MANUAL
OF
FIELD SAMPLING
AND
TESTING PROCEDURES

MATERIALS DIVISION

ARKANSAS DEPARTMENT OF TRANSPORTATION
P.O. BOX 2261 **11301 WEST BASELINE ROAD**
LITTLE ROCK, ARKANSAS 72203 **LITTLE ROCK, ARKANSAS 72209**

January 2024

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION

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FOREWORD

This publication is issued by the Materials Division for use by Arkansas Department of Transportation personnel. Its purpose is to make available a "Manual of Field Sampling and Testing Procedures" for use on Department projects and purchases.

The publication shall be used in conjunction with the Standard Specifications, the Supplemental Specifications, the Special Provisions, the plans and all supplementary documents effective at the time of usage.

Additions and revisions will be printed and forwarded to the holders of the publication so that each manual is maintained up to date.

Extra care should be taken to assure that reference is made to the current "Qualified Products List" at the time of usage, regardless of the formulation date of the list and the letting date of a contract. (The time of usage is defined as the date of the Department's inspection and acceptance of the product for a specific project or purchase order.)

Any questions concerning the contents or use of this publication should be directed to the Materials Division where the master "Manual of Field Sampling and Testing Procedures" is maintained.

NOTICE OF NONDISCRIMINATION

The Arkansas Department of Transportation (Department) complies with all civil rights provisions of federal statutes and related authorities that prohibit discrimination in programs and activities receiving federal financial assistance. Therefore, the Department does not discriminate on the basis of race, sex, color, age, national origin, religion (not applicable as a protected group under the Federal Motor Carrier Safety Administration Title VI Problem), disability, genetic information, Limited English Proficiency (LEP), or low-income status in the admission, access to and treatment in the Department's programs and activities, as well as the Department's hiring or employment practices. Complaints of alleged discrimination and inquiries regarding the Department's nondiscrimination polices may be directed to Joanna P. McFadden Section Head-EEO/DBE (ADA/504/Title VI Coordinator), P.O. Box 2261, Little Rock, AR 72203, (501) 569-2298,(Voice/TTY 711), or the following email address: joanna.mcfadden@ardot.gov

Free language assistance for Limited English Proficient individuals is available upon request.

This notice is available from the ADA/504/Title VI Coordinator in large print, on audiotape and in Braille.

MATERIALS DIVISION
TELEPHONE LISTINGS

Below is a list of administrative and laboratory personnel and a list by laboratory operational units showing general areas of responsibilities. Your use of these telephone numbers will usually expedite the exchange of information, eliminate the time spent waiting for calls to be transferred and reduce the number of calls to the Division office which must be forwarded to the proper party.

Paul Tinsley	Division Head	(501) 569-2186
Dwayne Cale	Assistant Division Head	(501) 569-2369
Olivia Woodward	Administrative Assistant	(501) 569-2185
Andrea White	Bookkeeper	(501) 569-2908
Vacant/Guard	Office Assistant	(501) 569-2367
Marc Maurer	Engineer IV Dist. 1, 3, 4, 5, 6	(501) 569-2010
Tamara Boggs	Materials Area Engr. Dist. 2, 7, 8, 9, 10	(501) 569-2372
Tammy Jernigan	Quality Assurance Engineer	(501) 569-2377
James Dean	Staff Materials Engineer	(501) 569-2389
Yongsheng Zhao	Staff Geotechnical Engineer	(501) 569-2496
Matt Green	Section Head – Geotechnical	(501) 569-2360
Bobbie Jordan	Advanced Engineer	(501) 569-2297
Jared Johnson	Advanced Engineer	(501) 569-2995
Paul Tierney	Advanced Engineer	(501) 569-2048
Masan Brown	Engineer	(501) 569-2048
Lakisha Rice	Section Head – Chemistry Lab	(501) 569-2198
Corey Garrett	Laboratory Facility Manager	(501) 569-2189
Rodney Catlett	Laboratory Coordinator – Geotech/Soils	(501) 569-2187
Andrew Littleton	Laboratory Coordinator – Str Mtls Unit	(501) 569-2188
Mark Greenwood	Laboratory Coordinator – Bituminous Design	(501) 569-2191
Khari Withers	Laboratory Coordinator – Sample Prep	(501) 569-2991
Vacant	DMS Dist. 1, Wynne	(870) 238-8144
Chance Byerly	DMS Dist. 2, Pine Bluff	(870) 536-1831
David Cummings	DMS Dist. 3, Hope	(870) 777-5792
Russell McNeill	DMS Dist. 4, Fort Smith	(479) 478-8537
Jonathan Brill	DLT	(479) 478-8537
Terry Standard	DMS Dist. 5, Batesville	(870) 251-3869
Shawn Hasley	DMS Dist. 6, Little Rock	(501) 569-2530
Tisha Reynolds	DMS Dist. 7, Camden	(870) 836-6885
Larry Wilson	DMS Dist. 8, Russellville	(479) 968-1257
Kyle Lasater	DMS Dist. 9, Harrison	(870) 743-2100
Dale Spence	DMS Dist. 10, Paragould	(870) 239-9511
Carson Sloan	Geologist	(501) 569-2507
Paul Campbell	Geologist	(501) 569-2497

CONCRETE & STRUCTURAL STEEL INSPECTION

Section responsibilities have been transferred to Bridge Division.

Structural Steel Inspection	Welding Procedures
Bridge Bearings, Expansion Devices	Precast/Prestressed Concrete & Joints

SAMPLE PREPARATION

Khari Withers	Laboratory Coordinator	(501) 569-2991
Patrick Cagle	Materials Technician	(501) 569-2061
Ezekiel Barnes	Materials Technician	(501) 569-2061
Kenyada Sain	Materials Technician	(501) 569-2061

GEOTECHNICAL SOILS LAB

Rodney Catlett	Laboratory Coordinator	(501) 569-2187
	Laboratory	(501) 569-2194
Tanya Hasley	Senior Materials Technician	(501) 569-2068
Andrew McBride	Materials Technician	(501) 569-2068
Rachel Tochydlowski	Materials Technician	(501) 569-2068

Hydrometer Analysis
R-Values & Other Soils Properties
Resilient Modulus Test – Subgrade
Test Results:

Gravel	pH
Sand	Soils
Stone	

Proctor Tests
Sodium Sulfate Soundness
Cement Stabilized Crushed Stone Base Course Designs
Lime Treated Subgrade Designs
Pressure Grouting Designs
Soil Cement Designs

BITUMINOUS DESIGN LAB

Mark Greenwood	Laboratory Coordinator	(501) 569-2191
	Laboratory	(501) 569-2190
Henry Williams	Senior Materials Technician	(501) 569-2990
Laurn Brawley	Senior Materials Technician	(501) 569-2990

Absorptions	Extractions
Asphalt Concrete Pavement Design	Specific Gravities
Densities	Mineral Fillers

CHEMISTRY LAB

Lakisha Rice	Section Head	(501) 569-2198
	Laboratory	(501) 569-2199
Cynthia Pearson	Lead Chemist	(501) 569-2199
Megan Fuller	Chemist	(501) 569-2199
Ryan Snead	Chemist	(501) 569-2199

	Erosion Control Matting
Lime – Chemical Analysis	Geotextile Fabric (Underseals, Filter, Cotton)
Abson Recovery (Reclaimed Asphalt)	Fencing Materials
Asphalt Anti-Strip Additives	Galvanizing on Steel Articles
Asphalt Binders	Joint Seal Gaskets
Performance Graded Asphalt Binders	Non-Asphalt Tackifiers & Mulch Cover Systems
Asphalt Extraction/Wash Solvents	Silicone Joint Sealer – Curb & Gutter
Asphalt Release Agents	Aluminum Epoxy Paint
Cutback Asphalts	
Emulsified Asphalt	Traffic Loop Wire Sealants
Silicone Additives for Asphalt Cement	Aluminum Sign Materials
Backer Rod for Joint Sealing	Delineators and Delineator Posts
Electrical Materials	Glass Beads for Pavement Markings
Concrete Admixtures	Pavement Markings (Paint, Thermoplastic, Tape, Raised Markers)
Concrete Bridge Deck Chloride Content	Retroreflectors
Concrete Curing Compounds	Sign Posts
Raised Pavement Marker Adhesives	Retroreflective Sheeting
Resin Anchoring Systems	Temporary Striping Tape
Fly Ash	Concrete Surface Finishes
Concrete Joint Sealers	Class 1 Protective Surface Treatment for Concrete (Boiled Linseed Oil)
Performed Expansion Joint Fillers	Class 2 Protective Surface Treatment for Concrete
Expansion Joint Fillers AASHTO M213	Class 3 Protective Surface Treatment for Concrete
Portland Cement	Structural Steel Paint Systems
Slag Cement	Non-shrink Grouts
Modified Portland Cement	Roofing Felt
Water Analysis	Waterproofing and Damp proofing
Construction Raised Pavement Markers	Construction Concrete Barrier Markers

STRUCTURAL MATERIALS UNIT

Andrew Littleton	Laboratory Coordinator	(501) 569-2188
	Laboratory	(501) 569-2989
John Frazier	Materials Technician	(501) 569-2989
Jarius Holmes	Materials Technician	(501) 569-2989

Test Results:

- Bolts
- Cable
- Culvert
- Miscellaneous Concrete Products
- Wire Mesh
- Plastic Pipe
- Reinforcing Steel
- Rockwell/Brinell Hardness
- Portland Cement Concrete

EQUIPMENT AND REPAIR

Corey Garrett	Laboratory Facility Manager	(501) 569-2189
Larry Bradbury	Testing Equipment Specialist	(501) 569-2404
Justin Cornett	Testing Equipment Specialist	(501) 569-2404
Taylor Gosvener	Senior Materials Technician	(501) 569-2404

- Air Meter Equipment
- Digital Thermometers
- Hot Plates
- Ovens
- Rolling Straightedge
- Speedy Moisture
- Compression Machines
- Extractors
- Superpave Gyratory Compactors
- Profilograph
- Scales
- Nuclear Density Testing Equipment

SUPPLIES, SHIPPING AND RECEIVING

Pepper Hobby	Materials Stockroom Coordinator	(501) 569-2196

NUCLEAR GAUGES

Corey Garrett	Radiation Safety Officer	(501) 569-2189

ACCEPTANCE SAMPLING & TESTING OF CONSTRUCTION MATERIALS

The Department's *Standard Specifications for Highway Construction, Edition of 2014* requires the Contractor to perform Quality Control sampling and testing and Acceptance sampling and testing of construction items. The Department will perform verification testing to verify the Contractor's testing equipment and procedures or verification and acceptance testing both to verify the Contractor's testing equipment and procedures and for use in the acceptance of material and to determine payment for the material.

CONTRACTOR QUALITY CONTROL

Quality Control sampling and testing results are to be used by the Contractor for controlling his material production and his construction procedures. Except for sampling and testing for ACHM and Concrete gradation and Retained Stability, the frequency of Quality Control sampling and testing is at the option of the Contractor.
Quality Control sampling and testing results are not used in the acceptance of material or to determine payment for the material.

CONTRACTOR ACCEPTANCE TESTING

The Contractor's Acceptance sampling and testing results are used by the Department to determine if materials meet specification requirements. These Acceptance testing results will be incorporated into the acceptance of material and will be used to determine payment for the material.

The Contractor must test for acceptance for the material qualities at the rates established in the Standard Specifications.

DEPARTMENT VERIFICATION TESTING

The Department will perform a minimum of one (1) verification test for each four (4) Acceptance tests performed by the Contractor (in applicable sections of Division 200 and Division 300, excluding Sections 308 & 309).

Quality Control tests which have specified frequencies will also be verified by the Engineer. These items and the verification rates are:

Lime Treated Subgrade Thickness	One per 48,000 sq. yds. (40,000 sq. m.)
Portland Cement Concrete Pavement Gradation: (Fine and Coarse Aggregate)	One per 4,000 cu yd (3000 cu m)

DEPARTMENT VERIFICATION AND ACCEPTANCE TESTING

The Department will test both to verify and to accept the material qualities at the minimum rates established in the Standard Specifications (in Sections 308 & 309, applicable sections of Division 400 through Division 800).

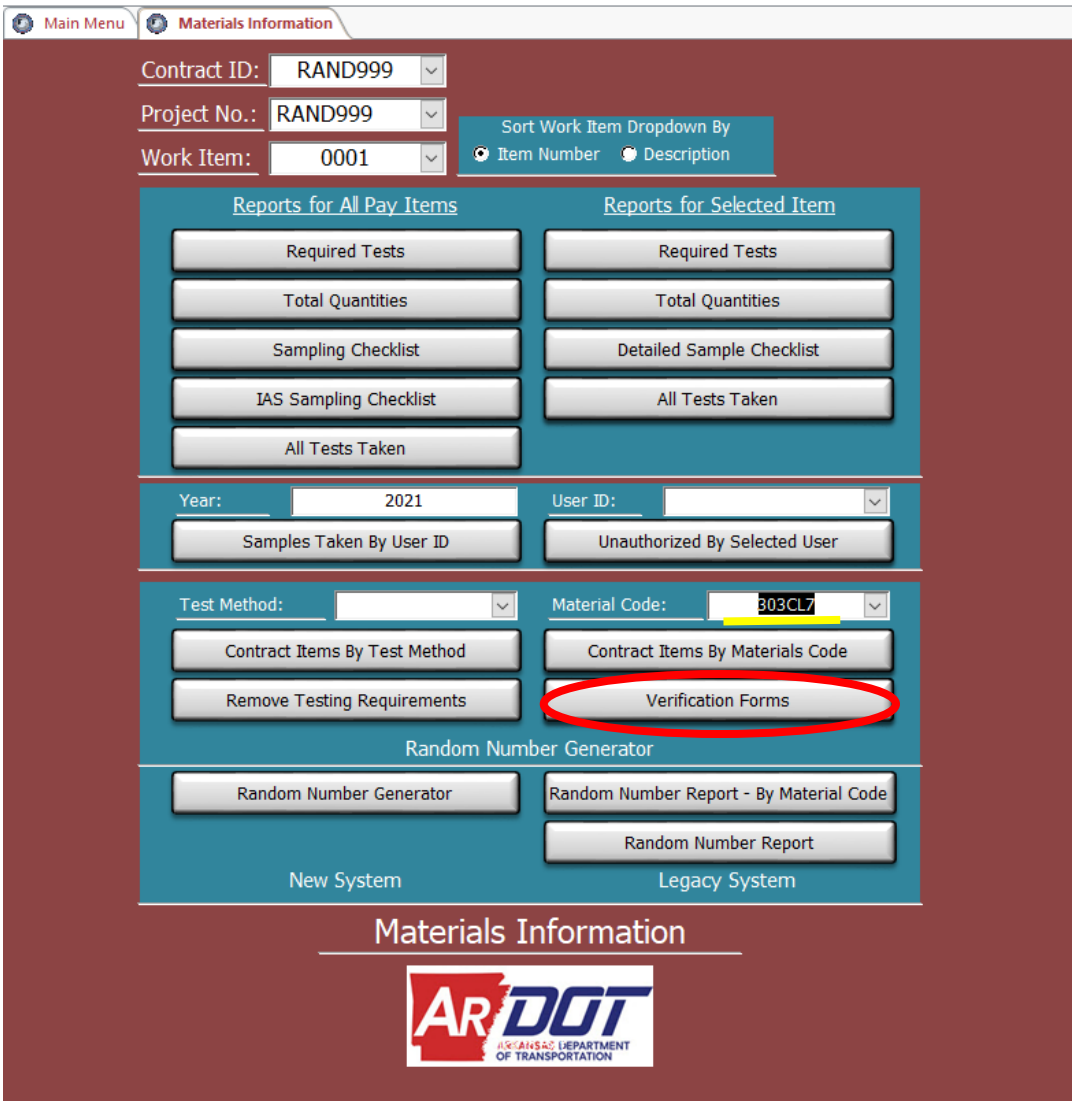
VERIFICATION TESTING

Verification will consist of comparing the results of the Engineer's lot test to the average of the Contractor's sublot tests. Both verification and acceptance test shall be taken according to ARDOT 465 or Random Number Generator in SiteManager. (These are not split samples.)

Verification tables are to be used for comparing the Engineer's results to the Contractor's results to determine if the Engineer's test results do verify the acceptance tests results reported by the Contractor.

