description

Metal Manufacturer ____
Fabricator of Pipe ____

Base Metal		**Coating**		**Fabrication**		**Type**	
Steel	( )	None	( )	Helical Weld	( )	I Culvert, Circular	( )
Aluminum	( )	Bituminous	( )	Lock Seam	( )	IA Sewer, Circular	( )
		Polymeric	( )			II Culvert, Arched	( )
		Paved Invert	( )			III Underdrain Pipe	( )

A. Lock Seam Pipe

1. 1.Seam

( ) Lap size 5/32 (5 mm) min. for pipe up to 10 in. (250 mm) diameter.
( ) Lap size 5/16 (8 mm)min. for pipe over 10 in. (250 mm)diameter.
( ) Lap tight contact along seam.

B. Pipe Coupling

1. Bands to be of sufficient width to engage 2 corrugations on each length of pipe.

PROJECT ENGINEER'S CHECK LIST FOR FINAL FIELD INSPECTION OF CORRUGATED METAL PIPE

C. Consult Drawing for Requirements.

1. Corrugations

   ( )2-2/3in. x ½ "(68 mm x 13 mm)   ( ) 3" x 1" (75 mm x 25 mm)   ( ) Other ____________________

2. Elongated: yes ( ) no ( )

   Strutted: shop ( ) field ( )

3. Diameter shall not vary more than 1% or ½" (13 mm), whichever is greater.

Heat #	Diameter	LIN. ft (m)

4. Thickness of metal (gauge).

   ____________ .040" (1.02 mm)
   ____________ .052" (1.32 mm)
   ____________ .064" (1.63 mm)
   ____________ .079" (2.01 mm)
   ____________ .109" (2.77 mm)
   ____________ .138" (3.51 mm)
   ____________ .168"(4.27 mm)

D. Bituminous Coating

1. Thickness of Coating

   ( ) Spec. 0.05" (1.5 mm) min. measured on crests of the corrugations.

2. Paved Invert

   ( ) Smooth pavement filling corrugations for at least 25% of periphery of full circle pipe and 40% of the opening of arch pipe.

3. Thickness of Coating of Paved Invert

   ( ) Spec. min. 1/8" (3 mm) above crest of corrugation.

4. Thickness of Coating of Smooth Flow

   ( ) All corrugations filled to 1/8" (3 mm) above crest of corrugations to comply with minimum specifications.

E. Polymeric Coating

( ) 0.05”(1 mm) thick coating on inner surface with thinner coating on outside.

F. General Requirements

1. Net Length

( ) Spec. avg. deficiency is greater than 1% - Shipment rejected.

2. Workmanship

( ) Even laps.

( ) No elliptical shape in pipe intended to be round.

( ) No variation from straight center line.

( ) No ragged or diagonal sheared edges.

( ) No unfinished ends.

( ) No illegible brand.

( ) No bruised, scaled, or broken spelter coating.

( ) No dents or bends in the metal itself.

3. Each length of pipe will have duct tape placed over 1 section, covering Heat Number and Decimal Thickness, if coated with asphalt.

4. Is a copy of the Metal Manufacturer's Analysis attached?

Yes ( ) No ( )

If coated, is a copy of the Asphalt Manufacturer's Analysis attached?

Yes ( ) No ( )

If No, then they should be obtained before paying for material.

Signed ______________________________ Approved ______________________________
Inspector Project Engineer

ASPHALT CONTENT GAUGE WORKSHEET

Copies: Division
Project Engineer
File

Contractor Testing __________
Department Testing __________

Project Number: ______________________
County: ______________________
Division: ______________________

Date(s) Sampled: ______________________
Date(s) Tested: ______________________

Plant Location: ______________________ Producer: ______________________
Lot Number: ______________________
Pay Item Number: ______________________ Mix Number ______________________

Gauge Information

Gauge Manufacturer: ______________________
Model Number: ______________________ Serial Number: ______________________
Calibration Number: ______________________ Background Count This Date: ______________________

Materials Specifications

Aggregate:

Source	Size	Percent

Asphalt:

Source	Grade

Test Number						
% AC Required						
% AC of Test Sample						
- % Moisture of Test Sample						
= Corrected % AC Content						

Certified Technician: ______________________
Expiration Date of Certification: ______________________

Page ________ of ________ Pages

ASPHALT CONTENT GAUGE CALIBRATION WORKSHEET

Copies: Division Engineer
Project Engineer
File

Project Number: ______________________
County: ______________________
Division: ______________________

Contractor Testing __________
Department Testing __________

Date(s): ______________________

Plant Location: ______________________
Producer: ______________________
Pay Item Number: ______________________
Mix Number: ______________________

Gauge Information

Gauge Manufacturer: ______________________
Model Number: ______________________
Serial Number: ______________________
Calibration Number: ______________________
Background Count This Date: ______________________

Materials Specifications

Aggregate:

Source	Size	Percent

Asphalt:

Source	Grade

Calibration Pan Number	1	2	3
Calibration % AC			
Mass Wt. Of Dry Agg., g			
Grams of Asphalt Added to Agg.			
Mass of Mix in Calibration Pan, g			
Calibration Count Data			
Calibration Pan % AC			
% AC After Calibration			

Gauge Constants

A/A1 ______________
B/A2 ______________
C/A3 ______________
<u>R Value</u>
Fit Coeff. ______________

Certified Technician: ______________________
Expiration Date of Certification: ______________________

Page ________ of ________ Pages

PRECAST CONCRETE PRODUCTS SHIPPING REPORT

Project: ______________________________ County: ______________________________
Manufactured by: ______________________ Location: ____________________________
Furnished by: ____
Contractor: ____

Date Shipped						
Size, in. (mm)						
Class						
No. of Sections						
Total feet (Meters)						
Lot or Pour No.						
BMT No.						
Ticket or Invoice No.						

I certify that the Precast Concrete Products covered by this report was manufactured to comply with the State of Alabama Department of Transportation Standard Specifications____.
I further certify that the Precast Concrete Products listed herein has been subjected to the required testing and inspection as evidenced by the above noted DOT number stamped on each section shipped. A copy of the inspection report is on file in our office.

Signed ______________________________

____

____
Notary Public

Subscribed and sworn to before me, this ____________ day of ________________ , __________.
Day Month Year

MATERIAL GUARANTY

Copies: Division Engineer
Project Engineer

Project Number: ____________________

Gentlemen:

As provided by Article 106.02 of the ____________ Edition of the Standard Alabama Department of Transportation Specifications, we the ______________________________ (Company), propose to use the untested materials listed hereinafter in the construction of the above referenced project.

The ______________________________ (Company) hereby guarantees that the material so used will meet all the requirements set forth by the Standard Specifications and/or the provisions of our contract, subject to tests made by the Department.

It is further understood that should any of ______________ (these - this) material(s) prove unacceptable, any work which incorporates ______________ (these - this) material(s) shall be removed from the project and replaced with satisfactory material(s), restoring the work to the same condition which existed prior to such removal, all of which shall be at our expense and without extra compensation.

Material: ____

____

____

Specification: ____

____

____

Approved under above conditions:

Signed: ______________________________
Authorized Representative

For: ______________________________

CONCRETE PLANT INSPECTOR'S WORK SHEET AND GRADATION REPORT

Copies
Division Engineer
File

Project Number: ____________________
County: ____________________
Division: ____________________
Date: ____________________

Concrete Class			Plant Location			
	Cement	**Water**	**Fly Ash**	**Entrained Air**	**Fine Aggregate**	**Coarse Aggregate**
1 Cubic Meter Batch	(A) lbs (kg)	(B) gals (liters)	(C) lbs (kg)	(D)	(E) lbs (kg)	(F) lbs (kg)

Surface Dry Moisture					(1) %	(2) %
		(7) gals (liters)			(5) lbs (kg)	lbs (kg)
Corrected One Cu. Meter Batch	(9) lbs (kg)	(8) lbs (kg)	(10)	(11)	(3) lbs (kg)	(4) lbs (kg)

(A) through (F) are taken from the concrete mix furnished by the Materials & Tests Bureau Concrete Section. The numbered Blocks are derived in the following manner:

$$(1) = \frac{\text{(Wet mass of sample – Heat dried mass)}}{\text{(Heat dried mass of sample)}} \text{ X } 100$$

The use of a Speedy Moisture Tester or other means may be used instead of drying.

$$(2) = \frac{\text{(Wet mass of sample – SSD mass of sample)}}{\text{(SSD mass of sample)}} \text{ X } 100$$

This is obtained by drying the coarse aggregate to a SSD state of moisture.

(3) =	(E) X (100% + (1))	(6) =	(4) - (F)	(9) =	(A)
(4) =	(F) X (100% + (2))	(7) =	(5) + (6)	(10) =	(C)
(5) =	(3) - (E)	(8) =	(B) - (7)	(11) =	(D)

Slump Correction

When it becomes necessary to reduce water to produce a desired slump, sand should be added to compensate for the volume loss. For each liter of water removed from the design mix an additional 2.5 kilograms of sand mass to adjust for yield.

Gradation Check

	% Passing Sieve Number													
	2.5" (63mm)	2" (50 mm	1.5 (37.5 mm)	1" (25 mm	¾" (19 mm)	½" (12.5 mm)	No. 4 (9.5 mm)	No. 8 (4.75 mm)	No. 16 (2.36 mm)	No. 30 (1.18 mm)	No. 50 (600 m)	No. 100 (300 m)	No. 200 (150m)	F.M.
F.A.														
C.A.														

Source of Cement: ____________________ Source of Fly Ash: ____________________
Source of Fine Aggregate: ____________________ Source of coarse Aggregate: ____________________
Source of Admixtures: ____________________
Remarks: ____________________ ____________________

Certified Technician & No.

CONCRETE PLACING
DAILY REPORT

Copies
Division Engineer
Project Engineer

Project Number: ________________
County: ______________________
District: ______________________
Division: ______________________
Date: __________________________

No. ____________________________
Type Concrete __________________
Weather Conditions
F ________ C ________ R ________

1. Temperature today ________ F (C) Low _______ F (C) High, Temperature of Mix ______ F (C)
2. Contractor ____
3. Description of (structure, paving) ______________________________
4. Description of part of (structure, paving) placed this date ______________________
5. Time placing started ______________________ , completed ______________________
6. Cubic Yds (Cubic Meters) placed this date ____________________ , to date ____________________
7. Batches delived to (structure, paving) this date ______________________________
8. Method of curing ____
9. Cold weather curing temperature adjacent to the fresh concrete ______________________
10. Field Tests

Time	Slump in. (mm)	Time	% Air Entrained

11. Cast Cylinder or Beam Record

Time	No.	Station or Structure	Test Age	Field Curing	
				Method	Temperature

12. Remarks ____

______________________________ Inpector

______________________________ Project Engineer

STATEMENT OF RECEIPT OF RADIOACTIVE MATERIALS

1. I accept responsibility for the physical security, safe handling, and transportation of the radioactive materials listed below.

2. I have read, familiarized myself with and understand the requirements contained in the Alabama Department of Transportation publication entitled "Radiological Safety Manual for the use of Moisture/Density and Asphalt Content Gauges".

3. I will comply with and insure that all persons, including observers, comply with the Alabama Department of Public Health's "Rules for Radiation Protection".

4. I will not delegate custody of any state applied radioactive material to any individual not authorized by the Alabama Department of Public Health or the Alabama Department of Transportation.

UNAUTHORIZED SOURCE TRANSFER WILL NOT BE TOLERATED.

5. Owner of Source ____________________________________ License No. __________________.

Serial No. ___________________ SG No. ___________________ **"RQ"**

Manufacturer	Model No.	Radioactive Material	Radioactive Quantity	Type Instrument
Proper Shipping Name	UN or ID No.	Authorization	Packing Category	Transport Index* Type
Radioactive Material Special Form N.O.S.	UN - 2974	Special Form	Yellow Label II-	0._ "A"

* Transport Index is provided on the "Yellow Label II" sticker found on the shipping case.

6. This is to certify that the above named materials are properly classified, described, packaged, marked, labeled and in proper condition for transportation according to the applicable regulations of the Department of Transportation.

____
Date

____
Signature Of Person Receiving Sources

____
Signature of Person Issuing Sources

Transferred From: ________________________

____
Radiation Safety Officer

Transferred To: __________________________

Work No. __________ Home No. _________

EMERGENCY RESPONSE INFORMATION REQUIRED FOR TRANSPORTATION DOT P 5800.5 ERG 90 and 49 CRF

This emergency information applies to the following shipping description:

RADIACTIVE MATERIAL, R. Q., SPECIAL FORM N.O.S. UN2974, CLASS 7

POTENTIAL HAZARDS

IMMEDIATE HAZARDS TO HEALTH

- Low level radioactive material; little personal radiation hazard.
- Materials in Special Form are not expected to cause contamination in accidents.
- Some radioactive materials cannot be detected by commonly available instruments.
- Potential internal radiation hazard from inhalation, ingerstion, or breaks of skin, only if special form capsule is breached.

FIRE or EXPLOSION

- No risk of fire or explosion.
- Radioactivity does not change flammability or other properties of the material.

EMERGENCY ACTION

IMMEDIATE PRECAUTIONS

- Emergency response may be performed prior to any measurement of radiation.
- Notify Radiation Authority of accident conditions.
- Detain uninjured persons, isolate damaged equipment and delay cleanup until instruction of Radiation Authority.

FIRE

- Do not move damaged containers or exposed contents.
- Small Fires: Dry chemical, CO_2, water spray, or regular foam.
- Large Fires: Water spray, fog (flooding amounts).

SPILL or LEAK

- Do not touch damaged containers or exposed contents.
- Damage to outer container is not expected to affect sealed sources.

FIRST AID

- Use first aid treatment according to the nature of the injury.
- Advise medical personnel that victim may be contaminated with low levels radioactive material only if special form capsule is breached.

QUALITY CONTROL PROGRAM
AGGREGATE TEST REPORT

Lab No. ______________________

Project Number: ________________
County: ______________________
Date: ________________________

Producer ________________________________
Source Number ______________________________
Material ________________________________
Redistribution Terminal No.
Consigned to ______________________________
Destination ________________________________
Amount Represented by this Report ____
Dry Unit Weight _____________________ (kg/m^3) (Loose) (Rodded)

Transport Co. Initials							
Vehicle Number							
Sieve Opening							
4" (100 mm)		X	X	X	X	X	X
3.5"(90 mm)		X	X	X	X	X	X
3.0"(75 mm)							
2.5"(63 mm)		X	X	X	X	X	X
2.0"(50 mm)		X	X	X	X	X	X
1.5"(37.5 mm)							
1" (25.0 mm)		X	X	X	X	X	X
3/4" (19.0 mm)							
1/2" (12.5 mm)		X	X	X	X	X	X
3/8" (9.5 mm)							
No. 4(4.75 mm)							
No. 8(2.36 mm)							
No.16 (1.18 mm)							
No. 30(600 µm)							
No. 50(300 µm)							
No. 100(150 µm)							
No. 200(75 µm)		X	X	X	X	X	X
	F.M.						
	W.F.M.						
	Difs	- +.	- +.	- +.	- +.	- +.	- +.

Deleterious substance approved by visual inspection. Yes _____ No _____ AASHTO T-11 = ______ %

Note: Figures show percent total passing on square mesh sieves. Sieves marked "X" are not to be added in for the F.M. The material represented by this report meets all of the applicable Alabama Department of Transportation Specifications for incorporation in ____ .

(Fill in item number and description)

____

Quality Control Technician Certificate #

ALABAMA DEPARTMENT OF TRANSPORTATION

BMT-92
Revision: 4/4/94

DAILY REPORT
TRAFFIC STRIPE

Copies
- Division Engineer
- Project Engineer
- File

Project Number: ______________
County: ______________
District: ______________
Division: ______________
Date: ______________

Report No. ______________ Type of Stripe ______________
Location of Project ______________
Stationing of Project ______________ Length Miles (Kilometers) ______________
Contractor ______________
Sub-Contractor ______________
Weather Today ______________ Temp. Today _______ ^{o}High ______ ^{o}Low ______ ^{o}Average

Thermoplastic

Manufacturer	Color	Batch Number	Lab. Number

Work Completed This Date

Station	To Station	Length miles or ft km or m	Width of Stripe in. (mm)	Location of Stripes	Side	Rate Required	Quantity Used	Rate Used

Work Completed to Date

Remarks: ______________

ALABAMA DEPARTMENT OF TRANSPORTATION

BMT-92
Revision: 4/4/94

DAILY REPORT
TRAFFIC STRIPE

INVERTED PROFILE THERMOPLASTIC PROFILE HEIGHT MEASUREMENTS

FROM STATION	TO STATION	PROFILE HEIGHT (mils) or (0.000”)

Remarks: ____

____

______________________ ______________________
Inspector Project Engineer

WORKSHEET TO CALCULATE MAT DENSITY LOT PAY FACTORS

Copies
Division Engineer
Project Engineer

Project Number: ________________
Item Number: ________________
Lot Number: ________________

	Sublot Number:________________		Sublot Number:________________		Sublot Number:________________	
Testing Increment	% Density	Deviation from 94%	% Density	Deviation from 94%	% Density	Deviation from 94%
Test #1						
Test #2						
Test #3						
Test #4						
	Average Deviation		Average Deviation		Average Deviation	
	Sublot Payfactor		Sublot Payfactor		Sublot Payfactor	

Remarks: ____

	Sublot Number:________________		Sublot Number:________________		Sublot Number:________________	
Testing Increment	% Density	Deviation from 94%	% Density	Deviation from 94%	% Density	Deviation from 94%
Test #1						
Test #2						
Test #3						
Test #4						
	Average Deviation		Average Deviation		Average Deviation	
	Sublot Payfactor		Sublot Payfactor		Sublot Payfactor	

Remarks: ____

$$\text{Formula: Lot Payfactor} = \frac{\text{PF Sublot 1 (length Sublot 1) + PF Sublot 2 (length Sublot 2) + \_\_\_\_\_}}{\text{length Sublot 1 + length Sublot 2 + \_\_\_\_\_}}$$

Lot Payfactor = ____

Lot Payfactor = ___________ (Record on BMT-21)

Note: This worksheet used to generate Lot Pay Factors using contractor generated data.

APPLICATION FOR CERTIFICATION

Certification Menu: (Circle appropriate item)

A.Roadway Technician

B.Level 1 - Field Technician

C. Level 2 - Quality Control Manager

D. Level 3 - Asphalt Mix Designer

Please Print

Name: ______________________________

SSAN: ______________________________

Employer: ______________________________

Company Address: ______________________________

____

____

Company Phone Number: ______________________________

	Training and Experience Taught by	Date (if known)
NUCLEAR SAFETY		
ROADWAY		
LEVEL 1		
LEVEL 2		
LEVEL 3		
SUPERPAVE		

Send application to: Bureau of Materials and Tests
Attention: HMA Engineer
3704 Fairground Road
Montgomery, AL 36110
Phone: (334) 206-2392

CERTIFIED TECHNICIAN WARRANT

This document affirms that ______________________________ is certified by the Alabama Department of Transportation as an Asphalt Technician (______________________________).