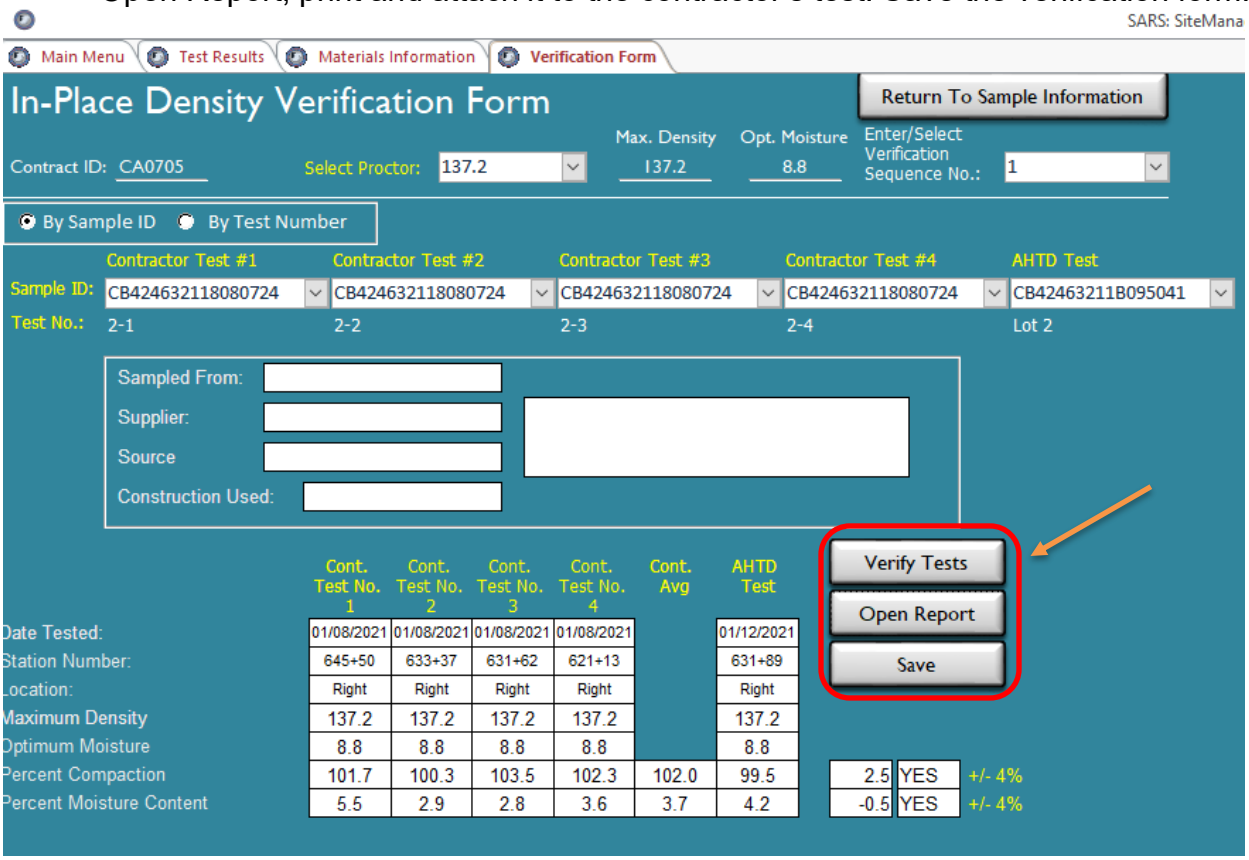
When verifying:

Verification forms are created in SARS for most commonly used material codes. They are located under Materials/Misc., then Materials Information. Select the Contract ID, then select the "Material Code" from the drop-down menu. Press Verification Forms button.



Fill in the information by selecting Sample IDs in the drop-down menus. Once the Contractor Test and the ARDOT test has been filled in select “verify test”. It would indicate if a test met the verification requirements for material.

Open Report, print and attach it to the contractor’s test. Save the verification form.



These forms shall be created as the project progresses and not at the end of the project.

If a template for a material code is not available, then complete verification by using acceptance tests results reported by the Contractor, add and subtract the value in the verification tables to/from the Contractor’s average result. This will establish the range that the Engineer’s lot test should lie within to verify the Contractor’s average result.

Even though results from both the Contractor and the Engineer may indicate that the tested material complies with specifications, the Engineer’s results may not verify those of the Contractor. Conversely, results from both the Contractor and the Engineer may indicate that the tested material does not comply with specifications, but the Engineer’s results may verify those of the Contractor.

If the Engineer’s test results do not verify the acceptance tests results reported by the Contractor, the Contractor shall make changes to his equipment and/or procedures so that the Engineer can verify his results. In general, the test results will not be considered to be verified when a maximum of two consecutive verification tests or three of any five consecutive verification tests do not verify the Contractor’s results.

The Engineer will note changes made by the Contractor in a memo to the Engineer’s job file. A copy should be sent to the Area Materials Engineer.

July 2015 **CORRELATION TABLE TO BE USED TO VERIFY CONTRACTOR TEST RESULTS (ENGLISH)**

	LABORATORY		GRADATION SIEVES										
MATERIAL	**MAXIMUM DENSITY (LB/FT³)**	**OPTIMUM MOISTURE (%)****	**1" & LARGER**	**3/4"**	**1/2" & 3/8"**	**#4**	**#8,10, 16, 20**	**#30, 40,50**	**#80,100**	**#200**	**FINENESS MODULUS**	**LIQUID LIMIT**	**PLASTIC LIMIT**
	(SPLIT SAMPLES)												
EMBANKMENT, SUBGRADE, SHAPING RDWY, SUBGR. & SHLDR PREP, RECOMP.SHLDRS	+/-5%	+/- 15%											
LIME TREATED SUBGRADE	+/-5%	+/- 15%											
SELECTED MATERIAL	+/-5%	+/- 15%	+/- 1%							+/- 5%		MEAN < 21,+/- 3* MEAN ≥ 21, +/- 13%**	MEAN < 15,+/- 3* MEAN ≥ 15, +/- 18%**
AGGR. BASE COURSE			+/- 10%	+/- 8%	+/- 6%	+/- 6%	+/- 5%	+/- 4%		+/- 2.5%		MEAN < 21,+/- 3* MEAN ≥ 21, +/- 13%**	MEAN < 15,+/- 3* MEAN ≥ 15, +/- 18%**
CEMENT TREATED BASE										+/- 2.5%			
CEMENT STABILIZED CRUSHED STONE BASE COURSE (CSCSBC)			+/- 10%	+/- 8%	+/- 6%	+/- 6%	+/- 5%	+/- 4%		+/- 2.5%		MEAN < 21,+/- 3* MEAN ≥ 21, +/- 13%**	MEAN < 15,+/- 3* MEAN ≥ 15, +/- 18%**
PCC BASE	See PCC-Fine & Coarse Aggregate										Check Calculations		
OPEN GRADED PCC BASE			+/- 10%	+/- 8%	+/- 6%	+/- 6%	+/- 5%						
AGGR. -ACHM Open Graded Base Course & Slurry Seal			+/- 10%	+/-8%	+/- 6%	+/- 6%	+/- 5%	+/- 4%	+/- 3%	+/- 2.5%			
PCCP-FINE AGGREGATE					+/- 6%	+/- 5%	+/- 5%	+/- 4%	+/- 2.5%				
PCCP-COARSE AGGREGATE			+/-10%	+/-8%	+/- 5%	+/- 2.5%	+/- 2.5%				Check Calculations		

* Add or Subtract 3 to Mean Value. ** Percentage of Mean Value added or Subtracted to Mean Value.

MATERIAL	**% PERCENT COMPACTION**	**MOISTURE (%)**	**THICKNESS**	**ASPHALT CONTENT (AC)**	**MAX. THEOR. SP. GRAVITY (Gmm)**	**AIR VOIDS (AV)**	**VOIDS IN MINERAL AGGREGATE (VMA)**	**SLUMP**	**AIR CONTENT**	**COMPRESSIVE STRENGTH**
	(SAMPLES FROM SAME MATERIAL)									
EMBANKMENT, SUBGRADE, SHAPING RDWY, SUBGR. & SHLDR PREP	+/-4%	+/- 4%								
RECOMP. SHLDRS.	+/-4%									
LIME TREATED SUBGRADE	+/-3%	+/- 4%	+/- 0.75 in							
SELECTED MATERIAL	+/-4%	+/- 4%	+/- 0.75 in							
AGGR. BASE COURSE (incl. RECONST.BASE)	+/-4%	+/- 4%	+/- 0.75 in							
CEMENT TREATED BASE										
CEMENT STABILIZED CRHED ST BASE			+/- 0.75 in							+/-15%
PCC BASE			+/- 0.75 in					+/- 1in	+/-1%	+/-15%
OPEN GRADED PCC BASE			+/- 0.75 in							
ACHM	+/-2%			+/- 0.3%	+/-0.019	+/- 1%	+/- 1%			
SEAL COURSE				+/- 0.3%						
OPEN GRADED BASE CRSE.				+/- 0.3%						
PORTLAND CEMENT CONCRETE(PCC)								+/- 1in	+/-1%	+/-15%
PCC PAVEMENT, PCC PATCHING			+/- 0.75 in					+/- 1in	+/-1%	+/-15%

CORRELATION TABLE TO BE USED TO VERIFY CONTRACTOR TEST RESULTS (METRIC)

	LABORATORY		GRADATION SIEVES										
MATERIAL	**MAXIMUM DENSITY (kg/m^3)**	**OPTIMUM MOISTURE (%) ****	**25 mm & LARGER**	**19 mm**	**12.5 & 9.5 mm**	**4.75 mm**	**2.36, 2.00, 1.18mm & 850 mcrn**	**600, 425 & 300 mcrn**	**180 & 150 mcrn**	**75 mcrn**	**FINENESS MODULUS**	**LIQUID LIMIT**	**PLASTIC LIMIT**
	(SPLIT SAMPLES)												
EMBANKMENT, SUBGRADE, SHAPING RDWY, SUBGR. & SHLDR PREP, RECOMP.SHLDRS	+/-5%	+/- 15%											
LIME TREATED SUBGRADE	+/-5%	+/- 15%											
SELECTED MATERIAL	+/-5%	+/- 15%	+/- 1%							+/- 5%		MEAN < 21,+/- 3* MEAN ≥ 21, +/- 13%**	MEAN < 15,+/- 3* MEAN ≥ 15, +/- 18%**
AGGR. BASE COURSE			+/- 10%	+/- 8%	+/- 6%	+/- 6%	+/- 5%	+/- 4%		+/- 2.5%		MEAN < 21,+/- 3* MEAN ≥ 21, +/- 13%**	MEAN < 15,+/- 3* MEAN ≥ 15, +/- 18%**
CEMENT TREATED BASE										+/- 2.5%			
CEMENT STABILIZED BASE			+/- 10%	+/- 8%	+/- 6%	+/- 6%	+/- 5%	+/- 4%		+/- 2.5%		MEAN < 21,+/- 3* MEAN ≥ 21, +/- 13%**	MEAN < 15,+/- 3* MEAN ≥ 15, +/- 18%**
PCC BASE	See PCC-Fine & Coarse Aggregate										Check Calculations		
OPEN GRADED PCC BASE			+/- 10%	+/- 8%	+/- 6%	+/- 6%	+/- 5%						
AGGR.-ACHM Open Graded Base Course & Slurry Seal			+/- 10%	+/-8%	+/- 6%	+/- 6%	+/- 5%	+/- 4%	+/- 3%	+/- 2.5%			
PCCP-FINE AGGREGATE					+/- 6%	+/- 5%	+/- 5%	+/- 4%	+/- 2.5%				
PCCP-COARSE AGGREGATE			+/-10%	+/-8%	+/- 5%	+/- 2.5%	+/- 2.5%				Check Calculations		

* Add or Subtract 3 to Mean Value. ** Percentage of Mean Value added or Subtracted to Mean Value.

MATERIAL	**(%) PERCENT COMPACTION**	**(%) PERCENT MOISTURE**	**THICKNESS**	**ASPHALT CONTENT (AC)**	**MAX. THEOR SP. GRAVITY (Gmm)**	**AIR VOIDS (AV)**	**VOIDS IN MINERAL AGGREGATE (VMA)**	**SLUMP**	**AIR CONTENT**	**COMPRESSIVE STRENGTH**
	(SAMPLES FROM SAME MATERIAL)									
EMBANKMENT, SUBGRADE, SHAPING RDWY, SUBGR. & SHLDR PREP	+/-4%	+/- 4%								
RECOMP. SHLDRS.	+/-4%									
LIME TREATED SUBGRADE	+/-3%	+/- 4%	+/- 19 mm							
SELECTED MATERIAL	+/-4%	+/- 4%	+/- 19 mm							
AGGR. BASE COURSE (incl. RECONST.BASE)	+/-4%	+/- 4%	+/- 19 mm							
CEMENT TREATED BASE										
CEMENT STABILIZED BASE			+/- 19 mm							+/-15%
PCC BASE			+/- 19 mm					+/- 25 mm	+/-1%	+/-15%
OPEN GRADED PCC BASE			+/- 19 mm							
ACHM	+/-2%			+/- 0.3%	+/-0.019	+/-1%	+/-1%			
SEAL COURSE				+/- 0.3%						
OPEN GRADED BASE CRSE.				+/- 0.3%						
PORTLAND CEMENT CONCRETE(PCC)								+/- 25 mm	+/-1%	+/-15%
PCC PAVEMENT, PCC PATCHING			+/- 19 mm					+/- 25 mm	+/-1%	+/-15%

TECHNICIAN / LABORATORY CERTIFICATION PROGRAM

All Contractor technicians performing quality control or acceptance sampling and testing on Department projects let after January 1, 1999 must be certified under an approved certification program. The University of Arkansas's Center for Training Transportation Professionals (CTTP) can provide training for certification. Non-certified technicians will not be permitted to conduct any quality control or acceptance testing on Department projects let after that date.

All jobs let to contract in the August 16, 2000 letting and thereafter require that materials testing used in quality control sampling and testing and in the acceptance decision be performed by laboratories that are qualified through the University of Arkansas's Center for Training Transportation Professionals (CTTP) program for qualifying laboratories.

An individual or Contractor may submit in writing to the CTTP the name/s of the individual who is to be certified and the area of certification that is being sought. List all training and certifications the individual has received from other agencies or professional organizations. This training and the certifications will be considered by the CTTP in determining if additional training must be obtained before an individual may be certified.

Certification of technicians and qualification of laboratories will be in five areas of materials testing: 1) Basic Aggregates; 2) Soils/Earthwork; 3) Asphalt Plant and Field Testing; 4) Portland Cement Concrete (PCC) Testing; and 5) Portland Cement Concrete (PCC) Strength Testing. AASHTO T 141(Sampling Freshly Mixed Concrete), AASHTO T 23 (Making and Curing Concrete Test Specimens in the Field), and AASHTO T 119 (Slump of Hydraulic Cement Concrete) are required to be performed by a certified technician but are not required to be performed by a qualified laboratory. Before a technician may become certified in Soils/Earthwork, Asphalt Plant and Field Testing, and Portland Cement Concrete Testing, and Portland Cement Concrete Strength Testing the technician must first attend a Basic Aggregates course. *An individual with an ACI Level 1 certification will be certified by the CTTP for Portland Cement Concrete Testing upon completion of the Basic Aggregates course.*

All Contractor, private testing lab, or supplier technicians performing quality control or acceptance sampling and testing of concrete on Department projects let to contract after January 1, 2010, must be certified to perform AASHTO T 22, Compressive Strength of Cylindrical Concrete Specimens. This certification is the ACI Concrete Strength Testing Technician certification. This certification is required for performing quality control or acceptance sampling and testing of any concrete used under the provisions of Divisions 300, 500, 600, 700, and 800 of the Standard Specifications for Highway Construction.

Requests by the Contractor for scheduling technicians for training at the CTTP is on a first come basis, except Contractors with awarded contracts will be given priority over Contractors that do not have contracts requiring certified technicians.

Each qualified laboratory used for a project shall be a permanent laboratory listed on the CTTP website at www.cttp.org. The location shown on the CTTP list must match the actual physical location of the laboratory in order for that laboratory to be acceptable for project testing. Laboratories must advise CTTP whenever a laboratory changes locations.

Testing performed by a qualified laboratory is only acceptable if it is done in the area of materials testing that the lab is qualified and for the specific AASHTO/ARDOT tests that it has requested qualification. The test methods that each laboratory is qualified to perform are listed on the CTTP website after the laboratory has been inspected by CTTP. As an example, field testing of concrete for air content can only be performed by a technician certified in PCC Testing and using equipment that is in the Quality Manual of a laboratory qualified in PCC and AASHTO Test methods T 152. Each laboratory that has requested to be qualified by CTTP is expected to check the calibration of its materials testing equipment and maintain those records in their Quality Manual. Equipment used in performing test methods for Sampling Freshly Mixed Concrete, Making and Curing Concrete Test Specimens in the Field, and Slump of Hydraulic Cement Concrete shall meet equipment requirements of the specific test method. The Resident Engineer may review these records when the Department's test results fail to verify a Contractor's test results.

Contact Dr. Stacy Williams, Director of the Center for Training Transportation Professionals (CTTP), at (479) 575-3997 to request technician and/or laboratory qualification.

GUIDE SCHEDULE OF FREQUENCY OF INDEPENDENT ASSURANCE SAMPLES AND TESTS FOR 2014 STD. SPECS.