This certification carries inherent rights and responsibilities. These rights include-but are not limited to-being exclusively sanctioned by the Alabama Department of Transportation to perform sampling, __________ and testing for quality control and quality assurance programs. These responsibilities include but are not limited to performing and reporting sampling, ___________________ and tests with the accuracy and precision expected of a certified Asphalt Technician.

Abuse or neglect of these rights and responsibilities shall be penalized upon recommendation by the working task force and approval by the Certification Board. The difference between neglect and abuse is intent and shall be determined by the working task force. The first instance of neglect shall result in a thirty-day suspension of the Asphalt Technician's certification. The second offense shall result in a one hundred and eighty day suspension; any subsequent instances shall be considered as and treated the same as abuse. The first instance of abuse shall result in permanent revocation of the Asphalt Technician's certification.

____ Working Task Force Chairman

____ Certification Board Chairman

I, _________________________, have read and understand the rights, responsibilities and penalties and know that this warrant expires on ____________________.

____

COMPARISON CHECK

Copies
Project Engineer
IAS & T
File

Project Number: ________________
County: ________________________

Mr. ___________________________________
District Engineer

Date: ____________________________

Alabama Department of Transportation

, Alabama

Re: Comparison Check

Dear Sir:

Attached is a copy of the comparison check made from the _________ Layer of ______________ on the above-mentioned project. A study of the IAS&T test results and the Acceptance test indicate

____

____

____

Concrete Aggregate:
____

____

____

Bituminous Plant Mix:
____

____

____

Other Material:
____

____

The test results (are) (are not) reasonably close. Further comments, if any, on attached sheet.

Yours very truly,

INSPECTORS WORKSHEET FOR CONTROL STRIP
DENSITY-MOISTURE/NUCLEAR PROBE

Project Number: ______________________
County: ______________________
Date: ______________________

Control Strip Number: __________ Layer Tested: ______________ Type Material: ____________ Layer Thickness: ____________
Control Strip Limits: __________ Begin Station: ______________ End Station: ____________ Roadway: ____________

Roller Type	**Gross Weight**	**Contact kPa**	**Number o Passes**	**Wet Density**

Probe Manufacturer: ________________ Energy Source: ____________________ Serial Number: ____________________
Model Number: ________________ Manufacturer's Standard Count - Density: ______________ Moisture: ______________
Check Count This Date (Average of Five) Density: Moisture:

Test Points	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Station										
Location										
Density Probe Count										
Density Count Ratio										
Wet Density lbs./ft39kg/m^3										
Moisture Probe Count										
Moisture Count Ratio										
Moisture kg/m^3										
Dry Density lbs/ft.3(kg/m$^{3)}$										
% Moisture (Soil Dry Basis)										

Average Density: ____________ Wet / Dry lb/ft^3 (kg/m^3) Average Moisture: ____________ % Soil Dry Basis

Control Strip
Accepted ______ Rejected ______

Remarks: ____

______________________________ Inspector

______________________________ Project Engineer

INSPECTORS DAILY TEST FOR IN-PLACE DENSITY MOISTURE CONTROL STRIP METHOD/NUCLEAR PROBE

LBSCopies
Division Engineer
Project Engineer
File

Project Number: ____________________
County: ____________________
Report Number: ____________________
Date: ____________________

Equipment Manufacturer: ________________________________
Type Transmission Direct ________ Back-Scatter ________ Other ________

Density Probe			Moisture Probe		
Energy Source			Energy Source		
Model Number			Model Number		
Serial Number			Serial Number		
Mfg's Std Count			Mfg's Std Count		
Check Counts					
Count	AM	PM	Count	AM	PM
1			1		
2			2		
3			3		
4			4		
5			5		
Average			Average		
Project Location:			Contractor:		
Specification:	Control Strip No.:		Layer Tested:	Date Placed:	
Roadway:	2 Lane	Multi-lane	Roadway Shoulder:	Right	Left
Test Section No.:	Begin Station:		End Station:		
Control Strip Density lbs/ft^3 (kg/m^3)			Wet	Dry	
% Soil Dry Basis:			Control Strip Moisture:		
Average Density:	% of Required Density:		Average Moisture:	% of Required Moisture:	
Test Section:			Passes:	Fails:	

Individual Test Sites

	1	2	3	4	5
Station of Test					
Location of Test					
Density Probe Count					
Density Count Ratio					
Wet Density lbs./ft^3 (kg/m^3)					
Dry Density lbs./ft.^{3} (kg/m^3)					
Moisture Probe Count					
Moisture Count Ratio					
Moisture lbs./ft. ^{3} (kg/m^3)					
% Moisture (Soil Dry Basis)					

Remarks: ____

________________________ Inspector

________________________ Project Engineer

CERTIFIED CEMENT SHIPMENTS

Copies
- White – Concrete Engineer
- Canary – Project Engineer
- Pink - Vendor
- Green – Concrete Plant

Part One for Producer

Producer: ______________________________ Type: ______________
Brand of Cement: ______________________________
Location of Cement Plant: ______________________________
Consignee: ______________________________
Location Shipped to: ______________________________
Car or Truck Initials and No.: ______________ Date Shipped: ______________
No. T (t) Tons Shipped: ______________ From Bin or Silo No.: ______________
Car or Truck Seal No.: ______________________________

I hereby certify that the above information is correct and that the cement shipped is in accordance with our current certification to the Alabama Department of Transportation that the cement meets Alabama Department of Transportation Specifications.

______________________________ ______________________________
Signed Date
(To be signed by Company employee responsible for weighing.)

Part Two Executed by Certified Concrete Technician

Project No.: ______________ County: ______________ Division: ______________
Car or Truck Seal No.: ______________________________
Source of Cement: ______________________________
Certification Accepted by: ______________ Cert. No.: ______________
Date: ______________

Part Three Executed by Testing Engineer

This cement has been supplied from a current approved source and has been approved for use.

____
Testing Engineer

MONTHLY QUANTITIES OF CONCRETE TO BE USED FOR TESTING CHARGES

Division:______________________

Date		**Distribution**									**Part Code**	**Concrete m^3 yd^3**
From	**To**	**A/C No.**	**Func.**	**Obj.**	**Fund**	**Project No.**						

Quantities of concrete should reflect the total of all concrete used, regardless of type and class.

Conc. Engr.
Proj. Engr.

____
Signed

____
Title

ALABAMA DEPARTMENT OF TRANSPORTATION

BMT-122

Revision 05/14/03

CONCRETE BATCH TICKET

DISTRIBUTION:

Project Engineer – White Copy

Concrete Plant – Yellow Copy

GENERAL INFORMATION

Concrete Plant: ______________ Vendor No. ________

Project: ______________

Concrete Class and Type: ______________

Truck Number: ______________

Ticket Number: ______________

Concrete Job Mix Number: ______________

County: ______________

Cubic Yards: ______________

Load Number: ______________

Date: ______________

CONCRETE PLANT DATA

Time Water Added: ______________ am/pm

Allowable Delivery Time: ______________

Initial Counter Reading: ______________ revs

Mixing Revolutions at Plant: ______________ revs

Max Water Allowed by Spec: ______________ gal. (L)

*Free Water from Aggregates: ______________ gal. (L)

*Batch Water Used: ______________ gal. (L)

*Wash Water Used: ______________ gal. (L)

Allowable Jobsite Water: ______________ gal. (L)

*Total Cement Content: ______________ lbs.(kg)

*Total Fly Ash Content: ______________ lbs.(kg)

*Other Mineral Admixtures: ______________ lbs.(kg)

*Fine Agg. Free Moisture: ______________ %

*Coarse Agg. Free Moisture: ______________ %

*Total Wet Fine Aggregate: ______________ lbs.(kg)

*Total Wet Coarse Aggregate: ______________ lbs.(kg)

*Air Entrainer Dosage: ______________ oz.(ml)

*Water Reducer Dosage: ______________ oz.(ml)

*Set Retarder Dosage: ______________ oz.(ml)

*Other Admixture Dosage: ______________ oz.(ml)

Concrete Temp After Mixing: ______________ ºF (ºC)

Slump: ________ in.(mm) Air Entrained: ________ %

ALDOT DATA AT JOBSITE

Time Truck Emptied: ______________ am/pm

Computed Delivery Time: ______________

Structure Mix Placed In: ______________

____

____

____

Water Added at Jobsite: ______________ gal. (L)

Total Calc. Water in Load: ______________ gal. (L)

Pre-mixing Counter Reading: ______________ revs

Post-mixing Counter Reading: ______________ revs

Mixing Revolutions at Jobsite: ______________ revs

Final Counter Reading: ______________ revs

Computed Total Revolutions: ______________ revs

Measured Slump This Truck: ______________ in.(mm)

Measured Air This Truck: ______________ %

Measured Concrete Temp: ______________ ºF (ºC)

Remarks: ______________

____

____

____

* This information shall be the exact batched quantities. Concrete plants using computerized batching procedures shall match the batched quantities entered here with the computer batch ticket.

ACCOUNTABILITY

Plant Technician Name: ______________

Plant Tech Number (ALDOT): ______________

I hereby certify that the concrete in this transit mixer is proportioned in accordance with the designated APPROVED mix design above and that all materials conform to ALDOT Specifications.

____

Plant Technician Signature

ALDOT Technician Name: ______________

ALDOT Technician Number: ______________

I hereby certify that the above information is based upon correctly performed testing as specified or computations that utilize both my observations and information certified by the Plant Technician.

____

ALDOT Technician Signature

CONCRETE BATCH TICKET
REQUIRED DATA DESCRIPTIONS

Time Water Added – Time when all water has been completely discharged into load.