MATERIAL	TYPE OF TEST	MINIMUM FREQUENCY OF TESTING	REMARKS
SPECIAL PROVISION EMBANKMENT MATERIAL	GRADATION, LIQUID LIMIT AND PLASTIC LIMIT	1 FOR EACH 125,000 CY (190,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 75,000 CY (95,000 TONS)	RATES FOR CONTRACTOR
	GRADATION, LIQUID LIMIT AND PLASTIC LIMIT	1 FOR EACH 250,000 CY (380,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 125,000 CY (190,000 TONS)	RATES FOR DEPARTMENT
210 EMBANKMENT (See Note 1) 212 SUBGRADE	DENSITY AND MOISTURE CONTENT	1 FOR EACH 100,000 CY (150,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 75,000 CY (115,000 TONS)	RATES FOR CONTRACTOR
	DENSITY AND MOISTURE CONTENT	1 FOR EACH 200,000 CY (300,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 150,000 CY (230,000 TONS)	RATES FOR DEPARTMENT
302 SELECTED MATERIAL 303 AGGREGATE BASE COURSE 307 CEMENT TREATED BASE COURSE 308 CEMENT STABILIZED CRUSHED STONE BASE COURSE 310 OPEN GRADED PCC BASE COURSE 417 OPEN GRADED ASPHALT BASE COURSE	GRADATION, LIQUID LIMIT AND PLASTIC LIMIT (ONLY GRADATION FOR AGGREGATE BASE COURSE, CEMENT STABILIZED CRUSHED STONE BASE COURSE, OPEN GRADED PCC BASE COURSE AND OPEN GRADED ASPHALT BASE COURSE)	1 FOR EACH 20,000 CY (25,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 15,000 CY (19,000 TONS)	RATES FOR CONTRACTOR
	GRADATION, LIQUID LIMIT AND PLASTIC LIMIT (ONLY GRADATION FOR AGGREGATE BASE COURSE, CEMENT STABILIZED CRUSHED STONE BASE COURSE, OPEN GRADED PCC BASE COURSE AND OPEN GRADED ASPHALT BASE COURSE)	1 FOR EACH 40,000 CY (50,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 30,000 CY (38,000 TONS)	RATES FOR DEPARTMENT
216 SCARIFYING AND RECOMPACTING SHOULDERS 301 LIME TREATED SUBGRADE 302 SELECTED MATERIAL 303 AGGREGATE BASE COURSE 305 RECONSTRUCTED BASE COURSE 307 CEMENT TREATED BASE COURSE	DENSITY AND MOISTURE CONTENT	1 FOR EACH 20,000 CY (25,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 15,000 CY (19,000 TONS)	RATES FOR CONTRACTOR
	DENSITY AND MOISTURE CONTENT	1 FOR EACH 40,000 CY (50,000 TONS) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 30,000 CY (38,000 TONS)	RATES FOR DEPARTMENT

GUIDE SCHEDULE OF FREQUENCY OF INDEPENDENT ASSURANCE SAMPLES AND TESTS FOR 2014 STD. SPECS.

MATERIAL	TYPE OF TEST	MINIMUM FREQUENCY OF TESTING	REMARKS
403 AGGREGATE FOR ASPHALT SURFACE TREATMENT	GRADATION	1 FOR EACH 15,000 TONS (12,000 CY) NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 1,500 TONS (1,200 CY)	RATES FOR DEPARTMENT
410 ASPHALT CONCRETE HOT/WARM MIX: BASE, BINDER, SURFACE COURSE 417 OPEN GRADED ASPHALT BASE COURSE 418 SLURRY SEAL	ASPHALT BINDER CONTENT, AIR VOIDS, VMA, MAX THEORETICAL SPECIFIC GRAVITY(Gmm), & DENSITY (See Note 2) (ONLY ASPHALT BINDER CONTENT FOR SLURRY SEAL AND OPEN GRADED ASPHALT BASE COURSE)	1 FOR EACH 30,000 TONS - PER COURSE NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 7,500 TONS	RATES FOR CONTRACTOR
	ASPHALT BINDER CONTENT, AIR VOIDS, VMA, MAX THEORETICAL SPECIFIC GRAVITY(Gmm), & DENSITY (See Note 2) (ONLY ASPHALT BINDER CONTENT FOR SLURRY SEAL AND OPEN GRADED ASPHALT BASE COURSE)	1 FOR EACH JOB WITH MORE THAN 40,000 TONS - PER COURSE	RATES FOR DEPARTMENT
308 CEMENT STAB CRUSHED STONE BASE COURSE (NOTE 3) 501 PORTLAND CEMENT CONCRETE PAVEMENT (NOTE 3) 501 HIGH EARLY STRENGTH CONCRETE PAVEMENT (NOTE 3) 503 CONTINOUSLY REINFORCED CONCRETE PAVEMENT (NOTE 3) 503 HIGH EARLY STRENGTH CONTINOUSLY REINFORCED CONCRETE PAVEMENT (NOTE 3) 507 PORTLAND CEMENT CONCRETE PAVEMENT PATCHING (NOTE 3) 511 PCC SHOULDER (ADD-ON) (NOTE 3)	SLUMP AND AIR CONTENT CORE COMPRESSIVE STRENGTH (FOR CEMENT STAB. CRUSHED STONE BS. CRS. CORE COMPRESSIVE STRENGTH ONLY)	1 FOR EACH 10,000 CY NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 10,000 CY	RATES FOR CONTRACTOR
	SLUMP AND AIR CONTENT (NO TESTING REQUIRED FOR CEMENT STAB. CRUSHED STONE BS. CRS.)	1 FOR EACH 40,000 CY NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 40,000 CY	RATES FOR DEPARTMENT
802 STRUCTURAL CONCRETE MIXTURES: CLASS S, CLASS S(AE), CLASS B, SEAL	SLUMP, AIR CONTENT (IF APPLICABLE), & COMPRESSIVE STRENGTH	1 FOR EACH 1,000 CY NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 300 CY	RATES FOR CONTRACTOR
	SLUMP, AIR CONTENT (IF APPLICABLE), & COMPRESSIVE STRENGTH	1 FOR EACH 4,000 CY NO SAMPLES REQUIRED ON JOBS WITH LESS THAN 600 CY	RATES FOR DEPARTMENT

UNIFORM THICKNESS	CONVERSION FACTOR
6"	0.16667
7"	0.19444
8"	0.22222
9"	0.25000
10"	0.27778
11"	0.30556
12"	0.33333
13"	0.36111
14"	0.38889

NOTES:

1. **TOTAL FOR EMBANKMENT IS LINE-ITEM AMOUNT OF COMPACTED EMBANKMENT OR IS DETERMINED BY ADDING LINE ITEM AMOUNT OF BORROW AND EXCAVATION (UNCLASSIFIED, ROCK AND COMMON) THEN SUBTRACT LINE ITEM FOR WASTE.**
2. **CHECK QUALITY MANUAL FOR COMPLIANCE OF GYRATORY COMPACTOR CALIBRATION. THE CHARACTERISTICS TO BE TESTED ARE THE SAME AS THOSE SPECIFIED FOR ACCEPTANCE.**
3. **CONVERSION FACTOR CHART SHOULD BE USED TO CONVERT SY TO CY.**

REMARKS:

A QUALITY ASSURANCE PROGRAM MUST PROVIDE FOR AN ACCEPTANCE PROGRAM AND AN INDEPENDENT ASSURANCE (IA) PROGRAM. THE PURPOSE OF THE IA PROGRAM IS TO ASSURE THAT ACCEPTANCE AND VERIFICATION TESTERS AND EQUIPMENT REMAIN CAPABLE OF PERFORMING THE REQUIRED TESTS PROPERLY. ALTHOUGH THE IA PROGRAM IS ADMINISTERED BY THE MATERIALS DIVISION, A SUCCESSFUL PROGRAM REQUIRES THE COOPERATION AND PARTICIPATION OF THE CONTRACTOR, RESIDENT/STAFF ENGINEER AND MATERIALS DIVISION IN ORDER TO INSURE THAT THE REQUIRED SAMPLES ARE OBTAINED AND CORRELATED IN A MEANINGFUL AND TIMELY MANNER.
THE MATERIALS DIVISION WILL UTILIZE WITNESSING, SEPARATE SAMPLES, SPLIT SAMPLES, PROFICIENCY SAMPLES, AND EQUIPMENT CALIBRATION INDIVIDUALLY OR IN COMBINATION AS AN INDEPENDENT CHECK OF THE CONTRACTOR'S AND RE'S FIELD SAMPLING AND TESTING PROCEDURES. GENERALLY, FIELD SAMPLES WILL BE OBTAINED IN THE SAME MANNER AS THOSE FOR ACCEPTANCE AND VERIFICATION AND WILL BE TESTED BY THE DISTRICT MATERIALS SUPERVISOR (DMS) OR THE DISTRICT LABORATORY TECHNICIAN (DLT) USING EQUIPMENT ASSIGNED TO THE DMS. ALL INDEPENDENT ASSURANCE TESTING FOR IA COMPARISONS SHALL BE PERFORMED UTILIZING DIFFERENT EQUIPMENT. IF DEEMED APPROPRIATE BY THE MATERIALS DIVISION, THE DMS COULD USE EQUIPMENT NOT ASSIGNED TO THE DMS AND/OR QUALIFIED PERSONNEL NOT ASSOCIATED WITH THE JOB TO PERFORM IA TESTING.

CLASS A, CLASS M AND PORTLAND CEMENT CONCRETE USED FOR MISCELLANEOUS PURPOSES GENERALLY ARE NOT INCLUDED IN THE IA PROGRAM OF TESTING. THE NUMBER OF IA SAMPLES SHOWN IN THE ABOVE TABLE ARE CONSIDERED MINIMUMS *AND ADDITIONAL SAMPLES MAY BE TAKEN AT ANY TIME. IA SAMPLING WILL BE PLANNED SO THAT AN ADEQUATE NUMBER WILL BE OBTAINED BUT NOT ALL AT THE SAME TIME*.

A PROMPT COMPARISON AND DOCUMENTATION SHALL BE MADE OF TEST RESULTS OBTAINED BY THE TESTER(S) BEING EVALUATED AND THE IA TESTER. THIS WILL BE ACCOMPLISHED BY THE DMS CORRELATING IA SAMPLE TEST RESULTS WITH JOB ACCEPTANCE AND/OR VERIFICATION RESULTS. THIS CORRELATION WILL BE A COMPARISON OF TEST RESULTS OF IA SAMPLES, AND OF SEPARATE AND/OR OF SPLIT SAMPLES AND/OR THE LAST FIVE (5) (IF AVAILABLE) ACCEPTANCE (INCLUDING VERIFICATION) SAMPLES. A COPY OF THE IA SAMPLE TEST RESULTS AND CORRELATION WILL BE SENT *BY THE MATERIALS DIVISION'S STAFF AREA ENGINEER (AE) TO THE RESIDENT/STAFF ENGINEER. THE RESIDENT/STAFF ENGINEER WILL FORWARD COPIES TO THE APPROPRIATE OFFICE(S) AS NECESSARY*. IA SAMPLE TEST RESULTS AND THE CORRELATION WILL BE FILED IN THE RESIDENT/STAFF ENGINEER JOB FILE.

IF IA SAMPLE TEST RESULTS DO NOT CORRELATE WITH ACCEPTANCE AND/OR VERIFICATION TEST RESULTS, THE MATERIALS AND FIELD SAMPLING PROCEDURES MUST BE REVIEWED. QUESTIONS TO BE ANSWERED ARE: 1. WERE THE SAMPLES FOR IA AND ACCEPTANCE AND/OR VERIFICATION REPRESENTATIVE?; 2. WERE PROPER SAMPLING TECHNIQUES/PROCEDURES USED TO OBTAIN SAMPLES?; 3. WAS THE CORRECT TESTING EQUIPMENT PROPERLY CALIBRATED AND IN GOOD WORKING ORDER FOR PERFORMING THE TEST?; 4. WERE TESTS PERFORMED IN ACCORDANCE WITH THE METHODS SET FORTH IN THE STANDARD SPECIFICATIONS?; 5. WAS THE LACK OF CORRELATION DUE TO MATERIAL VARIABILITY?

IF THE RESIDENT/STAFF ENGINEER'S TEST RESULTS DO NOT CORRELATE, INDEPENDENT REVIEWS WILL BE CONDUCTED BY THE RE ON HIS EQUIPMENT AND TESTING PROCEDURES AND BY THE MATERIALS AE ON THE DMS'S EQUIPMENT AND TESTING PROCEDURES. ONCE REVIEWS ARE COMPLETED, THE RE, THE MATERIALS DIVISION'S AE, AND THE DMS WILL DISCUSS THEIR FINDINGS, WRITE A BRIEF SUMMARY OF THE FINDINGS AND INITIATE CORRECTIVE ACTION IF NECESSARY. EACH INDIVIDUAL WILL SIGN THE SUMMARY OF REPORTED FINDINGS AND FORWARD IT TO THE *CONSTRUCTION* ENGINEER.

IF THE CONTRACTOR'S TEST RESULTS DO NOT CORRELATE, THE CONTRACTOR MUST CONDUCT A REVIEW (ASSISTED BY THE RESIDENT/STAFF ENGINEER) ON HIS EQUIPMENT AND TESTING PROCEDURES AS OUTLINED ABOVE. THE CONTRACTOR MUST PARTICIPATE IN THE DISCUSSION OF THE FINDING AND SIGN THE SUMMARY REPORT.

IF THE REQUIRED NUMBER OF IA SAMPLES ARE NOT OBTAINED, A MEMORANDUM OUTLINING THE REASON(S) MUST BE SENT (BY THE RESIDENT/STAFF ENGINEER) TO THE *CONSTRUCTION* ENGINEER. MISSED OR NON-CORRELATING IA SAMPLES MUST BE LISTED AS EXCEPTIONS ON THE MATERIALS CERTIFICATE.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS

Standard Specifications for HIGHWAY CONSTRUCTION, Edition 2014

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
ACRYL-BUTA-STYR(ABS) PIPE ASTM D2680	611			QPL[1]
ACTUATED CONTROLLER	701		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE.	ENGINEER APPROVAL - TRAFFIC
ADMIXTURES, PCC (INCLUDES RETARDERS, AIR ENTRAINING AGENTS, ACCELERATORS, AND SUPERPLASTICIZERS)	206, 309, 500, 600, 700, 800			QPL[1] AND /OR APPROVED BY ENGINEER. ALL ADMIXTURES USED IN A MIX SHALL BE COMPATIBLE WITH EACH OTHER AS ADVISED BY THE MANUFACTURER.
AGGREGATE: PC CONCRETE FOR STRUCTURES (INCLUDES CLASSES A, B, S, S[AE], SEAL AND REPAIR AND OVERLAY CONCRETE FOR BRIDGE DECK)	504, 505, 605, 609, 610, 611, 613, 614, 615, 617, 619, 631, 632, 633, 634, 640, 641, 701, 702, 711, 712, 714, 715, 724, 730, 731, 732, 734, 802, 805, 816, 822	CONTR. QUALITY CONTROL TESTING OF GRADATION, DECANTATION. & FINENESS MODULUS. (FM): ONE (FINE AND COARSE) PER SUBLOT OF 500 CU YD [400 CU M] OF CONCRETE MINIMUM 1 PER BRIDGE STRUCTURE		MATERIALS MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. SEE QPL[1] OR CONTACT MATERIALS DIVISION FOR SOURCE SAMPLING AND APPROVAL. IF DETERMINED NECESSARY BY VISUAL OBSERVATION, THE AMOUNT OF DELETERIOUS SUBSTANCES WILL BE TESTED. ALL FINE AGGREGATE SHALL BE FREE OF INJURIOUS AMOUNT OF ORGANIC IMPURITIES. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL QUALITY CONTROL FIELD TEST REPORTS.
AGGREGATE: PC CONCRETE PAVEMENT (INCLUDES HIGH EARLY STRENGTH CONCRETE PAVEMENT, CONTINUOUSLY REINFORCED CONCRETE PAVEMENT, HIGH EARLY STRENGTH CONTINUOUSLY REINFORCED CONCRETE PAVEMENT, PCC BASE, PCCP PATCHING AND PCC SHOULDER [ADD-ON])	309, 501, 503, 504, 507, 511	CONTR. QUALITY CONTROL TESTING OF GRADATION, DECANTATION & FINENESS MODULUS (FM): ONE (FINE AND COARSE) PER SUBLOT OF 1000 CU YD [750 CU M] OF CONCRETE ARDOT PERFORMS VERIFICATION TESTING FOR GRADATION: THE RATE OF VERIFICATION TESTING WILL BE 1 PER LOT OF 4000 CU YD OF MIX		MATERIALS MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. SEE QPL[1] OR CONTACT MATERIALS DIVISION FOR SOURCE SAMPLING AND APPROVAL. IF DETERMINED NECESSARY BY VISUAL OBSERVATION, THE AMOUNT OF DELETERIOUS SUBSTANCES WILL BE TESTED. ALL FINE AGGREGATE SHALL BE FREE OF INJURIOUS AMOUNT OF ORGANIC IMPURITIES. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL QUALITY CONTROL AND VERIFICATION FIELD TEST REPORTS.
AGGREGATE BASE COURSE (INCLUDES REMOVING AND REPLACING BASE COURSE AND ASPHALT SURFACING)	209, 303, 306, 310, 405, 504, 731, 816	(1) 75 LB [35 KG] FOR GRADATION, PI, DUST RATIO, % CRUSHED PARTICLES & % DELETERIOUS (2) 200 LB [95 KG] FOR NUMBER (1) ABOVE AND MAXIMUM DENSITY TEST CONTRACTOR ACCEPTANCE TESTING OF GRADATION, PI, DUST RATIO (CALCULATED), THICKNESS (IF SPECIFIED), DENSITY AND MOISTURE CONTENT: ONE PER 1000 TONS [1000 T] R.E. PERFORMS VERIFICATION TESTING OF GRADATION, , DUST RATIO (CALCULATED), THICKNESS (IF SPECIFIED), DENSITY AND MOISTURE CONTENT: ONE PER 4000 TONS [4000 T]		MATERIAL MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. QPL[1] IF DETERMINED NECESSARY BY VISUAL OBSERVATION, THE % DELETERIOUS OR % CRUSHED WILL BE TESTED. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. IF CRUSHED STONE, THE DEPARTMENT WILL FURNISH PI INFORMATION. RE PERFORMS MOISTURE CHECK PER SEC. 109.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
AGGREGATE IN SLURRY SEAL	418			SEE SLURRY SEAL.
ALUMINUM PRODUCTS	806		MFR. CERTIFIED TEST	MATERIALS DIVISION. APPROVES REPORT.
ALUMINUM COATED STEEL PRODUCTS	806		MFR. CERTIFIED TEST	MATERIALS DIVISION APPROVES REPORT.
ALUMINUM IMPREGNATED ASPHALT PAINT	724			APPROVED BY ENGINEER. (CONTACT MATERIALS DIVISION IF NEEDED)
ANCHOR BOLTS, BRIDGE	807		MFR. CERTIFIED TEST	BRIDGE DIVISION APPROVES REPORT.
ANCHOR BOLTS, BRIDGE EPOXY AND NON-SHRINK GROUT	807			QPL[1]
ANCHOR BOLTS, MISCELLANEOUS	609, 610, 613,631, 724, 730		MFR. CERTIFIED TEST	BRIDGE DIVISION APPROVES REPORT. SAMPLED AT THE REQUEST OF MAT'LS. DIV.
ANTI-STRIP ADDITIVE, ASPHALT MIX	400, 504, 615, 731			QPL[1] ENTER BRAND NAME ON REPORT OF INSPECTION AT ASPHALT PLANT (M389) NOTE: ACCEPTED WITH MIX DESIGN
ASPHALT, CUT-BACK	307, 308, 401,402, 403, 411, 414, 415, 731	UNCERTIFIED SUPPLIER: ONE SAMPLE PER SHIPMENT (1 QT.)		QPL[1] (INFORMATION DOCUMENTED ON FORM 19-208 AND 19-209) (IN SITEMANAGER REPORT IN DWR). NOTE: UNCERTIFIED SHIPMENT MUST BE TESTED PRIOR TO USING RANDOM SAMPLING BY REQUEST FROM MATERIALS DIVISION
ASPHALT, EMULSIFIED	307, 308, 401, 402, 403	UNCERTIFIED SUPPLIER: ONE SAMPLE PER SHIPMENT (1 GALLON)		QPL[1] (INFORMATION DOCUMENTED ON FORM 19-208 AND 19-209))(IN SITEMANAGER REPORT IN DWR). NOTE: UNCERTIFIED SHIPMENT MUST BE TESTED PRIOR TO USING RANDOM SAMPLING BY REQUEST FROM MATERIALS DIVISION.
ASPHALT, FIBER MODIFIED, WATERPROOFING	813, 815			QPL[1] RANDOM SAMPLING BY REQUEST FROM MATERIALS DIVISION.
ASPHALT, MOPPING, WATERPROOFING	813, 815			QPL[1] RANDOM SAMPLING BY REQUEST FROM MATERIALS DIVISION.
ASPHALT, TACK	401	UNCERTIFIED SUPPLIER: ONE SAMPLE PER SHIPMENT (1 QT. FOR CUTBACK; 1 GAL. FOR EMULSIONS)		QPL[1] (INFORMATION DOCUMENTED ON FORM 19-208 AND 19-209))(IN SITEMANAGER REPORT IN DWR). NOTE: UNCERTIFIED SHIPMENT MUST BE TESTED PRIOR TO USING RANDOM SAMPLING BY REQUEST FROM MATERIALS DIVISION.
ASPHALT BINDER	400, 504, 615, 731, 732			QPL1 NOTE: ACCEPTED WITH MIX DESIGN RANDOM SAMPLING BY REQUEST FROM MATERIALS DIVISION.
ASPHALT CONCRETE COLD MIX	411, 414	CONTRACTOR ACCEPTANCE TESTING OF GRADATION AND ASPHALT CONTENT: ONE PER LOT OF 750 TONS [750 T] THE DEPARTMENT WILL PERFORM VERIFICATION TESTING AS NEEDED.		CONTRACTOR DEVELOPED MIX DESIGN SUBMITTED TO DMS FOR REVIEW AND SUBMITTED TO MATERIALS ENGINEER. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. MIX WILL BE FIELD VERIFIED BY CONTRACTOR AT START OF PRODUCTION OR AFTER AN INTERRUPTION OF MORE THAN 120 CALENDAR DAYS.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	**2014 STD SPEC. SECTION**	**MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION**	**CERTIFICATION REQUIREMENTS**	**REMARKS**
ASPHALT CONCRETE HOT MIX	400, 414, 415, 504, 615, 731	CONTRACTOR QUALITY CONTROL TESTING: WATER SENSITIVITY: ONCE DURING FIRST THREE DAYS OF PRODUCTION OR AFTER AN INTERRUPTION OF MORE THAN 120 CALENDAR DAYS AGGREGATE GRADATION: ONE PER 750 TONS [750 T] CONTRACTOR ACCEPTANCE TESTING: ASPHALT BINDER CONTENT, AIR VOIDS, VMA AND DENSITY ONE PER SUBLOT OF 750 TONS [750 T] ARDOT ACCEPTANCE / VERIFICATION TESTING: ASPHALT BINDER CONTENT, AIR VOIDS, VMA, AND DENSITY; ONE PER LOT OF 3000 TONS [3000 T]		CONTRACTOR MIX DESIGNS SUBMITTED TO MATERIALS DIVISION FOR REVIEW AT LEAST FIVE (5) WORKING DAYS PRIOR TO USE. IF ASPHALT BINDER OR AGGREGATE SOURCES NOT ON QPL, ALLOW AT LEAST 10 WORKING DAYS FOR SAMPLING AND TESTING BEFORE REVIEW. MIX WILL BE FIELD VERIFIED BY CONTRACTOR AT START OF PRODUCTION OR AFTER AN INTERRUPTION OF MORE THAN 120 CALENDAR DAYS. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. ARDOT WILL PERFORM ALL TESTS FOR ACCEPT. AND ADJUSTMENT ON MATERIAL USED TO REPLACE UNACCEPTABLE MATERIAL REMOVED BY THE CONTRACTOR.
ASPHALT IN SLURRY SEAL	418			SEE SLURRY SEAL & ASPHALT, EMULSIFIED
ASPHALT PRIMER WATERPROOFING ASTM D 41	813, 815			QPL [1]
ASPHALT RELEASE AGENT	410			QPL [1]
ASPHALT SURFACE TREATMENT	402			SEE REQUIREMENTS FOR ASPHALT MATERIAL USED AND FOR SEE MINERAL AGGREGATE IN ASPHALT SURFACE TREATMENT.
BACKFILL MATERIAL	606, 607, 608, 609, 610, 724 801	DENSITY & MOISTURE FOR ACCEPTANCE: (1) PIPE CULVERTS - ONE PER 125 LINEAL FEET OF TYPE PIPE CULVERT SPECIFIED (2) BOX CULVERTS - TWO PER STRUCTURE (3) BRIDGE ENDS - ONE PER LAYER (4) MISCELANEOUS STRUCTURES (DROP INLET, JUNCTION BOXES, ETC..): ONE PER INDIVIDUAL STRUCTURE ALL ACCEPTANCE TESTING BY ARDOT		R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS.
BAR MAT REINFORCEMENT				SEE REINFORCING STEEL WIRE AND WIRE FABRIC.
BAR SUPPORTS (HI-CHAIRS, SLAB & BEAM BOLSTERS)	502, 507,606, 609, 610, 613, 631, 640, 701 804		RE VERIFY DIPPED PLASTIC PROTECTION OR PREMOLDED PLASTIC TIPS FOR METAL SUPPORTS RE CERT [2]	COATING THICKNESS CHECKED BY R.E.
BLOTTER COURSE MATERIAL	401		RE CERT [2]	
BOLTS, NUTS, WASHERS	608, 613, 617	SAMPLED BY OR AT THE REQUEST OF MATERIALS DIVISION	MFR. CERTIFIED TEST.	APPROVED BY BRIDGE DIVISION.
BOLTS, NUTS, WASHERS, (HIGH STRENGTH)	617, 631, 807	ONE PER SIZE PER LENGTH PER HEAT PER MANUFACTURER PER 2000 ITEMS	MFR. CERTIFIED TEST	CHECK TO SEE IF PRE-TESTED BY MATERIALS DIV. R.E. VERIFIES MARKINGS. (SEE ADD'L REQ. FOR HIGH STRENGTH GUARDRAIL BOLTS, NUTS & WASHERS) APPROVED BY BRIDGE DIVISION.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
BORROW (ALSO, SPECIAL PROVISION GRANULAR BORROW)	210			SEE COMPACTED EMBANKMENT.
BRIDGE BEARING PADS, PREFORMED FABRIC	802, 807		MFR. CERTIFIED TEST	APPROVED BY BRIDGE DIVISION ON REQUEST.
BRIDGE BEARING PLATES, BRONZE (INCLUDING SELF-LUBRICATING)	802,807		MFR. CERTIFIED TEST	APPROVED BY BRIDGE DIVISION ON REQUEST.
BRIDGE BEARING PLATES, COPPER-ALLOY	802, 807		MFR. CERTIFIED TEST	APPROVED BY BRIDGE DIVISION ON REQUEST.
BRIDGE BEARINGS, ELASTOMERIC PADS	802, 807		MFR. CERTIFIED TEST	APPROVED BY BRIDGE DIVISION ON REQUEST.
BRIDGE END TERMINAL	734	R.E. PERFORMS CONCRETE ACCEPTANCE SAMPLING AND TESTING FOR CONCRETE COMPONENT SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES; PORTLAND CEMENT CONCRETE (PCC)	MFR./SUPPLIER CERTIFICATION TO NCHRP-350 or MASH TL-3	R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS. MATERIALS AND MANUFACTURER'S DETAILS APPROVED BY ENGINEER
BRIDGE NAME PLATE	812			QPL[1]
BRIDGE RAILING	806		MFR. CERTIFIED TEST	APPROVED BY BRIDGE DIVISION.
BURLAP-POLYETHYLENE SHEETING				SEE POLYETHYLENE – BURLAP MAT PCC CURING.
CEMENT				SEE PORTLAND CEMENT
CEMENT STABILIZED CRUSHED STONE BASE COURSE	308, 504	AT LEAST 30 DAYS PRIOR TO BEGINNING OF TREATMENT RE SUBMIT SAMPLE SIZE OF 500 LB [230 KG] OF AGGREGATE AND 20 LB [10 KG] OF CEMENT FROM APPROVED SOURCE CONTRACTOR ACCEPTANCE TESTING OF GRADATION, L.L. & P.I., DUST RATIO, THICKNESS (CORES) AND COMPRESSIVE STRENGTH (CORES): ONE PER SUBLOT OF 1000 CU YD [750 CU M] ARDOT ACCEPTANCE / VERIFICATION TESTING OF GRADATION, L.L. & P.I., DUST RATIO, THICKNESS (CORES) AND: COMPRESSIVE STRENGTH (CORES): ONE PER LOT OF 4000 CU YD [3000 CU M]		MATERIALS DIVISION PREPARES THE DESIGN AND DETERMINES MAXIMUM DENSITY; IF DETERMINED NECESSARY BY VISUAL OBSERVATION, THE % DELETERIOUS AND % CRUSHED WILL BE TESTED. NOTE: SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE OF SAMPLING AND APPROVAL. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
CEMENT TREATED BASE COURSE	302, 307, 504	RE AT LEAST 30 DAYS PRIOR TO BEGINNING OF WORK, SUBMIT THE FOLLOWING SAMPLE SIZE: IF PLUS 4.75 MM [NO. 4] MATERIAL 10% MAX. 250 LB. [115 KG] IF PLUS 4.75 MM [NO. 4] MATERIAL OVER 10% 500 LB [230 KG] 20 LB [10 KG] OF CEMENT FROM APPROVED SOURCE. CONTRACTOR ACCEPTANCE TESTING THICKNESS, GRADATION, PLASTICITY INDEX, DENSITY AND MOISTURE CONTENT: ONE PER 12,000 SQ YD [10,000 SQ M] R.E. PERFORMS VERIFICATION TESTING. (1 PER 48,000 SQ YD [40,000 SQ M].		MATERIALS DIVISION PREPARES THE DESIGN AND DETERMINES MAXIMUM LAB DENSITY. NOTE: SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
CHAIRS, REINFORCEMENT PRESET	503		R.E. CERT.[2]	
CHANNEL POST SIGN SUPPORT	729		MFR. CERTIFIED TEST	APPROVED BY MATERIALS DIVISION.
COMMON EXCAVATION – STRUCTURES	801			SEE BACKFILL MATERIAL
COMPACTED EMBANKMENT (ALSO BORROW, SHAPING ROADWAY SECTION, SPECIAL PROVISION GRANULAR BORROW AND [WHEN NOT WASTED], EXCAVATION [COMMON, ROCK & UNCLASSIFIED])	210, 213,	CONTRACTOR QUALITY CONTROL MAXIMUM LABORATORY DENSITY: ONE FOR EACH SOIL TYPE WITH A MINIMUM OF ONE PER JOB. CONTRACTOR TO SPLIT MAXIMUM DENSITY SAMPLE WITH RE FOR VERIFICTION (RE TO RUN AT LEAST ONE SPLIT SAMPLE FOR VERIFICATION PER PROJECT. REMAINING SPLIT SAMPLES TO BE RUN ON AN AS NEEDED BASIS) CONTRACTOR ACCEPTANCE TESTING OF DENSITY & % MOISTURE: ONE FOR EACH 3000 CU.YD. [2500 CU M] MINIMUM OF ONE PER LAYER DEPARTMENT VERIFICATION – ONE FOR EACH 12,000 CU YD [10,000 CU M]		GRANULAR BORROW - PLASTICITY INDEX AND GRADATION TESTING REQUIRED. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
CONCRETE BARRIER WALL	631			SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES; REINFORCING STEEL (BARS) R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. QPL[1] SEE JOINT FILLER TYPE 2 FOR JOINT FILLER MATERIAL.
CONCRETE DITCH PAVING	605	R.E. PERFORMS CONCRETE ACCEPTANCE SAMPLING AND TESTING		SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES - MISCELLANEOUS R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS. QPL[1] SEE JOINT FILLER, PREF. ASPH., AASHTO M 213 OR SEMI-RIGID CLOSED-CELL POLYPROPYLENE FOAM ASTM D8139.
CONCRETE ISLAND	632	R.E. PERFORMS CONCRETE ACCEPTANCE SAMPLING AND TESTING		SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES - MISCELLANEOUS R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS. QPL[1] SEE JOINT FILLER, PREF. ASPH., AASHTO M 213 OR SEMI-RIGID CLOSED-CELL POLYPROPYLENE FOAM ASTM D8139.
CONCRETE PULL BOXES	711		PERFORMANCE TEST UNDER 717 INCLUDED.	QPL[1] SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES. SEE REINFORCING STEEL (BARS)
CONCRETE SPILLWAY	614	R.E. PERFORMS CONCRETE ACCEPTANCE SAMPLING AND TESTING		SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES- MISCELLANEOUS R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS. QPL[1] IF PRECAST SEE PRECAST CONCRETE PRODUCTS, MISC.
CONCRETE STEPS INCLUDES CONCRETE WALKS	633	R.E. PERFORMS CONCRETE ACCEPTANCE SAMPLING AND TESTING		SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES- MISCELLANEOUS AND ALSO, HANDRAILING SEE STEEL PRODUCTS FOR HANDRAILING. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
COPOLYMER/SYNTHETIC BLANKET ASTM C 171	309, 500, 605, 606, 609, 610, 613-615, 617,631-634, 732, 802, 822		R.E. CERT.[3]	
COPPER WATER STOPS & FLASHING	802		MFR. CERTIFIED TEST	NOTE: MUST CONFORM TO ASTM B 152 / B152m. APPROVED BY MAT'LS. DIV.
CORRUGATED METAL PIPE, COATED & UNCOATED (INCLUDE FLARED END SECTIONS)	504, 606, 609, 611, 621, 805	NOTE: ASPHALT COATED PIPE: FIELD INSPECT COATING - 0.05 IN [1.3 MM] MIN. AT CORRUGATION CRESTS (INSIDE & OUTSIDE). SEE SAMPLING METHOD ARDOT 65.	R.E. RETAINS CERTS.OF COMPLIANCE R.E. DOCUMENTS ASPHALT COATING THICKNESS [2]	QPL[1]
CORRUGATED POLYETHYLENE TUBING, UNDERDRAIN	611			QPL[1]
COUPLING BANDS	504, 606, 609, 611,			SAME REQS. AS CORRUG. METAL PIPE.
CRASH CUSHIONS	732	R.E. PERFORMS CONCRETE ACCEPTANCE SAMPLING AND TESTING	MFR./SUPPLIER CERTIFY THAT MEETS MASH FOR TL-3 CRASH CUSHION.	RIGID PAD: SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES-MISCELLANEOUS
CURBING	634			SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. SEE JOINT SEALER, CURB & GUTTER
DELINEATOR	728			SEE SIGNS, STANDARD
DELINEATOR, STEEL POST	618, 728		MFR. CERTIFIED TEST	APPROVED BY MAT'LS. DIV.
DITCH CHECKS STRAW, SANDBAG, ROCK	621		R.E. CERT. [3]	ROCK-SEE STONE BACKFILL
DOWEL BARS	501, 503, 507, 821		MFR. CERTIFIED MILLTEST CONTRACTOR CERT. ON EPOXY COATING IF REQUIRED.	APPROVED BY BRIDGE DIVISION. RESIN ANCHORING SYSTEM FOR SECURING BARS LISTED IN QPL
ELASTOMERIC BEARINGS	808		MFR. CERTIFIED TEST	APPROVED BY BRIDGE DIVISION. QPL[1]
ELECTRICAL CONDUCTOR	700		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE	ENGINEER APPROVAL – TRAFFIC.
ELECTRIC SERVICE POLES	716			SEE TREATED WOOD POLES
EPOXY COATED REINFORCING STEEL	501, 502, 804		CERT. OF DELIVERY.	QPL[1] NOTE: IF REINFORCING STEEL SUPPLIER NOT ON QPL CONTACT BRIDGE DIVISION. FOR ACCEPTANCE REQUIREMENTS EPOXY COATERS LISTED IN QPL[1]
EROSION MATTING, ARDOT CLASS 1, 2 & 3	621, 626			QPL[1]
FABRIC, ASPHALT TREATED ASTM D173	815, 818			QPL[1]
FELT MEMBRANE WATERPROOFING (ASTM D 226 , TYPE II)	815			QPL[1]