Allowable Delivery Time – Governed by ALDOT specifications dependent on concrete temperature, admixtures, type of concrete, etc.

Initial Counter Reading – Number of revolutions on the truck's drum counter after all components have been discharged into the drum and prior to mixing the load. (Note: Adjustable counters shall be reset to zero at this point.)

Mixing Revolutions at Plant – The number of truck drum revolutions turned at the plant while mixing the load.

Max Water Allowed by Spec – Total maximum water allowed for size load batched as governed by the job mix design.

Free Water from Aggregates – Total water contained in the aggregates contributing to the mix water for the size load batched.

Batch Water Used – Total water discharged into the truck during the batching process.

Wash Water Used – Water that is added to the load by the truck driver during the wash-down of the truck's drum, fins, hopper, etc.

Allowable Jobsite Water – Water that may be added to the load at the jobsite. The amount of water allowed is the difference between the total water contained in the load and the maximum amount of water allowed by the job mix.

Total Cement Content – Total mass of the cement introduced into this load.

Total Fly Ash Content – Total mass of the fly ash introduced into this load.

Other Mineral Admixtures –Total mass of other mineral admixtures introduced into this load.

Fine Agg. Free Moisture – Percent of moisture contained in the fine aggregate contributing to the mixing water in the concrete.

Coarse Agg. Free Moisture – Percent of moisture contained in the coarse aggregate contributing to the mixing water in the concrete.

Total Wet Fine Aggregate – Total mass of the fine aggregate, including free moisture, contained in this load.

Total Wet Coarse Aggregate – Total mass of the coarse aggregate, including free moisture, contained in this load.

Air Entrainer Dosage – Total volume of air entraining agent introduced into this load.

Water Reducer Dosage – Total volume of water reducing agent introduced into this load.

Set Retarder Dosage – Total volume of set retarding agent introduced into this load.

Other Admixture Dosage – Specify type of additional admixtures and the total volume introduced into this load.

Computed Delivery Time – Actual time for delivery from time the water is added to the aggregates to the time the truck is emptied.

Structure Mix Placed In – Description of the structure in which the concrete is being placed.
(Ex. Deck span #1, Pour #1, NBR)

Total Calc. Water in Load – Total amount of water contained in the load.

**** Pre-mixing Counter Reading** – Drum revolution counter reading after water added at jobsite, (if necessary), and prior to mixing.

**** Post-mixing Counter Reading** – Drum revolution counter reading after mixing with additional jobsite water added.

**** Mixing Revolutions at Jobsite** – Total number of drum revolutions at mixing speed at jobsite after additional water added.

Final Counter Reading – Drum revolution counter reading at the time the truck is emptied or if last load, pour is complete.

Computed Total Revolutions – Difference between the final counter reading and the initial counter reading.

**** Enter data here only if water is added to the load at the jobsite.**

Note: Concrete temperature, slump and air tests at the jobsite are not required on every truck, however, these tests shall be taken as often as necessary in order to assure compliance with all governing specifications.

REQUEST FOR SOURCE APPROVAL
AGGREGATE QUALITY CONTROL PROGRAM

1. Source Name: ______________________________

2. Producer: ______________________________
____

   Address: ______________________________
____
____

3. Owner: ______________________________

   Address: ______________________________
____
____

4. Source Location (Give land description-range, township, section and 1/4 section):
____
____

5. Type Material Produced: ______________________________
____

6. Has this source ever been submitted for approval before?

   Yes _______ No _______

   If Yes, when? ______________________________

7. Is this source approved by other transportation authorities or agencies?

   Yes _______ No _______

   If Yes, by whom? ______________________________
____
____

The vendor is hereby notified that the Product Evaluation Board of the Alabama Department of Transportation reserves the right to release or distribute any of the information included in this form as well as any recommendations the Board might make concerning this source.

Signed ______________________________

Type Name ______________________________

Title ______________________________

Date ______________________________

The Product Evaluation Board will not consider any new source for approval until this form is completed and signed by a responsible official of the firm promoting the source. A check for $250.00, which includes a $50.00 submittal fee and a $200.00 evaluation fee, as per BMTP-355, should be made payable to: Alabama Department of Transportation. The completed form, along with the $250.00 check should be returned to the address below:

Materials and Tests Engineer
Attention: Aggregate Control Section
Alabama Department of Transportation
3704 Fairground Road
Montgomery, Alabama 36110

BMT-135
Revision: 04/25/03

ALABAMA DEPARTMENT OF TRANSPORTATION

WORKSHEET TO DETERMINE PAY FACTORS WHEN THEY CANNOT BE DETERMINED FROM VERIFICATION SAMPLES

Project Number: ____

Lot Number: ____________________ Date: __________________

% Asphalt Required: __________________

TEST RESULTS

Testing Increment	CONTRACTOR	DIVISION	M&T	Used To Determine Pay Factors Test Results / Deviation
1				
2				
3				
4				
5				
6				
7				

Average Deviation	
Pay Factor	

% Air Voids Required: __________________

Testing Increment	CONTRACTOR		DIVISION		M&T		Used To Determine Pay Factors Test Results / Deviation
	Air Voids	Rice	Air Voids	Rice	Air Voids	Rice	
1							
2							
3							
4							
5							
6							
7							

Average Deviation	
Pay Factor	

SHIPPING NOTICE
PRESTRESS CONCRETE
BRIDGE MEMBERS

Copies
- Conc. Engineer
- Project Engineer
- Plant File

Project No.: ______________________________ Project Engineer: ___________________________

Plant Site: ____ Date: ____________________

This is to certify that the following precast bridge units have been inspected and meet the current ALDOT specifications. Do not incorporate these units into the project until a visual inspection has been made to verify that no damage has occurred during shipment. All pertinent test reports are on file at the producer's plant and in the central file of the Bureau of Materials and Tests.

Unit Type[1]	Pour Number	Date Poured	Unit Number	Unit Size	Shipping Status[2]

[1] Unit Type: G( ) = Girder (Type) or P( ) = Pile (Type) or Other__________
[2] Shipping Status: C.P. = Current Production or P.P. = Partial Payment

____
Inspector's Signature

AGREEMENT FOR PARTICIPATION IN QUALITY CONTROL PROGRAM FOR ACCEPTANCE OF FINE AND COARSE AGGREGATES

The undersigned, representing ____________________________ does hereby apply for participation
(Name of Company)
in the Alabama Department of Transportation's Quality Control Program for Acceptance of Coarse and Fine

Aggregates at our source located at: ____
(Production Point)

We have reviewed the Department's Quality Control Procedure, BMTP-249 and thoroughly understand all of the requirements of this procedure.

We agree to comply with all requirements and policies set forth in the prevailing BMTP-249, including staffing this production point with a Department Certified Quality Control Technician and to furnish and maintain a laboratory at this source with all equipment necessary to perform the tests required by the producer in BMTP-249 and to properly monitor and certify all quality requirements of aggregates shipped to the Department.

By: ______________________________
(Signature)

Title: ______________________________

Date: ______________________________

By: ______________________________
(Signature)

Title: ______________________________

Date: ______________________________

____
Notary Public

Sworn to and subscribed before me, this ______ day of ________ , _______
(Day) (Month) (Year)

Recommended: ______________________________ Date: ______________
Materials & Tests Engineer

Approved: ______________________________ Date: ______________
Chairman, Product Evaluation Board

BITUMINOUS MATERIAL CERTIFICATE OF COMPLIANCE

Project Number ______________________ County ______________________

Consignee ______________________ Destination ______________________

Producer Reference No. ______________ Transport No. ______________________

Material Grade ______________________ Time Loaded __________ AM __________ PM

Tank No. ______________ Flash F (C) ______________ Loading Temp. ____________

Anti-Strip ______________ % Brand ______________ Material contains Silicone (Yes)(No)

Net Weight of Load lbs (kg) ______________________________________

Grade of Previous Load Contained in this Transport ______________________

The undersigned certified that this shipment does meet all the applicable requirements of the Alabama Department of Transportation for the grade of bituminous material shown. It is further certified that the transporting vehicle was inspected prior to loading and found to contain no contaminating material.

______________________ ______________________
(Name of Company) (Address of Company)

______________________ ______________________
(Signature of Authorized Representative) (Date of Shipment)

* *

(For ALDOT Use When All Material Is Not Used On Above Project)

Net Weight of Load ______________________________________ Lbs (Kg)

Net Weight of Material in this Load used on this Project ______________________ Lbs (Kg)

Weight of Material Transferred to Project No. ______________ is __________ Lbs (Kg)

______________________ ______________________ ______________________
(ALDOT Representative) (Signature) (Date)

HOT MIX DESIGN BY THE MARSHALL METHOD

Material: ____________________
Producer: ____________________
Source: __________ See below __________
Sampled by: ____________________
Submitted by: __________ Date: __________

Lab Number: ____________________
Project Number: ____________________
County: ____________________
Division: ____________________
Date Tested: ____________________

Apparent Specific Gravity of Agg.: __________
Effective Specific Gravity of Agg.: __________
Bulk Specific Gravity of Agg.: __________
Specific Gravity of AC: __________

Mixing Temperature: __________
Compaction Temperature: __________
__________ blow Marshall Stability

Sample Number	Per Cent AC		Volume of Sample	S.G. of Mix	Unit Weight	Theoretical S.G.	Per Cent Voids	Per Cent VMA	Per Cent Voids Filled	Stability - kN		Flow mm
	Agg. Basis	Total Mix								Measured	Adjusted	