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
FELT, ROOFING FOR BRIDGE JTS. ASTM D 6830, CLASS S, TYPE IV	802			QPL[1] NOTE: PLANS MAY REFER TO MATERIAL AS 2.2 KG/SQ. M (45#) ROOFING FELT
FENCE, CHAIN LINK AND TYPE A & B	619			QPL[1] NOTE: SEE FENCE POST IF WOOD
FENCE, TYPE C & D	619		R.E. CERT [2]	
FENCE POST, WOODEN, TREATED	619	ONE SAMPLE OF 20 WOOD CORES PER TREATMENT CHARGE, MIN. 2-IN CORE LENGTH. NONE IF LESS THAN 50 POSTS		APPROVED BY MAT'LS. DIV. CHECK WITH MAT'LS. DIV. FOR PRETESTED POSTS. NO TEST REQ'D. FOR TYPE C & D. DELIVERY TICKETS WITH ARDOT SEALS.
FERTILIZER	620, 621, 622, 623, 624		R.E. CERT. [5]	
FILTER BLANKET: (1) STONE (2) FABRIC	303, 816	(1) ARDOT ACCEPT. TESTING FOR GRAD: ONE PER 500 TONS [450 T], 150 LB [70 KG] MINIMUM OF ONE PER PROJECT.		(1) NOTE: AGGR. MATERIAL MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. (1) R.E. APPROVES FIELD TEST REPORTS (2) QPL[1]
FILTER FABRIC WITH UNDERDRAIN, RIPRAP, & GABIONS	611, 625, 629, 816			QPL[1]
FLARED END SECTION	606			SEE CORRUGATED METAL PIPE/ PRECAST CONCRETE PRODUCTS MISC.
FLASHING BEACON CONTROLLER	703		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE	ENGINEER APPROVAL – TRAFFIC.
FLOOD GATES, AUTOMATIC	616		MFR. CERTIFIED TEST.	APPROVED BY BRIDGE DIVISION.
FLOWABLE SELECT MATERIAL	206	RE ACCEPTANCE: UNIT WEIGHT AND FLOW ONE PER 50 CU. YD. [38 CU M] WITH MINIMUM OF ONE PER PROJECT.		CONTRACTOR MIX DESIGN APPROVED BY R.E. MATERIALS LISTED ON QPL R.E. APPROVES ACCEPTANCE FIELD TEST REPORTS.
FLY ASH	206, 307, 308, 309, 501, 503, 802	UNCERTIFIED SUPPLIER:ONE SAMPLE PER SHIPMENT ONE - 10 LB [4.5 KG] BAG WITH LINER	R.E. RETAINS MFR. CERT.DELIVERY TICKETS	QPL[1] RANDOM SAMPLING BY REQUEST OF MAT'LS. DIV. SEE QPL FOR INFORMATION REQUIREMENTS.
GABIONS	629	ONE BASKET AND 6 FT. [2 M] OF LACING WIRE PER PROJECT NOTE: IF LACING WIRE NOT USED, CONTACT MATERIALS DIVISION.		APPROVED BY MATERIALS DIVISION.
GABIONS, STONE FOR FILLING	629		R.E. CERT. [2]	NOTE: MAT'L MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. SEE CURRENT QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. QPL[1]
GALVANIZING, FIELD REPAIRING	617, 633, 807			QPL[1] NOTE: DRY FILM THICKNESS REQUIRED WILL DEPEND ON ORIGINAL THICKNESS SPEC.
GATES, ALUMINUM/STEEL	619		R.E. CERT. [2]	
GEOTEXTILE FABRIC	611, 621, 625, 629, 816			QPL[1] (SEE QPL FOR REQUIREMENTS)

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
GLASS BEADS, TRAFFIC MARKINGS	604, 718, 719		CONTRACTOR CERTIFICATION OF CONSTRUCTION AND INTERIM PAVEMENT MARKINGS MFR. CERT. ON EACH BATCH.	QPL[1] (PERMANENT BEADS)
GRANULAR FILTER MATERIAL	611	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING FOR MINERAL AGGREGATE (SECTION 403): GRADATION, DECANTATION, ONE PER 500 TONS (400 CU.YD.) [450 T (300 CU M)] FOR AGGREGATE (COARSE) FOR CONCRETE (SECTION 802): GRAD., DECANT. & FINENESS MOD. (FM) ONE PER 500 CU YD [400 CU M]		MATERIALS MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. IF NECESSARY, BY VISUAL OBSERVATION, THE % DELETERIOUS AND/OR % CRUSHED WILL BE TESTED. R.E. APPROVES ACCEPTANCE FIELD TEST REPORTS.
GROUND ROD	701, 712, 714, 715		R.E. CERT. [2]	
GUARD CABLE	618			QPL[1]
GUARD CABLE, ACCESSORIES	618	ONE OF EACH ACCESSORY PER PROJECT		APPROVED BY BRIDGE DIVISION. ALSO SEE REQS FOR DELINEATORS
GUARD CABLE, STEEL POST	618		MFR. CERTIFIED TEST.	APPROVED BY BRIDGE DIVISION
GUARD CABLE, WOODEN POST	618	ONE SAMPLE (20 CORES) (CORE LENGTH – SAWN 2.5IN.; ROUND 2.0IN.) PER 1,000 POSTS OR ONE PER TREATMENT CHARGE (TREATMENT BATCH)		APPROVED BY MATERIALS DIVISION.
GUARDRAIL	617, 639		MFR./SUPPLIER CERT. OF COMPLIANCE	QPL[1] NOTE: SEE QPL FOR GALV. COAT. REPAIR
GUARDRAIL, HIGH STRENGTH BOLTS, NUTS & WASHERS.	617, 631, 639, 802	ONE PER SIZE PER PROJECT (IF NOT PRETESTED)	MFR. CERTIFIED TEST	QPL[1] PRETESTED BOLTS, NUTS & WASHERS WILL BE CERTIFIED BY SUPPLIER BY REFERENCE TO MAT'LS. DIV. LAB TEST NUMBER. SAMPLES TESTED BY MATERIALS DIV. AND APPROVED BY BRIDGE DIVISION. R.E. VERIFIES MARKINGS AND RECORDS IN DWR.
GUARDRAIL, WOODEN POST	617, 639	ONE SAMPLE (20 CORES) PER 1,000 POSTS OR ONE PER TREATMENT CHARGE (TREATMENT BATCH)		APPROVED BY MATERIALS DIVISION.
GUARDRAIL, STEEL POST	617, 639		MFR./SUPPLIER CERT. OF COMPLIANCE RE RETAIN DELIVERY TICKETS	QPL[1]
GUARDRAIL, TERMINAL ANCHOR POST	617, 639	RE PERFORMS ACCEPTANCE SAMPLING AND TESTING OF CONCRETE	MFR./SUPPLIER CERT. R.E. RETAINS DELIVERY TICKETS.	QPL[1] SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES- MISCELLANEOUS
GUARDRAIL, TERMINAL (TYPE 2)	617, 639		MFR. CERTIFICATION THAT TERMINAL MEETS MASH FOR TL-3 TERMINAL	CONTRACTOR PROVIDES MANUFACTURER DETAILS AND INSTALLATION MANUALS
HAND RAILING	633		MFR. CERT. TEST	APPROVED BY BRIDGE DIVISION. WELDER CERTIFICATION REQUIRED.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
IMPACT ATTENUATION BARRIER	731	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING OF CONCRETE.	MFR./SUPPLIER CERT. THAT MEETS NCHRP-350 OR MASH FOR TL-3 CRASH CUSHIONS	FLEXIBLE PAD: SEE AGGREGATE BASE COURSE AND ASPHALT CONCRETE HOT MIX RIGID PAD: SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES-MISCELLANEOUS
IRON CASTINGS (AASHTO M105, CLASS 30)	609, 610, 807			QPL[1]
JOINT FILLER, PREF. ASPH, AASHTO M 213 OR SEMI-RIGID CLOSED-CELL POLYPROPYLENE FOAM ASTM D8139.	505, 605, 632, 633, 634			QPL[1]
JOINT FILLER TYPE 1, MC-250 OR SS-1 WITH SAWDUST	501, 503, 504, 509, 512	CUTBACK-1 QT. [ONE L] METAL CAN EMULSION - 1 GAL. [4 L.] PL. JUG		QPL[1] UNCERTIFIED SHIPMENT MUST BE TESTED PRIOR TO USING.
JOINT FILLER TYPE 2 AASHTO M 153, TYPE I (SPONGE RUBBER)	501, 504, 617, 631, 802			QPL[1]
JOINT FILLER BACKER ROD (ASTM D5249 TYPE 1, FOR TYPES 3, 4 & 5; (ASTM D5249 TYPE 2, FOR TYPES 3 & 4)	501, 503, 504, 509, 511, 634, 802			QPL[1]
JOINT SEALER, CURB AND GUTTER	634			QPL[1]
JOINT SEALER, TYPES 3 THROUGH 6 (TYPE 3 SILICONE [ASTM D5893] (PRIMERLESS), TYPE 4 SILICONE [ASTM D5893] [REQUIRES PRIMER], TYPE 6 HOT POUR [ASTM D6690 TYPE 1]	501, 503, 504, 509, 511, 634, 802			QPL[1]
LIME, AGRICULTURAL	620, 622	pH SOIL SAMPLE REQUIRED 5 LB. [2.3 KG] OF SOIL	R.E. CERT.[2]	MATERIALS DIVISION PROVIDES LIME REQUIREMENT
LIME, HYDRATED & QUICK (PEBBLE)	301, 418	ONE - 10 LB [4.5 KG] BAG WITH LINER	R.E. RETAINS MFR. CERT.DELIVERY TICKETS	QPL[1] CERTIFIED SUPPLIER: SAMPLE AS REQUESTED BY MAT'LS. DIV. UNCERTIFIED SUPPLIER: ONE SAMPLE PER SHIPMENT
LIME TREATED SUBGRADE	301	AT LEAST 30 DAYS PRIOR TO BEGINNING OF LIME TREATMENT, SUBMIT 50 LB [25 KG] OF EACH DIFFERENT SOIL & 10 LB [4.5 KG] OF LIME TO BE USED ON PROJECT. IF SOIL HAS 10% OR GREATER PASSING NO. 4 SIEVE SUBMIT 150 LB [70 KG] OF SOIL AND 30 LB [13.5KG] OF LIME. CONTRACTOR MAXIMUM LABORATORY DENSITY DETERMINATION: ONE FOR EACH SOIL TYPE WITH A MINIMUM OF ONE PER JOB. CONTRACTOR ACCEPTANCE TESTING OF DENSITY, MOISTURE CONTENT &THICKNESS: ONE FOR EACH 12,000 SQ.YD. [10,000 SQ. M] (THICKNESS – QUALITY CONTROL) R.E. VERIFICATION TESTING OF DENSITY, MOISTURE CONTENT & THICKNESS: ONE FOR EACH 48,000 SQ. YDS.[40,000 SQ. M]		MATERIALS DIVISION PREPARES THE DESIGN. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. FOR LIME SEE LIME, HYDRATED OR QUICK (PEBBLE).
LINSEED OIL AASHTO M 233 (ASTM D 260)	803			QPL[1]
LUMBER, TREATED	817	ONE SAMPLE OF 20 CORES (LENGTH UP TO 3IN.) PER 1,000 PIECES		APPROVED BY MATERIALS DIVISION. CHECK MAT'LS. DIV. FOR POSSIBLE PRETEST

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
MAILBOX (INCL. POST & HARDWARE)	637		R.E. CERT.[2]	QPL[1] (Alternate Supports)
MANHOLE STEPS	609, 610, 640			QPL[1]
MECHANICAL REBAR SPLICES	503, 804			QPL[1]
MECHANICALLY STABILIZED EARTH WALLS (MSE WALLS) (INCLUDES RETAINING WALLS AND MODULAR BLOCK WALLS)	SPECIAL PROVISION			QPL[1]
MEMBRANE CURING COMPOUND ASTM C 309, TYPE 1 (CLEAR), TYPE 1-D (CLEAR W/DYE) OR TYPE 2	309 500, 605, 606, 609, 610, 613-615, 617, 631-634, 802, 822			QPL[1]
MINERAL AGGR. IN ASPHALT SURF. TREATMENT CLASSES 1 THRU 5	402, 403, 611	SUBMIT TO MATERIALS DIVISION FOR TESTING: 50 LB [25 KG] IF LOOSE UNIT WEIGHT IS DESIRED. ARDOT ACCEPTANCE TESTING OF GRADATION, DECANTATION: ONE PER 500 TONS (400 CU.YD.) [450 T (310 CU M)]		MATERIAL MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. IF NECESSARY, BY VISUAL OBSERVATION, THE % DELETERIOUS AND/OR % CRUSHED WILL BE TESTED. R.E. DETERMINES RATE OF APPLICATION QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. R.E. APPROVES FIELD TEST REPORTS
MINERAL FILLER AASHTO M 17	406, 405, 407,409, 411, 417,418			SOURCES ACCEPTED WITH MIX DESIGN
MULCH CONTROL NETTING	621		R.E . CERT.[3]	NOTE: R.E. VERIFIES WEIGHT AND SIZE
MULCH COVER	620, 621, 622		R.E . CERT.[3]	SEE TACKIFIER IF APPLICABLE FOR WATER REQUIREMENTS SEE WATER.
NEOPRENE PADS	807			SEE BRIDGE BEARINGS, ELASTOMERIC PADS
NEOPRENE TROUGH	807		MFR. CERT. TESTS	APPROVED BY MATERIALS DIVISION.
OPEN GRADED ASPHALT BASE COURSE	417	SUBMIT 50 LB [25 KG] OF EACH AGGREGATE TO BE USED IN THE BLEND ALONG WITH AVERAGE STOCKPILE GRADATIONS. IF ONLY ONE MATERIAL TO BE USED, SUBMIT 75 LB [40 KG]. CONTRACTOR ACCEPTANCE TESTING OF ASPHALT BINDER CONTENT AND GRADATION: ONE PER SUBLOT OF 750 TONS [750 T] ARDOT ACCEPTANCE TESTING, OF ASPHALT BINDER CONTENT AND GRADATION: ONE PER LOT OF 3000 TONS [3000 T] MINIMUM OF ONE PER JOB,		MATERIALS DIVISION PREPARES THE MIX DESIGN. AT LEAST 10 WORKING DAYS PRIOR TO THE BEGINNING OF FIELD PRODUCTION, MIX WILL BE FIELD VERIFIED BY CONTRACTOR AT START OF PRODUCTION OR AFTER AN INTERRUPTION OF MORE THAN 120 CALENDAR DAYS. AGGR MUST HAVE A CURRENT ABRASION AND SOUNDNESS SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. (NO DENSITY REQ.) MATERIAL CONSOLIDATED TO RE's SATISFACTION.) ARDOT WILL PERFORM ALL TESTS FOR ACCEPTANCE AND ADJUSTMENT ON MATERIAL USED TO REPLACE UNACCEPTABLE MATERIAL REMOVED BY THE CONTRACTOR.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
OPEN GRADED PORTLAND CEMENT CONCRETE BASE	310	CONTRACTOR ACCEPTANCE TESTING OF GRADATION: ONE PER LOT OF 2500 SQ. YDS. (2000 SQ.M.) ARDOT VERIFICATION TESTING OF GRADATION: ONE PER 10,000 SQ. YDS. (8,000 SQ. M.)		CONTRACTOR PREPARES MIX DESIGN RE APPROVES MIX DESIGN (NO DENSITY REQ. MATERIAL CONSOLIDATED TO RE's SATISFACTION.) R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
PAINT, MISCELLANEOUS (ALUMINUM EPOXY PAINT SYSTEM)	609, 638, 712, 714, 715, 805, 811			R.E. CHECKS DRY FILM THICKNESS (MINIMUM OF 0.125 mm [5 MILS]) QPL[1]
PAINT, STEEL STRUCTURES PRIMER - TIE COAT – URETHANE	807, 820			QPL[1] (SAME MANUFACTURER FOR ALL COATINGS IN SYSTEM)
PAINT, REFLECTORIZED PAVEMENT MARKING	604,718		CONTRACTOR CERT OF CONSTRUCTION AND INTERIM PAVEMENT MARKINGS. MFR. CERT. EACH LOT FOR PAINT. MFR. CERT. BEADS	QPL[1] (CHECK QPL FOR APPROVED BATCH) BEADS ON QPL ALSO CERT. ON BEADS NOT REQ. IF USING FUSED PREFORMED MARKINGS.
PAPER, INSULATING, WATERPROOFING	815		R.E. CERT.[2]	
PAVEMENT REPAIR OVER CULVERTS	615	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING @ FREQUENCY OF ACHM OR PCCC FOR STRUCTURES.		IF ASPHALT, SEE ASPHALT CONCRETE HOT MIX IF CONCRETE, SEE PORTLAND CEMENT CONCRETE- MISCELLANEOUS FOR STRUCTURES AND REINFORCING STEEL WIRE AND WIRE FABRIC R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS.
PEDESTRIAN SIGNAL HEADS	707		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE	SEE SIGNS (STANDARD) FOR ACCEPTANCE OF SUBSIDIARY SIGNS ENGINEER APPROVAL – TRAFFIC
PERMANENT PAVEMENT MARKING TAPE	604, 719, 720		CONTRACTOR CERT FOR CONSTRUCTION AND INTERIM PAVEMENT MARKINGS	QPL[1]
PERMANENT STEEL DECK FORMS	802		MFR. CERT. TESTS WELDER CERT. REQUIRED.	APPROVED BY BRIDGE DIVISION SEE WELDING MATERIALS
PILING, PRECAST CONCRETE	805			SEE PRECAST AND PRESTRESSED CONC. PRODUCTS, STRUCTURAL
PILING & ACCESSORIES, STEEL	805, 811		MFR. CERT. TEST WELDER CERT. REQUIRED	QPL[1] (NOT NOTED IN SITEMANAGER) APPROVED BY BRIDGE DIVISION SEE WELDING MATERIALS FOR CONCRETE IN STEEL SHELL PILES SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES. FOR PAINTING SEE PAINT MISCELLANEOUS.
PILING, “H”, STEEL POINTS	805		WELDER CERT. REQUIRED.	QPL[1] SEE WELDING MATERIALS
PILING, “SHELL”, STEEL TIPS	805, 811		MFR. CERT. TEST WELDER CERT. REQUIRED.	QPL[1] (NOT NOTED IN SITEMANAGER) APPROVED BY BRIDGE DIVISION SEE WELDING MATERIALS
PILING, TREATED TIMBER	818	ONE SAMPLE OF 30 CORES PER 1000 PILES OR ONE PER TREATMENT CHARGE (TREATMENT BATCH)		APPROVED BY MATERIALS DIVISION. CHECK MAT'LS. DIV. FOR PRETESTED PILING.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
PIPE JOINT SEAL GASKET	606, 607, 609, 610			QPL[1]
PIPE UNDERDRAIN	611	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING FOR AGGREGATES.		QPL[1](FILTER FABRIC & PIPE) SEE MINERAL AGGREGATE OR AGGREGATE FOR PCC - STRUCTURES.
PITCH, (ASTM D450-96)	817, 818		MFR. CERTIFIED TESTS	APPROVED BY MATERIALS DIVISION
PLASTIC PIPE	606, 621		MFR. CERT. OF DELIVERY USED PIPE FOR SLOPE DRAINS CERTIFIED BY RE [2]	QPL[1] NOTE: AASHTO M 294 PIPE MUST BE TYPE 'S' WHICH HAS A SMOOTH INNER LINING AND CORRUG. (ANNULAR) OUTER SURFACE. AASHTO M 294 OR M 304 SHOULD BE PRINTED ON PIPE. (TYPE 'C' CAN BE USED FOR SLOPE DRAINS - SECT. 621)
POLYETHYLENE SELF ADHERING WATERPROOF. ALSO SEE WATERPROOFING	815			QPL[1]
POLYETHYLENE SHEETING	309, 500, 605, 606, 609, 610, 613-615, 617, 631-634, 732, 802, 822		R.E. CERT.[3]	MINIMUM THICKNESS OF 0.10 mm (4 MILS)
POLYETHYLENE-BURLAP MAT PCC CURING ASTM C171	309, 500, 605, 606, 609, 610, 613-615, 617, 631-634, 732, 802, 822		R.E. CERT.[3]	
POLYURETHANE, COLD APPLIED WATERPROOFING ALSO SEE WATERPROOFING	815			QPL[1]
PORTLAND CEMENT CONCRETE (PCC) BASE	309			SEE PC CONCRETE PAVEMENT (1) PROPORTIONS CAN COMPLY WITH SECTION 501 FOR PAVING CONCRETE OR SECTION 802 FOR CLASS A OR CLASS S CONCRETE. (2) COMPRESSIVE STRENGTH WILL BE DETERMINED BY CYLINDERS. (3) A MINIMUM COMPRESSIVE STRENGTH OF 2100 PSI (15 MPa) MUST BE OBTAINED BEFORE OPENING TO TRAFFIC. (4) THICKNESS WILL BE DETERMINED BY SOUNDING AFTER FRESH CONCRETE HAS BEEN STRUCK OFF. SINCE SEVERAL CLASSES OF CONCRETE CAN BE UTILIZED FOR PCC BASE, AIR CONTENT MAY NOT BE APPLICABLE.
PORTLAND CEMENT CONCRETE DRIVEWAY	505	SEE PCC - MISCELLANEOUS		