Note 1: The sand in this mix contains __________ % Clay, which is __________ % Clay total sample.
Note 2: The above were put up with __________ Blows per side using AC __________ from ____________________
__________, and the following combined aggregates: ____________________
Note 3: Maximum Specific Gravity was determined on: __________ percent of AC.
Comments: ____________________

SUMMARY OF INDEPENDENT ASSURANCE SAMPLES AND TESTS CORING REPORT

PROJECT NUMBER __________ COUNTY __________ DIVISION ______

ROADWAY DESIGN (SINGLE RDWY.) ______ (DOUBLE RDWY.) ______

ROADWAY CORED __________ LAYER CORED __________

CORED BY __________ DATES CORED __________

Plan Requirements:

STATION	THICKNESS		STATION	THICKNESS	
	LEFT	RIGHT		LEFT	RIGHT

AGREEMENT FOR PARTICIPATION IN CERTIFIED ACCEPTANCE AND QUALITY CONTROL OF ASPHALT MATERIALS PROGRAM

The undersigned, representing ________________________ , verified that all bituminous material
(name of company)

furnished from ____________________________ for use by the Alabama Department of Transportation
(refinery or terminal location)

manufactured, stored, and shipped under strict Quality Control Standards and that all bituminous material supplied to the Department meets the Specifications for the grade supplied. ____________________________
(name of company)

further agrees to comply with all requirements and policies set forth in the prevailing BMTP-243 (effective January 1, 1997), "Acceptance Program for Asphalt Materials", and that all transporting vehicle tanks will be thoroughly inspected before loading and that any tank containing contaminants will not be loaded for shipment to an Alabama Department of Transportation project.

________________________ also agrees to furnish, maintain, and staff an approved laboratory equipped with
(name of company)

all apparatus, equipment, and supplies necessary to properly monitor all quality requirements of bituminous material shipped to the Department and that free unannounced access to the laboratory will be allowed to representatives of the Alabama Department of Transportation for laboratory inspections and tests.

By: ______________________________
(Signature)

Title: ______________________________

Date: ______________________________

Sworn to and subscribed before me, this ______ day of ________ , ________ ____________________
(Day) (Month) (Year) Notary Public

Recommended: ____________________________
Materials & Tests Engineer

Approved: ____________________________
Chairman, Product Evaluation Board

NOTIFICATION TO SUSPEND SHIPMENTS OF ASPHALT MATERIALS ON BMT-146, ASPHALT CERTIFICATE OF COMPLIANCE

Date:____

Producer: ____

Asphalt Material Grade: ____

Reason for Suspending Shipments: ____

____

Signature of ALDOT Materials
and Tests Engineer

CERTIFIED TECHNICIAN WARRANT

This document affirms that ____ is certified by the Alabama Department of Transportation as a Certified Asphalt Materials Technician, with the following certification designation:

____

This certification carries inherent rights and responsibilities. These rights include, but are not limited to, being exclusively sanctioned by the Alabama Department of Transportation to perform inspection and testing of asphalt products necessary to ensure a high level of quality control. These responsibilities include the reporting of test results with accuracy and precision expected of a Certified Asphalt Materials Technician.

Abuse or neglect of these rights and responsibilities shall be penalized upon recommendation by the Working Task Force and approval by the Certification Board. The difference between neglect and abuse is intent and shall be determined by the Working Task Force. The first instance of neglect shall result in a thirty (30) day suspension of the Certified Asphalt Materials Technician's certification. The second offense of neglect shall result in a one hundred and eighty (180) day suspension; the first instance of abuse shall result in a one (1) year suspension. The second instance of abuse shall result in a permanent revocation of the Certified Asphalt Materials Technician's certification.

____
Chairman, Working Task Force

____
Chairman, Certification Board

I, _______________________________________, have read and understand the rights, responsibilities, and penalties as they pertain to my duties. I further acknowledge that this warrant expires on _____________________________, subject to renewal as per BMTP-243.

GUARDRAIL SUBMITTAL FORM

Project Number ____________________
County ____________________
Division ____________________
Date ____________________

GUARDRAIL MATERIAL (Feet or Meters) AND TYPE OF ANCHOR

BRAND	QUANTITY	PAY ITEM NO. & DESCRIPTION

STEEL POSTS AND BLOCKS

	HEAT/LOT NO.	QUANTITY	DESCRIPTION

TREATED WOOD POSTS AND BLOCKS

CHARGE NO.		QUANTITY	DESCRIPTION

BMT-171
Revision: 07/26/02

ALABAMA DEPARTMENT OF TRANSPORTATION

EVAPORATION RATE RECORD

Distribution:
- Project Engineer – White
- Division Engineer – Green
- Contractor - Yellow

GENERAL INFORMATION

Project No.: ____________________ County: ______________ Date:

Concrete Class and Type: ______________ Concrete Job Mix Number: ______________

Hygrometer Number: **M&T -** ______________ Anemometer Number: **M&T -** ______________

DATA RECORD

TIME	AIR TEMP. (°F)	RELATIVE HUMIDITY (%)	CONCRETE TEMP. (°F)	WIND SPEED (Mile/hr)	RATE OF EVAPORATION ($lb/Ft^2/hr$)	REMARKS

ACCOUNTABILITY

Technician Name: ____________________ Technician Number (ALDOT No.): ____________________

I hereby certify that the above information is based upon correctly performed testing as specified and/or computations using the above instruments.

____
Technician Signature

BMT-172
Rev. 07/26/02

Distribution:
Proj. Engineer - White
Div. Engineer - Green
Ready Mix Plant - Yellow

ALABAMA DEPARTMENT OF TRANSPORTATION
RECORD OF CALIBRATION VERIFICATION OF TRUCK MOUNTED WATER METERS

GENERAL INFORMATION

Concrete Producer:	______________________	Vendor Code:	______________
Verification Date:	______________________	Truck Number:	______________
Scale Calibration Date:	______________________	Meter Serial No.:	______________

DATA

WEIGHT OF DRUM (lb) [1]	WEIGHT OF DRUM PLUS WATER (lb) [2]	WEIGHT OF WATER (lb) [3] = [2] – [1]	TOTALWATER IN GALLONS [3] ¸ 8.34

METER READING (gl) [4]	METER READING TOLERANCE		DELIVERED GALLONS [3]
	+ 1% [5]	- 1% [6]	

$$FLOW\ RATE = \frac{DELIVERED\ GALLONS}{TIME\ OF\ DELIVER} = \_\_\_\_\_\_\_\_\_\_ \text{ gl/min}$$

DOES METER MEETS CALIBRATION: YES ☐ NO ☐

ACCOUNTABILITY

Plant Technician Name: ______________________

Plant Technician Number (ALDOT) ____________

ALDOT Technician Name: ______________________

ALDOT Technician Number: ______________________

I hereby certify that the above calibration verification was performed in accordance with ALDOT– 407 and that the results meet the requirement of ALDOT Specifications.

I hereby certify that I observe the calibration verification of the above water meter and that all the recorded information is correct.

____
Plant Technician Signature

____
ALDOT Technician Signature

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

May 4, 1995

TECHNICAL MEMORANDUM 73-95

TO: ALL HOLDERS
Testing Manual

FROM: William J. Hartzog
Materials and Tests Engineer WJH

Re: **Change #1**

Please make the following changes to the Alabama Department of Transportation, Testing Manual.

INDEX: Remove sheet 5 of 5 and replace with new sheet, dated 5-4-95.

ACCEPTANCE SAMPLING AND TESTING SCHEDULE

Section 301, Frequency Guide: Remove old sheet and replace with new sheet dated 10-19-94.

BMT PROCEDURES

BMTP-243: Remove old document and replace with new document dated 3-2-95.

BMTP-249: Remove old document and replace with new document dated 5-4-95.

BMTP-341: Remove sheets 3 of 4 and 4 of 4 and replace with new sheets dated 11-16-94.

BMTP-364: Remove old document and replace with new document dated 4-3-95.

BMTP-368: Remove old document and replace with new document dated 1-20-95.

BMTP-374: Remove old document and replace with new document dated 3-29-95.

BMTP-376: Remove old document and replace with new document dated 3-29-95.

BMTP-377: Remove old document and replace with new document dated 3-29-95.

BMTP-382: New document--add in numerical sequence.

BMT WORKSHEET AND TEST REPORT FORMS

BMT-169: New form--add in numerical sequence.

Note: New BMTP-383, Certification Program for Bituminous Technicians, and new BMTP-384, Superpave Level I Gyratory Compactor Mix Design Procedure are listed in the Index; however, they are not ready for distribution.

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELM/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard. Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

August 22, 1995

TECHNICAL MEMORANDUM 74-95

TO: ALL HOLDERS
<u>Testing Manual</u>

FROM: William J. Hartzog
Materials and Tests Engineer

RE: Change #2

Please make the following changes to the Alabama Department of Transportation, Testing Manual

<u>BMT PROCEDURE INDEX</u>: Remove entire index and replace with the new index, dated 8-15-95.

<u>BMTP-333</u>: This procedure has been deleted. Remove procedure from the Testing Manual.

<u>BMTP-355</u>: Remove old pages 3 and 4 of 6 and replace with new pages 3 and 4 of 6. dated 8-15-95.

<u>BMTP-383</u>: Add this procedure in numerical sequence.

<u>BMTP-384</u>: Add this procedure in numerical sequence.

<u>BMTP-386</u>: Add this procedure in numerical sequence.

<u>BMT FORM 114</u>: Remove the old form and replace with the new form, dated 7-14-95.

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELM/dh
Attachments

Posted
2-5-96

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

November 28, 1995

TECHNICAL MEMORANDUM 75-95

TO: ALL HOLDERS
<u>Testing Manual</u>

FROM: William J. Hartzog
Materials and Tests Engineer

RE: Change #3 to Testing Manual

Please make the following changes to the Alabama Department of Transportation, Testing Manual.

<u>BMT PROCEDURE INDEX</u>: Remove entire index and replace with new index, dated 11-28-95.

<u>BMTP-130</u>: Remove old procedure and replace with new procedure, dated 8-24-95.

<u>BMTP-310</u>: Remove old procedure and replace with new procedure, dated 10-17-95.

<u>BMTP-354</u>: Remove old procedure and replace with new procedure, dated 11-28-95.

<u>BMTP-379</u>: This procedure has been deleted. Remove procedure from the Testing Manual.

<u>BMTP-384</u>: Remove old procedure and replace with new procedure, dated 11-10-95.

<u>BMTP-387</u>: Add this procedure (dated 11-14-95) in numerical sequence.

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELM/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

January 11. 1996

TECHNICAL MEMORANDUM 76-96

TO: ALL HOLDERS
Testing Manual

FROM: William J. Hartzog
Materials and Tests Engineer WJH f.m

RE: Change #4 to Testing Manual

Attached is revised BMTP-350, "In-Place Bituminous Plant Mix Density Measurements," to be placed in your Testing Manual. This procedure replaces the old BMTP-350.

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELM/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

March 13, 1996

TECHNICAL MEMORANDUM 78-96

TO: ALL HOLDERS
Testing Manual

FROM: William J. Hartzog
Materials and Tests Engineer

RE: Change #6 to Testing Manual

Attached are new BMT Form 21 and new BMT Form 55 (both dated 3-13-96).

Please remove the old BMT forms and replace with the attached new forms

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELM/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

June 5, 1996

TECHNICAL MEMORANDUM 79-96

TO: ALL HOLDERS
Testing Manual

FROM: William J. Hartzog
Materials and Tests Engineer

RE: Change #7 to ALDOT Testing Manual

Please make the following changes to the Alabama Department of Transportation Testing Manual.

ACCEPTANCE SAMPLING AND TESTING SCHEDULE:

SECTION 301, FREQUENCY GUIDE: Remove old sheet (10-19-94) and replace with new sheet (6-5-96).

BMTP INDEX: Remove old index (11-28-95) and replace with new index (6-5-96).

BMT PROCEDURES:

BMTP-249: Remove page 23 of 23 (5-4-95) and replace with new page (6-5-96)

BMTP-344: Remove pages 5 of 6 and 6 of 6 (3-18-94) and replace with new pages (4-4-96).

BMTP-370: Remove old procedure (3-18-94) and replace with new procedure (6-5-96).

BMTP-372: Remove old procedure (3-18-94) and replace with new procedure (6-5-96).

BMTP-380: Remove old procedure (3-18-94) and replace with new procedure (4-4-96).

BMTP-385: This is a new procedure (2-16-96). Place this procedure in numerical sequence.

BMTP-387: This procedure has been deleted. Remove from Testing Manual.

BMTP-388: This is a new procedure (5-8-96). Place this procedure in numerical sequence.

BMTP-389: This is a new procedure (3-19-96). Place this procedure in numerical sequence.

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELM/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

July 1, 1997

TECHNICAL MEMORANDUM 80-97

TO: ALL HOLDERS
Testing Manual

FROM: Larry Lockett
Materials and Tests Engineer

Larry Lockett - els

RE: Change #8 to ALDOT Testing Manual

Please make the following changes to the Alabama Department of Transportation Testing Manual.

ACCEPTANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGES):

SECTION PAGE IDENTIFICATION	REMOVE PAGE	INSERT PAGE
Section 210 Excavation and Embankment Construction (Continued) MATERIAL: Improved Roadbed from Approved Cuts and Borrow Pits	4/26/94	5/19/97
Section 230 Roadbed Processing MATERIAL: Modified Roadbed	4/26/94	5/19/97
Section 232 Lime Stabilized Roadbed (Continued) MATERIAL: Soil	4/26/94	5/19/97
Section 301 Soil, Soil Aggregate, and Aggregate Base and Subbase (Continued) MATERIAL: Plant, Road or Yard Mixed Base or Subbase Without Chemical Additives (Continued)	4/26/94	5/19/97
Section 315 Drainage Plane Layer MATERIAL: Commercial Aggregate	4/26/94	5/19/97

ACCEPTANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGES):

SECTION PAGE IDENTIFICATION	REMOVE PAGE	INSERT PAGE
Section 401 Bituminous Surface Treatments and Latex Modified Bituminous Surface Treatment MATERIAL: Liquid Bituminous Material	4/26/94	5/19/97
Section 402 Slurry Seal MATERIAL: Liquid Bituminous Material	4/26/94	5/19/97
Section 410 Asphalt Plant Mixes (Continued) MATERIAL: Liquid Binder (Contractor's storage tanks)	4/26/94	5/19/97
Section 410 Asphalt Plant Mixes (Continued) MATERIAL: Coarse Aggregate Continued, Manufactured Fine Aggregate	4/26/94	5/19/97
Section 410 Asphalt Plant Mixes (Continued) MATERIAL: Asphalt Plant Mix Continued TEST: Dust/Asphalt Ratio	4/26/94	5/19/97
Section 410 Asphalt Plant Mixes (Continued) MATERIAL: Asphalt Plant Mix Continued TEST: In-place Density	4/26/94	5/19/97
Section 450 Portland Cement Concrete Pavement (Continued) MATERIAL: Mix Components (Continued) NOTE: The removed page begins with Coarse Aggregates while the inserted page begins with Water	4/26/94	5/19/97
Section 450 Portland Cement Concrete Pavement (Continued) MATERIAL: Components Continued (Joint Fillers) Hot Pour	4/26/94	5/19/97

ACCEPTANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGES):

SECTION PAGE IDENTIFICATION	REMOVE PAGE	INSERT PAGE
Section 450 Portland Cement Concrete Pavement (Continued) MATERIAL: Portland Cement Concrete (Continued) Finished Portland Cement Concrete Pavement	4/26/94	5/19/97
Section 453 Pressure Grouting and Repair of Portland Cement Concrete Pavement MATERIAL: Quality Control Operations	4/26/94	5/19/97
Section 453 Pressure Grouting and Repair of Portland Cement Concrete Pavement (Continued) MATERIAL: Water	4/26/94	5/19/97
Section 502 Steel Reinforcement MATERIAL: Reinforcement Steel Bars	4/26/94	5/19/97
Section 505 Piling MATERIAL: Precast or Prestressed Concrete Piles	4/26/94	5/19/97
Section 507 Abutment and Bulkhead Anchors MATERIAL: Prefabricated Metal or Precast Prestressed Concrete Bulkheads	4/26/94	5/19/97
Section 508 Structural Steel and Miscellaneous Metals (Continued) MATERIAL: High Strength Fasteners (Continued) Paints Oils Pigments	4/26/94	5/19/97
Section 509 Untreated and Treated Timber MATERIAL: Timber	4/26/94	5/19/97
Section 513 Prestressed Concrete Bridge Members MATERIAL: Girders and/or Span Sections	4/26/94	5/19/97

ACCEPTANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGES):

SECTION PAGE IDENTIFICATION	REMOVE PAGE	INSERT PAGE
Section 517 Bridge and Sidewalk Handrail MATERIAL: Galvanized Steel Pipe	4/26/94	5/19/97
Section 520 Repair or Raising Existing Bridges MATERIAL: All New Components	4/26/94	5/19/97
Section 524 Reinforced Concrete Box Culverts Precast Sections MATERIAL: See Section 214, 501, and 502	4/26/94	5/19/97
Section 529 Concrete Retaining Walls (Continued) MATERIAL: Selected Backfill (Local Material)	4/26/94	5/19/97
Section 529 Concrete Retaining Walls (Precast Units) (Continued) MATERIAL: Longitudinal Reinforcing Strips	4/26/94	5/19/97
Section 605 Pavement Edge Drains (Continued) MATERIAL: Filter Fabric (Woven or Non-Woven)	4/26/94	5/19/97
Section 606 Pipe Underdrain (Continued) MATERIAL: PSP (PVC)	4/26/94	5/19/97
Section 606 Pipe Underdrain (Continued) MATERIAL: Fine Aggregate Local or Commercial Continued TEST: Permeability	4/26/94	5/19/97
Section 614 Slope Paving (Continued) MATERIAL: Steel Reinforcement	4/26/94	5/19/97

ACCEPTANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGES):

SECTION PAGE IDENTIFICATION	REMOVE PAGE	INSERT PAGE
Section 623 Curb, Gutter and Combination Curb and Gutter (Continued) MATERIAL: Expansion Joint Fillers	4/26/94	5/19/97
Section 658 Hydro-Seeding and Mulching (Continued) MATERIAL: Seed	4/26/94	5/19/97
Section 701 Traffic Stripe MATERIAL: Reflective or Nonreflective Paint	4/26/94	5/19/97
Section 707 Delineators and Hazard Markers (Continued) MATERIAL: Standard or Special Sign Panels	4/26/94	5/19/97
Section 710 Roadway Signs MATERIAL: Standard Sign Panels	4/26/94	5/19/97
Section 710 Roadway Signs (Continued) MATERIAL: Bolts and Nuts (Standard strength)	4/26/94	5/19/97
Section 717 Overhead Sign Structures Renovation or Relocation MATERIAL: Any New Materials	4/26/94	5/19/97
Section 730 Furnishing and Installing Traffic Control Equipment MATERIAL: Equipment	(Insert Page Only)	5/19/97

INDEPENDENT ASSURANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGES):

Section 210 Excavation Embankment Construction MATERIAL: Unclassified Excavation and Borrow Excavation	4/29/94	5/19/97

INDEPENDENT ASSURANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGES):

SECTION PAGE IDENTIFICATION	REMOVE PAGE	INSERT PAGE
Section 230 Roadbed Processing MATERIAL: Modified Roadbed	4/29/94	5/19/97
Section 410 Asphalt Plant Mixes General Requirements (Continued) MATERIAL: Asphalt Mix	4/29/94	5/19/97
Section 705 Pavement Markers Class A MATERIAL: Single and Double Lens	4/29/94	5/19/97

BMTP INDEX: Remove old index (6-5-96) and replace with new index (7-1-97).