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
PORTLAND CEMENT CONCRETE (PCC) – STRUCTURES (INCLUDES CLASSES A, B, M, S, S(AE), SEAL	631, 634, 802, 805, 816	CONTR. ACCEPTANCE TESTING OF AIR CONTENT, SLUMP AND COMPRESSIVE STRENGTH: ONE SET PER SUBLOT OF 100 CU YD [75 CU M] FOR EACH CLASS WITH A MINIMUM OF ONE SET PER BRIDGE STRUCTURE. ALSO, FOR CLAS S S(AE), A MINIMUM OF ONE SET PER DECK POUR. ARDOT ACCEPTANCE TESTING: AIR CONTENT, SLUMP AND COMPRESSIVE STRENGTH; ONE SET PER LOT OF 400 CU YD [300 CU M]		SEE AGGREGATES PCC - STRUCTURES FOR INFORMATION ON GRADATION TESTING. CONTRACTOR MIX DESIGNS SHALL BE SUBMITTED TO THE R.E. FOR REVIEW AND APPROVAL PRIOR TO PRODUCTION THE DEPARTMENT WILL PERFORM ALL TESTING REQUIRED FOR WATER, CEMENT, FLY ASH, SOUNDNESS AND LOS ANGELES WEAR OF AGGREGATES. SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. CONTRACTOR CASTS TWO (2) CONCRETE CYLINDERS PER SET OF TESTS; AVERAGE IS USED FOR ACCEPTANCE VALUE R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. ADD'L CYLINDERS MAY BE CAST BY CONTR.FOR SCHEDULING PURPOSES TO DETERMINE TIME FOR STRIPPING FORMS OR LOADING THE STRUCTURE. TESTING OF GRADATION OF AGGREGATES FOR CLASS M CONCRETE IS NOT REQUIRED. QPL [1] (CURING COMPOUND)
PORTLAND CEMENT CONCRETE (PCC) – PAVEMENT, HIGH EARLY STRENGTH CONCRETE PAVEMENT, CONTINUOUSLY REINFORCED CONCRETE PAVEMENT, HIGH EARLY STRENGTH CONTINUOUSLY REINFORCED CONCRETE PAVEMENT, PORTLAND CEMENT CONCRETE PAVEMENT PATCHING, PORTLAND CEMENT CONCRETE SHOULDER (ADD-ON)	309, 501, 503, 507, 511	CONTRACTOR ACCEPTANCE TESTING FOR AIR CONTENT, SLUMP AND CORE RESULTS (COMPRESSIVE STRENGTH AND THICKNESS): ONE PER SUBLOT OF 1000 CU YD [750 CU M] (CYLINDERS AND WET THICKNESS FOR PORTLAND CEMENT CONCRETE PAVEMENT PATCHING.) ARDOT ACCEPTANCE TESTING FOR CORE RESULTS: ONE PER LOT OF 4000 CU YD [3000 CU M] OPENING PAVEMENT TO TRAFFIC AFTER 7 DAYS (24 HRS IF HIGH EARLY STRENGTH CONCRETE PAVEMENT SPECIFIED) AND CONTRACTOR TEST RESULTS OF REPRESENTATIVE TEST CYLINDERS ACHIEVING MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI (21.0 MPa)		ACCEPTANCE SAMPLING AND TESTING IN ACCORDANCE WITH SECTION 802.06 WHEN CYLINDERS ARE USED FOR Acceptance. CONTRACTOR MIX DESIGN WITH CERTIFICATION OF LOW ALKALI CEMENT OR POTENTIAL ALKALI REACTIVITY TEST AND JOB MIX FORMULA SUBMITTED TO RE MINIMUM 15 WORKING DAYS PRIOR TO USE. CONTRACTOR TO SPLIT QUALITY CONTROL AGGREGATE SAMPLES WITH RE FOR VERIFICATION TESTING RE APPROVES MIX DESIGN SEE AGGREGATES (PCCP) FOR INFORMATION ON GRADATION TESTING. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS. AT CONTRACTOR'S OPTION, ADDITIONAL TESTING MAY BE PERFORMED FOR CONFIRMING PRICE REDUCTIONS OR REJECTION DUE TO COMPRESSIVE STRENGTHS. ARDOT WILL PERFORM ALL TESTS FOR ACCEPT.AND ADJUSTMENT ON MATERIAL USED TO REPLACE UNACCEPTABLE MATERIAL REMOVED BY THE CONTRACTOR. QPL[1] (CURING COMPOUND)

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	**2014 STD SPEC. SECTION**	**MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION**	**CERTIFICATION REQUIREMENTS**	**REMARKS**
PORTLAND CEMENT CONCRETE (PCC) – MISCELLANEOUS: INCLUDES DRIVEWAY, DITCH PAVING, DROP INLET, JUNCTION BOXES, (MANHOLE – DROP INLET – JUNCTION BOXES ADJUSTED TO GRADE), OTLET PROTECTORS, STEEL GRATE ASSEMBLY, SPILLWAY, PAVEMENT REPAIR OVER CULVERTS, GUARDRAIL, FENCES, ISLAND, WALKS, STEPS, MODIFYING DROP INLET AND JUNCTION BOXES, WHEELCHAIR RAMPS, SPAN WIRE SUPPORT POLE WITH FOUNDATION, TRAFFIC SIGNAL MASK ARM AND POLE FOUNDATION, TRAFFIC SIGNAL PEDESTAL POLE WITH FOUNDATION, SIGN STRUCTURE, BREAKAWAY SIGN SUPPORT, IMPACT ATTENUATION BARRIER, CRASH CUSHION, BRIDGE END TERMINAL REPAIR AND OVERLAY OF CONCRETE BRIDGE DECK.	505, 605, 606, 609, 610, 611, 613, 614, 615, 617, 619, 632, 633, 640, 641, 701, 702, 712, 714, 715, 724, 730, 731, 732, 734, 822	ARDOT ACCEPTANCE TESTING FOR AIR CONTENT, SLUMP AND CORE RESULTS (COMPRESSIVE STRENGTH AND THICKNESS): ONE PER 100 CU YD [75 CU M]		QPL[1] (CURING COMPOUND & JOINT FILLER) R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS. SEE AGGREGATES PCC - STRUCTURES FOR INFORMATION ON GRADATION TESTING. CONTRACTOR MIX DESIGNS SHALL BE SUBMITTED TO THE R.E. FOR REVIEW AND APPROVAL PRIOR TO PRODUCTION THE DEPARTMENT WILL PERFORM ALL TESTING REQUIRED FOR WATER, CEMENT, FLY ASH, SOUNDNESS AND LOS ANGELES WEAR OF AGGREGATES. SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. RE CASTS TWO (2) CONCRETE CYLINDERS PER SET OF TESTS; AVERAGE IS USED FOR ACCEPTANCE VALUE TESTING OF GRADATION OF AGGREGATES FOR CLASS M CONCRETE IS NOT REQUIRED.
PORTLAND CEMENT CONCRETE (PCC) – APPROACH SLABS & GUTTERS	504	IF 501 PCCP CONCRETE USED: CONTRACTOR ACCEPTANCE TESTING FOR AIR CONTENT, SLUMP AND CORE RESULTS (COMPRESSIVE STRENGTH AND THICKNESS): ONE PER SUBLOT OF 1000 CU YD [750 CU M] RE VERIFICATION FOR AIR CONTENT, SLUMP AND CORE RESULTS (COMPRESSIVE STRENGTH AND THICKNESS): ONE PER LOT OF 4000 CU YD [3000 CU M] IF 802 STRUCTURAL CONCRETE USED: CONTRACTOR ACCEPTANCE TESTING FOR AIR CONTENT, SLUMP AND CORE RESULTS (COMPRESSIVE STRENGTH AND THICKNESS): ONE PER SUBLOT OF 100 CU YD [75 CU M] RE VERIFICATION FOR AIR CONTENT, SLUMP AND CORE RESULTS (COMPRESSIVE STRENGTH AND THICKNESS): ONE PER LOT OF 400 CU YD [300 CU M]		QPL[1] (CURING COMPOUND & JOINT FILLER) R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE FIELD TEST REPORTS. CONTRACTOR TO SPLIT QUALITY CONTROL AGGREGATE SAMPLES WITH RE FOR VERIFICATION TESTING RE APPROVES MIX DESIGN SEE AGGREGATES (PCCP OR PCC STRUCTURES) FOR INFORMATION ON GRADATION TESTING.)
PORTLAND CEMENT, TYPES I, II & III FLYASH SLAG CEMENT PORTLAND-POZZOLAN CEMENT, TYPE IP(##) SLAG-MODIFIED PORTLAND CEMENT, TYPE IS(##) SLAG-MODIFIED PORTLAND CEMENT (PORTLAND BLAST-FURNACE SLAG CEMENT)	206, 300, 418, 500, 600, 800	ONE - 10 LB [5 KG] BAG WITH LINER UNCERTIFIED SUPPLIER:ONE SAMPLE PER SHIPMENT	R.E. RETAINS MFR. CERT.DELIVERY TICKETS	QPL[1] CERTIFIED SUPPLIER: SAMPLE AS REQUESTED BY MAT'LS. DIV.
PRECAST CONCRETE BARRIER	604		CONTRACTOR CERT.	
PRECAST CONCRETE PIPE	606			SEE REINFORCED CONCRETE PIPE
PRECAST CONCRETE PRODUCTS, MISC. (INCLUDE FLARED END SECTIONS, CURTAIN WALLS, CATTLE PASSES, UNDERDRAIN OUTLET PROTECTORS, DI's, JUNCTION BOXES, CONCRETE SPILLWAY)	606, 609, 611, 614		MFR. CERTS. OF DELIVERY	QPL[1] INDIVIDUAL PCS. MAY BE STAMPED BY ARDOT INSPECTORS

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
PRECAST AND PRESTRESSED CONC. PRODUCTS, STRUCTURAL	802, 805		MFR. CERTS.OF DELIVERY	APPROVED BY BRIDGE DIVISION. INDIVIDUAL PCS STAMPED BY ARDOT OR AGENT INSPECTED AT MFR. BY ARDOT, OTHER STATE DOT OR ARDOT CONTRACTED COMMERCIAL FIRM QPL[1] SEE PLANS FOR GROUT REQUIREMENTS.
PRECAST REINFORCED CONCRETE, BOX CULVERT	607		MFR. CERTS.OF DELIVERY	QPL[1] INDIVIDUAL PCS. STAMPED WITH ARKANSAS CONCRETE PIPE ASSOCIATION (ARCPA)(FORMERLY CONCRETE PIPE ASSOCIATION OF ARKANSAS (CPAA)) OR AMERICAN CONCRETE PIPE ASSOCIATION (ACPA) CERTIFIED SEAL (STAMP), OR NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA) LOGO WITH CAST DATE AND MANFACTURER'S IDENTIFICATION. SHOP DRAWINGS SUBMIT TO BRIDGE FOR REVIEW & APPROVAL. SEE PLANS FOR GROUT REQUIREMENTS. SEE JOINT SEALER FOR REQUIREMENTS. SEE CURING COMPOUND REQUIREMENTS. SEE ASPHALT WATERPROOFING REQUIREMENTS.
PREFORMED FABRIC PADS	802,807			SEE BRIDGE BEARING PADS, PREFORMED FABRIC
PREFORMED JOINT SEAL, AASHTO M 297	809			QPL[1] BRIDGE DIVISION APPROVES DIMENSION DRAWINGS LUBRICANT-ADHESIVE AS RECOMMENDED BY MANUFACTURER
PREFORMED LOOP DETECTOR	704		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE FOR APPROVAL BY ENGINEER.	QPL[1] ENGINEER APPROVAL - TRAFFIC
PRESTRESSING REINFORCEMENT STEEL, SEVEN WIRE STRAND	802, 805	ONE SAMPLE 12 FT.[4 M]PER HEAT NUMBER PER SHIPMENT (PER 7 COILS MAX.)	MFR. CERTIFIED TEST.	APPROVED BY BRIDGE DIVISION.
PRETIMED CONTROLLER	702			SAME REQ. AS ACTUATED CONTROLLER
PROCESS LIME TREATED SUBGRADE	301			SEE LIME TREATED SUBGRADE
PROTECTIVE SURFACE TREATMENT, CLASS 1,2 & 3	803			QPL[1]
RAISED PAVEMENT MARKERS & ADHESIVES	604, 721		CONTRACTOR CERT. OF CONSTRUCTION AND INTERIM PAVEMENT MARKINGS	QPL[1]
RECONSTRUCTED BASE COURSE	305	200 LB [95 KG] FOR MAXIMUM DENSITY TEST CONTRACTOR ACCEPTANCE TESTING OF DENSITY AND MOISTURE CONTENT: ONE PER 1000 TONS [1000 T] R.E. PERFORMS VERIFICATION TESTING OF DENSITY AND MOISTURE CONTENT: ONE PER 4000 TONS [4000 T]		SAME REQUIREMENTS AS AGGREGATE BASE COURSE FOR COMPACTION EXCEPT REQUIRES A MINIMUM OF 95% OF MAXIMUM LABORATORY DENSITY. SOUNDINGS ARE NOT REQUIRED R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
REINFORCED CONCRETE PIPE	606, 621		MFR. CERTS.OF DELIVERY	QPL[1] INDIVIDUAL PCS. STAMPED WITH ARKANSAS CONCRETE PIPE ASSOCIATION (ARCPA)(FORMALLY CONCRETE PIPE ASSOCIATION OF ARKANSAS (CPAA)) OR AMERICAN CONCRETE PIPE ASSOCIATION (ACPA) CERTIFIED SEAL (STAMP) WITH CAST DATE AND MANFACTURER'S IDENTIFICATION. SEE BACKFILL MATERIAL FOR ADDITIONAL REQUIREMENTS

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
REINFORCED CONCRETE PIPE GASKET	606, 607, 609, 610			QPL[1]
REINFORCING STEEL (BARS)	501-504, 605-607, 609-611 613, 614, 617, 631, 712, 714, 715, 724, 730, 732, 802, 804, 805, 822		CERTS.OF DELIVERY	QPL[1] NOTE: IF SUPPLIER NOT ON QPL, CONTACT BRIDGE DIVISION FOR ACCEPTANCE REQUIREMENTS ALSO SEE EPOXY REINFORCING STEEL
REINFORCING STEEL WIRE AND WIRE FABRIC	502, 503, 504, 507, 615, 701, 702, 711, 732, 804, 816, 822	ONE FULL WIDTH BY 5 FT. [1.5 M] PER 40,000 LB [18,000 KG]	MFR. CERTIFIED TEST WITH MILL ANALYSIS REPORT	APPROVED BY BRIDGE DIVISION. CHECK WITH BRIDGE DIVISION FOR POSSIBLE PRETEST & TAG
RELEASE AGENT (NON-PETROLEUM)	410			QPL[1]
REMOVING & REPLACING BASE COURSE AND ASPHALT SURFACING	209			SAME REQUIREMENTS AS AGGREGATE BASE COURSE FOR COMPACTION, R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
REPAIR AND OVERLAY OF CONCRETE BRIDGE DECKS	822	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING		SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES- MISCELLANEOUS AGGREGATE GRADATION AS SPECIFIED IN SECTION 822. DENSITY TESTING ACCORDING TO ASTM C 1040. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
RESIN ANCHORING SYSTEMS	501, 507, 804			QPL[1]
RIPRAP, CONCRETE	816			SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES, REINFORCING STEEL (BARS) AND REINFORCING STEEL WIRE AND WIRE FABRIC. R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
RIPRAP, DUMPED (FOUNDATION PROTECTION RIPRAP, DUMPED RIPRAP – GROUTED)	621, 816		R.E . CERT.[2]	QPL[1] SEE CURRENT QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL.
ROCK BUTTRESS	630		R.E . CERT.[2]	QPL[1] MAT'L MAY HAVE CURRENT TEST RESULTS AVAILABLE FOR TRANSFER. SEE CURRENT QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL
ROCK EXCAVATION	210			SEE BACKFILL MATERIAL
SAFETY END SECTIONS	606		R.E. RETAINS CERTS.OF COMPLIANCE	QPL[1]
SANDBAGS	621			SEE DITCH CHECKS.
SCARIFYING AND RECOMPACTING SHOULDERS	216	MAXIMUM LABORATORY DENSITY SUBMIT 150 LB [70 KG] SAMPLE SIZE CONTRACTOR ACCEPTANCE TESTING FOR DENSITY& % MOISTURE: ONE FOR EACH 6000 SQ.YD. [5000 SQ. M]		MATERIALS PERFORMS MAXIMUM LABORATORY DENSITY R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
SEED (INCLUDING WILDFLOWERS)	620-623		R.E. CERT[4]	MUST MEET ARKANSAS STATE PLANT BOARD RULES AND REGULATIONS
SELECTED MATERIAL	302, 307, 504	FOR MAXIMUM DENSITY: IF PLUS NO. 4[4.75 MM] MATERIAL 11%-30% SUBMIT SAMPLE OF 150 LB [70 KG] IF PLUS NO. 4[4.75 MM] MATERIAL IS OVER 30% SUBMIT SAMPLE OF 200 LB [90 KG]		MAXIMUM LABORATORY DENSITY DETERMINED BY ARDOT ALL MATERIAL SHALL BE FREE OF DELETERIOUS MATTER R.E. REVIEWS, INITIALS AND AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS
SHAPING ROADWAY SECTION	213	SAME REQUIREMENTS AS COMPACTED EMBANKMENT		R.E. REVIEWS, INITIALS AND AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
SHEET COPPER	807		MFR. CERTIFIED TEST	APPROVED BY BRIDGE DIVISION.
SHEET ZINC ASTM B 69 TYPE II	807, 818		MFR. CERTIFIED	APPROVED BY BRIDGE DIVISION.
SIGNS, CONSTRUCTION	604			SEE TRAFFIC CONTROL DEVICES IN CONST. ZONES
SIGN POSTS – SEE U-CHANNEL POSTS				
SIGNS, STANDARD (INCLUDES GUIDE SIGNS & DELINEATORS)	618, 706, 707, 723, 725, 726,728		ALUMINUM BLANKS AND ACCESSORIES: MFR CERTIFIED TEST	QPL[1] (SHEETING) SHOP DRAWINGS APPROVED BY ENGINEER SEE PARTICULAR TYPE OF SUPPORT (IF APPLICABLE) FOR ACCEPTANCE CRITERIA MFR CERTIFIED TEST APPROVED BY MAT'LS. DIV.
SIGN SUPPORT, BREAKAWAY	730	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING OF CONCRETE	MFR. CERTIFIED TEST	FOR FOUNDATION, SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES- MISCELLANEOUS AND REINFORCING STEEL(BARS) APPROVED BY BRIDGE DIVISION. SHOP DRAWINGS APPROVED BY ENGINEER.
SIGN STRUCTURES: OVRHD, BRIDGE MOUNTED, CANTILEVER	724	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING OF CONCRETE	MFR. CERTIFIED TEST FOR MATERIALS CONTRACTOR CERT. WELDING & FABRICATION.	FOR FOUNDATION, SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES AND REINFORCING STEEL(BARS) MATERIALS APPROVED BY BRIDGE DIVISION. COMMERCIAL ALTERNATIVES WITH DESIGN CALCULATIONS AND CERTIFICATION OF DESIGN BY PROFESSIONAL ENGR. APPROVED BY ENGINEER SHOP DRAWINGS APPROVED BY ENGINEER BEFORE FABRICATION.
SILICONE, ASPHALT ADDITIVE	409			QPL[1]
SLAG CEMENT (FORMERLY GROUND GRANULATED BLAST FURNACE SLAG (GGBFS))	206, 307, 308, 309, 501, 503, 802	UNCERTIFIED SUPPLIER:ONE SAMPLE PER SHIPMENT ONE - 10 LB [4.5 KG] BAG WITH LINER	R.E. RETAINS MFR. CERT.DELIVERY TICKETS	QPL[1] RANDOM SAMPLING BY REQUEST OF MAT'LS. DIV. SEE QPL FOR INFORMATION REQUIREMENTS.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
SLURRY SEAL	418	CONTRACTOR ACCEPTANCE TESTING ASPHALT BINDER CONTENT AND GRADATION: ONE PER SUBLOT OF 30,000 SQ. YDS. [25,000 SQ. M] ARDOT ACCEPTANCE/VERIFICATION TESTING ONE PER LOT OF 120,000 SQ. YDS. [100,000 SQ. M]		CONTRACTOR MIX DESIGNS SHOULD BE SUBMITTED TO MAT'LS. DIV. FOR REVIEW AT LEAST FIVE (5) WORKING DAYS PRIOR TO USE. IF AGGREGATE SOURCES NOT ON QPL, ALLOW AT LEAST 10 WORKING DAYS FOR SAMPLING AND TESTING BEFORE REVIEW. ALSO, PRIOR TO BEGINNING WORK, EMULSION SUPPLIER SHALL FURNISH MATERIALS DIVISION SAMPLES OF BASE ASPHALT AND POLYMER USED IN EMULSION. NOTE: AGGR MUST HAVE A CURRENT ABRASION AND SOUNDNESS. SEE QPL OR CONTACT MAT'LS. DIV. FOR SOURCE SAMPLING AND APPROVAL. LIMESTONE MINERAL AGGREGATE NOT ALLOWED. ASPHALT EMULSION: SAME REQS. AS ASPHALT PENETRATING PRIME R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
SILICONE JOINT SEALANT	809		MFR. CERTIFIED	
SOD MULCH	622		R.E. CERT.[2]	ALSO SEE FERTILIZER; LIME, AGRICULTURAL; TACKIFIER, MULCH.
SODDING, SOLID	624		R.E. CERT.[2]	ALSO SEE FERTILIZER
SOFTENING AGENT FOR RECYCLED ASPHALT PAV.	416		MFR. CERTIFIED	ACCEPTED WITH MIX DESIGN. SAMPLED BY / OR AT REQUEST OF MATERIALS DIVISION.
SOIL AGGREGATE				SEE REQUIREMENTS FOR CEMENT TREATED BASE CRS. OR SELECTED MATERIAL AS APPROPRIATE
STAPLES, EROSION MATTING	626		R.E. CERT.[3]	
STEEL GRATE ASSEMBLY	613	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING OF CONCRETE.	MFR. CERTIFIED TEST & FABRICATORS CERT.	STEEL MUST BE GALVANIZED. APPROVED BY BRIDGE DIVISION. SEE APPLICABLE REQUIREMENTS FOR PORTLAND CEMENT CONCRETE-MISCELLANEOUS SEE REINFORCING STEEL (BARS) R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND FIELD TEST REPORTS.
STEEL PIPE SIPHON	612		MFR. CERTIFIED TEST & FABRICATORS CERT. CERT. WELDER REQUIRED	APPROVED BY BRIDGE DIVISION. SEE WELDING MATERIALS. .SEE BACKFILL MATERIAL
STEEL PRODUCTS (NOT LISTED ELSEWHERE)	500, 600, 700, 800		MFR. CERTIFIED TEST & FABRICATORS CERT.	APPROVED BY BRIDGE DIVISION.
STONE BACKFILL (INCLUDES MAT'L FOR ROCK DITCH CHECKS AND ROCK FILTER)	207, 621		R.E. CERT.[2]	SEE AGGREGATE BASE COURSE.
STRUCTURAL PLATE PIPE AND ARCHES (INCLUDES BOLTS, NUTS AND WASHERS.)	608		MFR. CERTIFIED TEST & FABRICATORS CERT. R.E. CERT.[2] (ASPHALT COATING THICKNESS)	APPROVED BY BRIDGES DIV. IF ASPHALT COATING SPECIFIED, FIELD INSPECT COATING -0.05 IN [1.3 MM] MINIMUM AT CORRUGATION CRESTS (IN & OUTSIDE). SEE SAMPLING METHOD 65. SEE BACKFILL MATERIAL.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
STRUCTURAL STEEL	807		MFR. CERTIFIED TEST	QPL[1] (FABRICATOR) APPROVED BY BRIDGE DIVISION. MATERIALS APPROVED FABRICATION LETTER REQUIRED. NOTE: INSPECTED AT MFR. BY ARDOT, OTHER STATE DOT OR ARDOT CONTRACTED COMMERCIAL FIRM
STRUCTURAL STEEL, OTHER	500, 600, 700, 800		MFR. CERTIFIED TEST & FABRICATORS CERT.	APPROVED BY BRIDGE DIVISION.
STUD SHEAR CONNECTORS	807		MFR. CERT.	QPL[1] SEE STRUCTURAL STEEL
SUBGRADE, SUBGRADE PREPARATION, AND TRENCHING AND SHOULDER PREPARATION	212, 214, 215	CONTRACTOR QUALITY CONTROL MAXIMUM LABORATORY DENSITY, ONE FOR EACH SOIL TYPE WITH A MINIMUM OF ONE PER JOB. RE WILL PERFORM VERIFICATION TESTING FOR MAXIMUM LABORATORY DENSITY ON SAMPLES SPLIT WITH CONTRACTOR (SEE COMPACTED EMBANKMENT), ONE FOR EACH SOIL TYPE WITH A MINIMUM OF ONE PER JOB. CONTRACTOR ACCEPTANCE TESTING OF DENSITY& % MOISTURE: ONE FOR EACH 12,000 SQ.YD. [10,000 SQ. M] WITH A MINIMUM OF ONE PER LAYER R.E. WILL PERFORM VERIFICATION TESTING OF DENSITY AND % MOISTURE: ONE FOR EACH 48,000 SQ. YDS. [40,000 SQ. M]		R.E. REVIEWS, INITIALS AND/OR AUTHORIZES IN SITEMANAGER ALL ACCEPTANCE AND VERIFICATION FIELD TEST REPORTS.
TACKIFIER, MULCH	620, 621, 622			QPL[1] ASPHALT: QPL SOURCE
TACTILE PANELS	641			QPL[1]
TEMPORARY STRUCTURE, MATERIALS	603		CONTRACTOR CERT.-BRIDGE R.E. CERT.[3] -- CULVERTS	
TEXTURED COATING FINISH	802			QPL[1]
THERMOPLASTIC PAVEMENT MARKINGS	718, 719			QPL[1] BEADS ON QPL MARKINGS PLACED ON CONCRETE REQUIRE PAINT PAVEMENT MARKINGS AS A PRIMER OR A PRIMER RECOMMENDED BY THERMOPLASTIC MANUFACTURER.
TOPSOIL	628		R.E. CERT.[2]	
TIE BARS	501, 502,503, 507		MFR. CERTIFIED MILLTEST CONTRACTOR CERT. ON EPOXY COATING IF REQUIRED.	APPROVED BY BRIDGE DIVISION. RESIN ANCHORING SYSTEM FOR SECURING BARS LISTED ON QPL
TIMBERS, BRIDGE, TREATED	817	ONE SAMPLE OF 20 WOOD CORES PER TREATMENT CHARGE, MIN 3-IN CORE LENGTH		APPROVED BY MAT'LS. DIV. CHECK WITH MATERIALS DIVISION. FOR PRETEST
TIMBERS BRIDGE, HARDWARE (BARS,PLATES,STR. SHAPES,CASTINGS, ETC.)	817		CONTRACTOR CERTIFIED TEST	APPROVED BY BRIDGE DIVISION.
TRAFFIC CONTROL DEVICES IN CONST. ZONES, CONTRACTOR CERTIFIED (INCLUDES SIGNS, VERT. PANELS, DRUMS, PRECAST CONCRETE BARRIERS, BARRICADES, CONSTR. PVMT. MRKS., INTERIM PVMT. MRKS., AND CONES	604		CONTRACTOR CERT. (NCHRP 350 OR MASH CERT WITH FHWA LETTER)	

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	**2014 STD SPEC. SECTION**	**MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION**	**CERTIFICATION REQUIREMENTS**	**REMARKS**
TRAFFIC CONTROL DEVICES IN CONST. ZONES ADV. WARNING ARROW PANEL & PORTABLE CHANGEABLE MESSAGE SIGN	604		R.E . CERT.[2]	R.E. DETERMINES MUTCD COMPLIANCE
TRAFFIC SIGNAL MAST ARM AND POLE, PEDESTAL POLE AND SPAN WIRE SUPPORT POLE WITH FOUNDATION.	712, 714, 715	FOR STRUCTURES AND REINFORCING STEEL (BARS) R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING OF CONCRETE	CERTIFICATION BY MANUFACTURER OR SUPPLIER THAT ITEM FABRICATED COMPLY WITH DESIGN AND MATERIALS COMPLY WITH SPECIFICATIONS.	FOR FOUNDATION, SEE PORTLAND CEMENT CONCRETE- MISCELLANEOUS DESIGN PLANS CERTIFIED BY P.E. SUBMITTED FOR REVIEW AND RECORD SEE QPL FOR MAT'LS USED FOR FIELD REPAIR OF ALUMINUM PAINT
TRAFFIC SIGNAL, FEEDER WIRE	704		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE	ENGINEER APPROVAL - TRAFFIC
TRAFFIC SIGNAL, GALVANIZED STEEL CONDUIT	709		R.E. CERT. [2]	
TRAFFIC SIGNAL HEAD & PEDESTRIAN HEAD	706, 707		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE FOR	ENGINEER APPROVAL - TRAFFIC SEE SIGNS (STANDARD) FOR ACCEPTANCE OF SUBSIDIARY SIGNS
TRAFFIC SIGNAL, LOOP SEALANT & BACKER ROD	704		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE FOR APPROVAL BY ENGINEER.	QPL[1]
TRAFFIC SIGNAL, LOOP WIRE	704		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE FOR APPROVAL BY ENGINEER.	ENGINEER APPROVAL - TRAFFIC
TRAFFIC SIGNAL, LOOP WIRE IN DUCT	705		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE FOR APPROVAL BY ENGINEER	ENGINEER APPROVAL - TRAFFIC
TRAFFIC SIGNALNON-METALLIC CONDUIT (PVC OR PE)	710		R.E. CERT.[2]	
TRAFFIC SIGNAL, SIGNAL CABLE	708		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE FOR APPROVAL BY ENGINEER.	ENGINEER APPROVAL - TRAFFIC
TRAFFIC SIGNAL, SPAN WIRE	713			QPL[1]
TRAFFIC SIGNAL, SPAN WIRE ACCESSORIES	713		CONTRACTOR/SUPPLIER CERTIFIED	
TREATED WOOD POLES (Also - ELEC.SERV. POLES)	716		CONTRACTOR CERTIFIES:CLASS, SIZE, & TREATMENT	
TRENCHING AND SHOULDER PREPARATION	215			SEE SUBGRADE.
U CHANNEL POST	618, 728, 729		MFR. CERTIFIED MILL TEST	APPROVED BY MAT'LS. DIV.
UNCLASSIFIED EXCAVATION – STRUCTURES	801			SEE BACKFILL MATERIAL
UNDERDRAIN, OUTLET PROTECTORS	611			SEE PRECAST CONCRETE PRODUCTS, MISCELLANEOUS
UNDERDRAIN, PIPE LATERALS ASTM D1785 FOR SCHEDULE 40 PIPE	611		R.E. CERT. [2]	
VEHICLE DETECTOR	704		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE FOR APPROVAL BY ENGINEER.	ENGINEER APPROVAL - TRAFFIC
VIDEO DETECTOR	733		CONTRACTOR SUBMITS TWO COPIES OF DESIGN CHARACTERISTICS BROCHURE	MANUFACTURER'S REPRESENTATIVE ASSISTS IN SETUP AND PROGRAMMING ENGINEER APPROVAL - TRAFFIC