BMT PROCEDURES:

BMTP-243: Remove old procedure (3-2-95) and replace with new procedure (9-12-96).

BMTP-259: This is a new procedure (5-9-97). Place this procedure in numerical sequence.

BMTP-313: This procedure has been deleted. Remove from Testing Manual.

BMTP-361: Remove old procedure (3-18-94) and replace with new procedure (6-11-96).

BMTP-383: This procedure has been deleted. Remove from Testing Manual. (The information is included in the new BMTP-243).

BMT WORKSHEET AND TEST REPORT FORMS:

BMT-7: This is a new form--add in numerical sequence.

BMT-100: Remove old form (4-4-94) and replace with new form (7-1-97).

BMT-164: Remove old form (4-18-94) and replace with new form (11-96).

BMT-169: Remove old form (4-95) and replace with new form (11-96).

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual

RBP/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

December 15, 1997

TECHNICAL MEMORANDUM 81-97

TO: ALL HOLDERS
Testing Manual

FROM: Larry Lockett
Materials and Tests Engineer

RE: Change #9 to ALDOT Testing Manual

Please make the following changes to the Alabama Department of Transportation Testing Manual.

BMTP INDEX: Remove old index (7-1-97) and replace with new index (12-15-97).

BMT PROCEDURES:

BMTP-307: Remove old procedure (2-28-94) and replace with new procedure (10-27-97).

BMTP-344: Remove old procedure (3-18-94) and replace with new procedure (10-27-97).

BMTP-349: Remove old procedure (3-18-94) and replace with new procedure (10-27-97).

BMTP-380: Remove old procedure (4-4-96) and replace with new procedure (10-27-97).

BMTP-384: Remove old procedure (11-10-95) and replace with new procedure (10-27-97).

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELS/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

March 16, 1998

TECHNICAL MEMORANDUM 82-98

TO: ALL HOLDERS
Testing Manual

FROM: Larry Lockett
Materials and Tests Engineer

RE: Change #10 to ALDOT Testing Manual

Please make the following changes to the Alabama Department of Transportation Testing Manual.

BMT PROCEDURES:

BMTP-389: Remove old procedure (3-19-96) and replace with new procedure (3-16-98).

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual

ELS/dh
Attachment

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

June 2, 1998

TECHNICAL MEMORANDUM 83-98

TO: ALL HOLDERS
Testing Manual

FROM: Larry Lockett
Materials and Tests Engineer

RE: Change #11 to ALDOT Testing Manual

Please make the following changes to the Alabama Department of Transportation Testing Manual.

BMT PROCEDURES:

BMTP-341: Remove old procedure (3-18-94) and replace with new procedure (4-1-98).

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

ELS/dh
Attachment

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Fob James, Jr.
Governor

Jimmy Butts
Transportation Director

August 3, 1998

TECHNICAL MEMORANDUM 84-98

TO: ALL HOLDERS
Testing Manual

FROM: Larry Lockett
Materials and Tests Engineer

RE: Change #12 to ALDOT Testing Manual

Please make the following change to the Alabama Department of Transportation Testing Manual.

ACCEPTANCE SAMPLING AND TESTING SCHEDULE (PAGE CHANGE):

SECTION PAGE IDENTIFICATION	REMOVE PAGE	INSERT PAGE
Section 410 Asphalt Plant Mixes (Continued) MATERIAL: Asphalt Plant Mix Continued TEST: Abson Recovery and Viscosity	5/19/97	8/3/98

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual

ELS/dh
Attachment

ALABAMA DEPARTMENT OF TRANSPORTATION

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Don Siegelman
Governor

G. M. Roberts
Transportation Director

August 23, 1999

TECHNICAL MEMORANDUM 85-99

TO: ALL HOLDERS
Testing Manual

FROM: Larry Lockett
Materials and Tests Engineer

RE: Change #13 to ALDOT Testing Manual

Please make the following changes to the Alabama Department of Transportation Testing Manual.

BMTP INDEX: Remove old index (12-15-97) and replace with new index (8-23-99).

BMT PROCEDURES:

BMTP-259: Remove old procedure (5-9-97) and replace with new procedure (8-23-99).

BMTP-335: Remove old procedure (5-9-94) and replace with new procedure (6-17-99).

BMTP-395: This is a new procedure (7-23-99). Place this procedure in numerical sequence.

BMTP-399: This is a new procedure (7-26-99). Place this procedure in numerical sequence.

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

RLW/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Don Siegelman
Governor

G. M. Roberts
Transportation Director

May 8, 2000

TECHNICAL MEMORANDUM 86-00

TO: ALL HOLDERS
Testing Manual

FROM: Larry Lockett
Materials and Tests Engineer

RE: Change #14 to ALDOT Testing Manual

Please make the following changes to the Alabama Department of Transportation Testing Manual.

BMTP INDEX: Remove old index (8-23-99) and replace with new index (5-8-00).

BMT PROCEDURES:

BMTP-353: Remove old procedure (3-18-94) and replace with new procedure (5-8-00).

BMTP-354: Remove old procedure (11-28-95) and replace with new procedure (5-8-00).

BMTP-374: Remove old procedure (3-29-95) and replace with new procedure (5-8-00).

BMTP-380: Remove old procedure (10-27-97) and replace with new procedure (5-8-00)

BMTP-384: Remove old procedure (10-27-97) and replace with new procedure (5-8-00)

Please file this Technical Memorandum in the Technical and Advisory Memorandums jacket contained in the manual.

RLW/dh
Attachments

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Don Siegelman
Governor

June 16, 2000

G. M. Roberts
Transportation Director

MATERIALS AND TESTS TECHNICAL ADVISORY 1-00

TO: Holders of Testing Manual

FROM: Larry Lockett Larry Lockett
Materials and Tests Engineer

RE: Sampling and Testing Guidelines for Drilled Shaft Concrete

Effective upon receipt the attached guidelines are in effect for drilled shaft concrete.

Please file a copy of this Technical Advisory in the Technical and Advisory Memorandums jacket contained in the testing manual.

Questions concerning this advisory may be directed to Mr. Sergio Rodriguez at (334) 206-2410.

RLW/dh
Attachment
cc: ALDOT Construction Engineer (Mr. McDuffie)
ALDOT Division Engineers
ALDOT Divisions (ATTN: Construction and Materials Engineers)
ALDOT Geotechnical Engineer (Mr. Cox)
ALDOT Testing Engineer (Mr. Wolfe)
FHWA (Mr. Wilkerson)
Alabama Road Builders' Association
Alabama Bridge Construction Association
Alabama Concrete Industries Association
File

ALDOT MATERIALS AND TESTS
TECHNICAL ADVISORY 1-00
JUNE 16, 2000

SAMPLING AND TESTING GUIDELINES FOR DRILLED SHAFT CONCRETE

1. Sampling freshly mixed concrete for use in determining compliance with air content, slump, temperature and compressive strength specifications shall be per AASHTO T-141.

2. For each drilled shaft (DS), cast a set of concrete cylinders for each 50 cubic yards (40 cubic meters) of concrete or fraction thereof for the first 100 cubic yards (80 cubic meters) placed. The frequency is decreased to one set of concrete cylinders for each 100 cubic yards (80 cubic meters) or fraction thereof for concrete placed exceeding 100 cubic yards (80 cubic meters).

3. DS concrete uses admixtures that delay the setting time of the concrete more than normal concrete; therefore, before moving a cylinder check to see if the concrete has already set. If the concrete has not set, prolong the initial curing to 48 hours rather than risking damage to the cylinder.

4. A set of concrete cylinders consists of 2 - 7 day, 2 - 14 day, and 2 - 28 day cylinders. All the cylinders from one set have to be cast from the same batch and as per AASHTO T-23.

5. For each drilled shaft, tests for air content, slump, and temperature have to be performed at the same frequency as casting a set of concrete cylinders.

6. Concrete that exceeds the specified air content shall not be accepted since it will affect the compressive strength of the concrete.

7. The chemical admixtures used in DS concrete can be adjusted to compensate for ambient temperature changes, but at no time shall the manufacturer recommended dose be exceeded.

ALABAMA DEPARTMENT OF TRANSPORTATION

BUREAU OF MATERIALS AND TESTS

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Telephone: 334/206-2300 - Fax No: 334/264-6263

Don Siegelman.
Governor

Paul Bowlin
Transportation Director

MEMORANDUM

August 1, 2001

To: All Division Materials Engineers
All Division Construction Engineers
All Traffic Striping/Marking Contractors

From: Larry Lockett
Materials and Tests Engineer

Re: "Traffic Marking Materials Certificate of Compliance", Form BMT-3

Effective **immediately**, all contractors responsible for the placement of traffic striping or traffic control markings and legends shall use form BMT-3 to report the quantities of materials specified by Sections 701 (Traffic Stripe), 702 (Profiled Traffic Stripe), 703 (Traffic Control Markings and Legends), and 856 (Traffic Marking Materials) of the Standard Specifications that are used in project construction.

Copies of the BMT-3 form shall be distributed as follows:

Original	-	Bureau of Materials and Tests
Copy	-	Division Materials Engineer
Copy	-	Project Engineer

The Paint Laboratory of the Central Testing Labs will use only the information provided on the BMT-3 form to release test reports to the project office. No other form will be acceptable.

The BMT-3 form will be used by the Project Engineer to determine the final quantities to be reported in the BMT-38 form, Summary of Tests. Therefore, all required information must be provided in careful detail. The completed BMT-3 must be signed by an authorized representative of the company and notarized.

A copy of the BMT-3 form may be viewed in the electronic version of the Testing Manual available through the ALDOT homepage at:

http://www.dot.state.al.us/Bureau/Materials_Tests/Testing/ALDOT_Testing_Manual.pdf

A copy of the BMT-3 form in Microsoft "Word" format suitable for use in entering required information is available upon request from Mr. Butch Bolling at (334) 206-2341.

LL/jkb

Cc: Mr. Lynn Wolfe
File

ALABAMA DEPARTMENT OF TRANSPORTATION

BUREAU OF MATERIALS AND TESTS
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050
Telephone: 334/206-2300 - Fax No: 334/264-6263

Don Siegelman.
Governor

Paul Bowlin
Transportation Director

February 14, 2002

TECHNICAL MEMORANDUM 87-02

To: All Division Materials Engineers
All Division Construction Engineers
Construction Bureau

From: Larry Lockett
Materials and Tests Engineer

Re: "QC/QA Mat Density Report", Form BMT-21

Effective **immediately**, the revised BMT-21 form (Revision: 02/12/002) shall be used to report mat density.

A copy of the revised BMT-21 form may be viewed in the electronic version of the Testing Manual available through the ALDOT homepage at:

http://www.dot.state.al.us/Bureau/Materials_Tests/Testing/ALDOT_Testing_Manual.pdf

A copy of the BMT-21 form in Microsoft "Word" format suitable for use in entering required information is available upon request from Mr. Sandy Marshal at (334) 206-2402.

LL/rlw

Cc: Mr. Gary Brunson
Mr. Lynn Wolfe
File

ALABAMA DEPARTMENT OF TRANSPORTATION

BUREAU OF MATERIALS AND TESTS
1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050
Telephone: 334/206-2300 - Fax No: 334/264-6263

Don Siegelman.
Governor

Paul Bowlin
Transportation Director

February 21, 2002

TECHNICAL MEMORANDUM 88-02

To: Testing Manual Users

From: Larry Lockett
Materials and Tests Engineer

Re: Procedure ALDOT-401, "Rutting Susceptibility Determination of Asphalt Paving Mixtures Using the Asphalt Pavement Analyzer"

Please be advised that the above referenced procedure has been added to the Testing Manual on this date. This procedure was approved for use on February 7, 2001.

A copy of the procedure may be viewed in the electronic version of the Testing Manual available through the ALDOT homepage at:

http://www.dot.state.al.us/Bureau/Materials_Tests/Testing/ALDOT_Testing_Manual.pdf

LL/rlw

Cc: Mr. Lynn Wolfe
File

ALABAMA DEPARTMENT OF TRANSPORTATION

BUREAU OF MATERIALS AND TESTS

1409 Coliseum Boulevard, Montgomery, Alabama 36130-3050

Telephone: 334/206-2300 - Fax No: 334/264-6263

Don Siegelman.
Governor

Paul Bowlin
Transportation Director

February 22, 2002

TECHNICAL MEMORANDUM 89-02

To: Testing Manual Users

From: Larry Lockett
Materials and Tests Engineer

Re: Procedure ALDOT-243, "Acceptance Program for Asphalt Materials"

Please be advised that the above referenced procedure has been revised on this date. This revisions of this procedure were approved for use on February 15, 2001.

The revisions include the following:

Section 2.20 - FTIR added.

Section 2.22 - Category "A" Technician deleted.

Section 2.25 - Category "D" Technician deleted.

Section 3.3.4.3 - Last two sentences regarding method of submittal deleted.

Section 3.3.4.4 - FTIR requirements added.

Section 3.4.1 - Requirements revised.

Table I - DTT and FTIR requirements added for PGAB

Table I - Anionic Emulsion section removed

Table II - Direct Tension Test (DTT) requirement added for PGAB.

Table II - Asphalt Cement section deleted.

Table II - Anionic Emulsion section removed.

A copy of the revised procedure may be viewed in the electronic version of the Testing Manual available through the ALDOT homepage at:

http://www.dot.state.al.us/Bureau/Materials_Tests/Testing/ALDOT_Testing_Manual.pdf

LL/rlw

Cc: Mr. Lynn Wolfe
File

ALABAMA
DEPARTMENT OF TRANSPORTATION

BUREAU OF MATERIALS AND TESTS
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-3050
Phone (334) 206-2201
FAX (334) 264-6263

BOB RILEY
GOVERNOR

JOE MCINNES
TRANSPORTATION DIRECTOR

March 4, 2003

TECHNICAL MEMORANDUM 90-03

TO: All Division Materials Engineers
All Division Construction Engineers
Construction Bureau

FROM: Larry Lockett
Materials and Tests Engineer

RE: "Measuring Profile Index of a Paved Surface," ALDOT-335-83

The revised ALDOT 335 procedure (revision date: 03/03/03) shall be used to determine pavement profile index on projects scheduled for the March 2003 letting and thereafter. In this revision, the blanking band has been reduced from 0.2 in. to zero, which makes hand reduction of profile traces impossible. For this reason, all references to manual reduction have also been removed.

A copy of the revised procedure may be viewed in the electronic version of the Testing Manual available through the ALDOT homepage at:

www.dot.state.al.us/Bureau/Materials_Tests/Testing/ALDOT_Testing_Manual.pdf

LL/wfb

cc: Mr. G. M. Harper
Mr. Pete Anderson
Mr. Scott George
Mr. Lynn Wolfe
Mr. Steve Mills, FHWA
File

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BLVD. MONTGOMERY, AL 36130-3050

BUREAU OF MATERIALS & TESTS
3700 FAIRGROUND RD. MONTGOMERY, AL 36110
TELEPHONE:334.206.2201 FAX:334.264.6263

BOB RILEY
GOVERNOR

JOE MCINNES
TRANSPORTATION DIRECTOR

May 6, 2003

TECHNICAL MEMORANDUM 91-03

To: Testing Manual Users

From: Larry Lockett Larry Lockett
Materials and Tests Engineer

Re: Procedure ALDOT-368, "Sampling Procedures for Elastomeric Bridge Bearing Pads"

Please be advised that the above referenced procedure was revised on May 1, 2001. The revisions to the procedure were approved for use on June 25, 2002.

The revisions include the following:

Revisions to reflect a change from four types of bearing pads to five types of bearing pads.

Revisions in references to fabricators and the handling and distribution of bearing pads to projects.

A copy of the revised procedure may be viewed in the electronic version of the Testing Manual available through the ALDOT homepage at:

http://www.dot.state.al.us/Bureau/Materials_Tests/Testing/ALDOT_Testing_Manual.pdf

LL/rlw

Cc: Mr. Lynn Wolfe
File

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BLVD. MONTGOMERY, AL 36130-3050

BUREAU OF MATERIALS & TESTS
3700 FAIRGROUND RD. MONTGOMERY, AL 36110
TELEPHONE:334.206.2201 FAX:334.264.6263

BOB RILEY
GOVERNOR

JOE MCINNES
TRANSPORTATION DIRECTOR

May 14, 2003

TECHNICAL MEMORANDUM 92-03

To: Testing Manual Users

From: Larry Lockett
Materials and Tests Engineer

Re: Revisions to ALDOT Testing Manual

Please note that the following revisions have been made to the Alabama Department of Transportation Testing Manual since the release of the previous edition dated 06/12/02:

Cover Page: Replace page dated 06/12/02 with page dated 05/14/03.

Acceptance Sampling and Testing Schedule: Replace Section 521 dated 5/19/97 with page dated 04/16/02.

ALDOT-243-84: Replace version dated 9/12/96 with version dated 11/29/01 (see Technical Memorandum 89-02).

ALDOT-335-83: Replace version dated 6/7/01 with version dated 03/03/03 (see Technical Memorandum 90-03).

ALDOT-368-89: Replace version dated 1/20/95 with version dated 5/01/01 (see Technical Memorandum 91-03).

Numerical Index of BMT Forms and Worksheets: Replace version dated 7/23/01 with version dated 5/13/03.

BMT-4: Replace version dated 4/27/94 with version dated 5/11/01.

BMT-19: Replace version dated 10/27/97 with sample data with blank form dated 10/27/97.

BMT-20: Replace with BMT-20-G dated 2/26/03 and BMT-20-M dated 2/26/03.

BMT-21: Replace version dated 2/12/02 with version dated 2/26/03.

BMT-92: Replace single-page form dated 4/4/94 with two-page form dated 4/4/94.

BMT-122: Replace version dated 4/27/94 with version dated 5/14/03.

BMT-135: Replace version dated 10/27/97 with version dated 4/25/03.

BMT-171: Add form dated 07/26/02.

BMT-172: Add form dated 07/26/02.

Technical Memorandum 88-02: Add memo dated February 21, 2002.

Technical Memorandum 89-02: Add memo dated February 22, 2002.

Technical Memorandum 90-03: Add memo dated March 4, 2003.

Technical Memorandum 91-03: Add memo dated May 6, 2003.

The revised Testing Manual dated 05/14/03 is available through the ALDOT homepage at:

http://www.dot.state.al.us/Bureau/Materials_Tests/Testing/ALDOT_Testing_Manual.pdf

LL/rlw

Cc: Mr. Lynn Wolfe
File