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF CONSTRUCTION MATERIALS, 2014				
MATERIAL	2014 STD SPEC. SECTION	MINIMUM SAMPLE SIZE QUALITY CONTROL / ACCEPTANCE / VERIFICATION	CERTIFICATION REQUIREMENTS	REMARKS
WATER FOR SEEDING & CONCRETE	206, 301, 307, 308, 309, 400, 500, 600, 800	ONE 1 GAL. [4 LITERS] SAMPLE PER PROJECT		APPROVED BY MATERIALS DIVISION. NO SAMPLE IF PUBLIC WATER SUPPLY IS SOURCE. ANNUAL SAMPLE AT TIME OF CONCRETE PLANT INSPECTION. SEEDING – 1 SAMPLE PER PROJECT PER SOURCE. RE APPROVES IRRIGATION QUALITY WATER FOR SEEDING
WATERPROOFING	815			QPL[1]
WATERSTOP, PVC AND RUBBER	802		MFR. CERTIFIED TEST	APPROVED BY MAT'LS. DIV.
WELDED SPLICES	503, 804		WELDER CERT. REQUIRED.	APPROVED BY ENGINEER
WELDED STEEL GRATES AND FRAMES	609		MFR. CERTIFIED TEST & FABRICATOR'S CERT. WELDER CERT. REQUIRED.	APPROVED BY BRIDGE DIVISION. MAY BE GALVANIZED OR PAINTED. SEE PAINT, MISCELLANEOUS IF FIELD PAINTED.
WELDED WIRE REINFORCEMENT	502, 503, 504, 507, 615, 701, 702, 711, 732, 804, 816, 822			SEE REINF. STEEL WIRE AND WIRE FABRIC
WELDING MATERIALS	609, 610, 612, 617, 802, 807, 811			QPL[1]
WHEELCHAIR RAMPS	641	R.E. PERFORMS ACCEPTANCE SAMPLING AND TESTING OF CONCRETE.		SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES- MISCELLANEOUS SEE ALSO TACTILE PANELS
YARD DRAINS	609			QPL[1] (MISC. IRON & STEEL, METAL CULVERT PIPE) SEE BACKFILL MATERIAL. SEE PORTLAND CEMENT CONCRETE FOR STRUCTURES- MISCELLANEOUS.

GENERAL NOTES:

- THE RESIDENT ENGINEER AND CONTRACTOR CAN NOT USE SPLIT SAMPLES FOR ACCEPTANCE. ACCEPTANCE SAMPLE MUST BE SEPARATE SAMPLES.
- IF A MATERIAL IS NOT LISTED ON THIS GUIDE SCHEDULE, SUCH AS JOB SPECIAL PROVISION ITEMS, CONTACT THE MATERIALS DIVISION TO DETERMINE A SAMPLING/TESTING RATE.
- IF THERE IS A QUESTION CONCERNING THE QUALITY OF A MATERIAL/PRODUCT OR WHETHER A MATERIAL/PRODUCT MEETS SPECIFICATIONS, EVEN IF PROPERLY CERTIFIED OR FROM A QPL, CONTACT MAT'LS. DIV. ABOUT TESTING OF THE MATERIAL/PRODUCT. SAMPLES MAY BE OBTAINED AT REQUEST OF MATERIAL'S DIVISION.
- NO SAMPLES ARE REQUIRED ON MATERIALS THAT ARE PRETESTED/INSPECTED BY MAT'LS. DIV. UNLESS STATED OTHERWISE IN THIS SCHEDULE. PRETESTED MATERIAL WILL NORMALLY HAVE AN ARDOT SEAL, TAG, OR MARKING. IF THERE ARE QUESTIONS CONCERNING THE VALIDITY OR SOURCE OF THESE IDENTIFIERS, CONTACT MAT'LS. DIV.
- ALL STEEL ITEMS ARE SUBJECT TO RESTRICTIONS AS EXPLAINED IN SECTION 106.01 OF THE STANDARD SPECIFICATIONS.
- FAILING TEST REPORTS ORIGINATING FROM THE MAT'LS. DIV. WILL BE RETURNED TO THE RESIDENT ENGINEER WITHOUT COMMENT AS TO THE FINAL DISPOSITION AND ACCEPTABILITY OF A MATERIAL UNLESS PREVIOUSLY ACCEPTED BY THE CONSTRUCTION, ROADWAY DESIGN, AND/OR BRIDGE DESIGN DIVISIONS. THE RESIDENT ENGINEER SHOULD MAKE APPROPRIATE COMMENTS AND TRANSMIT THROUGH THE DISTRICT ENGINEER TO THE CONSTRUCTION DIVISION. A COPY OF THE TEST REPORT SHOULD ACCOMPANY THESE COMMENTS. THE STATE CONSTRUCTION ENGINEER WILL DETERMINE THE FINAL DISPOSITION OF THE MATERIAL AFTER CONSIDERING THE COMMENTS OF THE RESIDENT ENGINEER AND THE DISTRICT ENGINEER, AND AFTER CONSULTING WITH THE MATERIALS ENGINEER.
- FOR FAILING FIELD TEST REPORTS OR OTHER MATERIAL IRREGULARITIES, REFER TO R. E. MANUAL FOR INSTRUCTIONS.

NOTES:

1. FOR NON-SITEMANAGER MATERIALS MODULE JOBS M196 REQUIRED. FOR SITEMANAGER JOBS REFER TO SITEMANAGER REQUIREMENT
2. FOR NON-SITEMANAGER MATERIALS MODULE JOBS M170 REQUIRED. FOR SITEMANAGER MATREIALS MODULE JOBS REFER TO SITEMANAGER REQUIREMENT.
3. FOR NON-SITEMANAGER MATERIALS MODULE JOBS M170 REQUIRED. FOR SITEMANAGER MATERIALS MODULE JOBS NO ACTION REQUIRED.
4. FOR NON-SITEMANAGER MATERIALS MODULE JOBS M40 REQUIRED. FOR SITEMANAGER MATERIALS MODULE JOBS REFER TO SITEMANAGER.
5. FOR NON-SITEMANAGER MATERIALS MODULE JOBS M41 REQUIRED. FOR SITEMANAGER MATERIALS MODULE JOBS REFER TO SITEMANAGER.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF MAINTENANCE MATERIALS FOR 2014 STD. SPECS.		
MATERIAL	**TYPE OF TESTS**	**FREQUENCY OF SAMPLING**
AGGREGATE BASE COURSE	GRADATION, LIQUID LIMIT, PLASTIC LIMIT AND PERCENT MOISTURE. ALSO, DENSITY AND THICKNESS WHEN APPLICABLE.	SUPPLIER ACCEPTANCE AND ARDOT VERIFICATION: SAMPLING AND TESTING REQUIREMENTS ARE THE SAME AS THOSE OUTLINED FOR CONSTRUCTION MATERIALS. SUPPLIER CERTIFIES TEST RESULTS KEPT AT SUPPLIER'S OFFICE. VERIFICATION SAMPLES ARE NOT REQUIRED FOR PROJECTS/SUPPLY CONTRACTS WITH LESS THAN 500 TONS (400 CU.YD) [450 t (304 cu m)]. ALSO, VERIFICATION SAMPLES ARE NOT REQUIRED WHEN SOURCE IS ROUTINELY SUPPLYING AGGREGATE BASE COURSE ON ARDOT CONSTRUCTION PROJECTS.
AGGREGATE: SURFACE TREATMENT	GRADATION AND DECANTATION	SUPPLIER CERTIFICATION. TEST RESULTS KEPT AT SUPPLIER'S OFFICE.
ASPHALT BINDERS AND LIQUID ASPHALTS (CUTBACKS AND EMULSIONS [EXCEPT RAPIDSETTING])	ALL APPLICABLE	MATERIAL FROM CERTIFIED SHIPPERS IS SAMPLED AT THE REQUEST OF MATERIALS DIVISION. UNTESTED OR UNIDENTIFIED MATERIAL, SEE NOTE 9.
ASPHALT, RAPID SETTING EMULSIONS (ANIONIC, CATIONIC, AND MODIFIED)	ALL APPLICABLE	FOR MATERIAL FROM CERTIFIED SHIPPERS, ONE DESTINATION SAMPLE SHOULD BE SENT TO MATERIALS DIVISION FOR EACH SPECIAL MAINTENANCE SEALING PROJECT REQUIRING 20,000 GAL. [75,000 L] OR MORE. NONE REQUIRED ON PROJECTS USING LESS THAN 20,000 GAL. [75,000 L]. ONE SAMPLE PER SUPPLY REQUISITION FOR ALL OTHER ROUTINE MAINT. ACTIVITIES THAT REQUIRE MORE THAN 6,000 GAL. [23,000 L] OF MATERIAL. ALSO, ONE FIELD VISCOSITY SHOULD BE PERFORMED FOR EACH SPECIAL MAINTENANCE SEALING PROJECT OR SUPPLY REQUISITION THAT REQUIRES MORE THAN 6,000 GAL. [23,000 L] OF MATERIAL. UNTESTED OR UNIDENTIFIED MATERIAL, SEE NOTE 9.
ASPHALT CONCRETE HOT MIXTURES	SUPPLIER MUST VERIFY MIX DESIGN AT START OF MIX PRODUCTION OR AFTER AN INTERRUPTION OF MORE THAN 90 CALENDAR DAYS. SUPPLIER TESTS EACH SUBLOT OF 750 TONS [750 t] FOR ASPHALT BINDER CONTENT, AIR VOIDS, AND VMA; DENSITY WHEN APPLICABLE. SUPPLIER MUST DETERMINE GRADATIONS FOR EVERY 750 TONS [750 t] OF MIX FOR QUALITY CONTROL.	FOR SUPPLY CONTRACTS: SUPPLIER MUST BE ON THE QPL. SUPPLIER CERTIFICATION THAT ACCEPTANCE TEST RESULTS ARE IN COMPLIANCE WITH THE PROPERTIES OF TABLE 410-1 (EXCEPT FOR DENSITY) REQUIRED FOR EACH VOUCHER REGARDLESS OF THE QUANTITY OF MATERIAL. DEPARTMENT PERFORMS VERIFICATION TESTING ON RANDOM BASIS. FOR OTHER HOT MIX CONTRACTS: SUPPLIER ACCEPTANCE AND ARDOT ACCEPTANCE AND VERIFICATION SAMPLING AND TESTING REQUIREMENTS ARE THE SAME AS THOSE OUTLINED FOR CONSTRUCTION MATERIALS**.** DEPARTMENT TESTS ONE LOT SAMPLE TAKEN AT RANDOM FOR THE PROPERTIES OF TABLE 410-1. NO VERIFICATION SAMPLING AND TESTING REQUIRED WHEN THE ASPHALT CONCRETE HOT MIX IS BEING ROUTINELY USED ON ARDOT CONSTRUCTION PROJECTS AND IS BEING SAMPLED/TESTED AT THE REQUIRED FREQUENCY.
ASPHALT CONCRETE COLD PLANT MIX	GRADATION AND ASPHALT BINDER CONTENT	SAME REQUIREMENTS AS FOR ASPHALT CONCRETE HOT MIX. SUPPLIER RESPONSIBLE FOR FURNISHING MIX DESIGN. DISTRICT MATERIALS SUPERVISOR MUST REVIEW NEW DESIGNS BEFORE THEY ARE USED.

GUIDE SCHEDULE OF ACCEPTANCE SAMPLING AND TESTING OF MAINTENANCE MATERIALS FOR 2014 STD. SPECS.		
MATERIAL	**TYPE OF TESTS**	**FREQUENCY OF SAMPLING**
PORTLAND CEMENT	ALL APPLICABLE	MATERIAL FROM CERTIFIED SHIPPERS ARE SAMPLED AT THE REQUEST OF MATERIALS. UNTESTED OR UNIDENTIFIED MATERIAL SHALL HAVE EACH SHIPMENT ACCEPTANCE SAMPLED/TESTED BY MATERIALS DIVISION BEFORE USE.
READY MIXED PORTLAND CEMENT CONCRETE	GRADATION, SLUMP, AIR CONTENT (IF APPLICABLE) AND COMPRESSIVE STRENGTH	MATERIAL MUST BE SUPPLIED FROM PLANT THAT HAS BEEN INSPECTED AND APPROVED BY ARDOT. ARDOT PERFORMS ALL ACCEPTANCE SAMPLING AND TESTING OF MATERIAL. 1 SAMPLE FOR EACH 200 CU. YD. [152 cu m] OF CONCRETE PER PURCHASE ORDER. NO SAMPLE REQUIRED FOR PURCHASE ORDER LESS THAN 20 C.Y. [15 cu m]] OR WHEN THE CONCRETE IS BEING ROUTINELY USED ON ARDOT CONSTRUCTION PROJECTS AND IS BEING SAMPLED & TESTED AT THE REQUIRED FREQUENCY
METRIC MINIMUM QUANTITIES ARE SHOWN IN BRACKETS, [ ].		

NOTES:

1. THE FREQUENCIES OF SAMPLING LISTED ABOVE ARE CONSIDERED MINIMUM QUANTITIES.

2. NO SAMPLES REQUIRED ON MATERIALS PRETESTED /INSPECTED BY MATERIALS DIVISION UNLESS STATED OTHERWISE IN THIS SCHEDULE. PRETESTED MATERIALS WILL NORMALLY HAVE AN ARDOT SEAL, TAG, OR MARKING. IF THERE ARE QUESTIONS CONCERNING THE VALIDITY OR SOURCE OF THESE IDENTIFIERS CONTACT MATERIALS DIVISION

3. THE DISTRICT MAINTENANCE ENGINEER/SUPERINTENDENT WILL REVIEW AND APPROVE/REJECT ALL FIELD TEST RESULTS ON SAMPLES TESTED FOR MAINTENANCE PROJECTS. THE TEST REPORTS ARE TO BE RETAINED AT THE DISTRICT OFFICE FOR A PERIOD OF 3 YEARS AFTER FINAL VOUCHER.

4. THE DISTRICT MAINTENANCE ENGINEER/SUPERINTENDENT WILL WRITE AND DISTRIBUTE THE FINAL MATERIALS CERTIFICATION IN ACCORDANCE WITH CHIEF ENGINEER'S MEMORANDUM.

5. THE DISTRICT MATERIALS SUPERVISOR WILL PROVIDE TEST REPORTS FOR THE DISTRICT MAINTENANCE ENGR./SUPERINT. AND WILL PERFORM ADD'L TESTS AS DEEMED NECESSARY BY THE DIST IN ACCORDANCE WITH CHIEF ENGINEER'S MEMORANDUM.

6. SMALL QUANTITIES OF MISCELLANEOUS MATERIALS MAY BE ACCEPTED IN ACCORDANCE WITH CHIEF ENGINEER'S MEMORANDUM OF 2-7-97 AND MAINTENANCE MEMORANDUM 97-1, BY THE DIST. MAINT. ENGR./SUPERINT. ON THE BASIS OF ONE OF THE FOLLOWING METHODS: (a) VISUAL EXAMINATION PROVIDED THE SOURCE OF SUPPLY IS RELIABLE AND HAS RECENTLY FURNISHED SIMILAR MAT'L FOUND TO BE SATISFACTORY UNDER THE DEPARTMENT'S NORMAL SAMPLING AND TESTING PROCEDURES; (b) CERTIFICATION BY THE MANUFACTURER OR SUPPLIER THAT THE MAT'L FURNISHED COMPLIES WITH CONTRACT REQUIREMENTS; (c) VISUAL EXAMINATION AND THE DIST. MAINT. ENGINEER'S/SUPERINTENDENT'S CERTIFICATION THAT THE MAT'L HAS PERFORMED THE FUNCTION INTENDED AND IS EITHER TEMPORARY OR EMERGENCY IN NATURE. THE APPROXIMATE MAX. QUANTITIES OF MAT'LS THAT MAY BE ACCEPTED UNDER THE ABOVE METHODS ARE THE SAME AS THOSE OUTLINED IN THE RESIDENT ENGINEER'S MANUAL.

7. ANY FAILING MATERIALS OR MATERIALS IRREGULARITIES WILL BE HANDLED IN COMPLIANCE WITH DEPARTMENT POLICY.

8. DESTINATION SAMPLES TAKEN FROM CERTIFIED SUPPLIERS SHOULD BE USED FOR VERIFICATION ONLY.

9. FOR SAMPLING AND TESTING OF MATERIALS NOT LISTED IN THIS GUIDE, REFER TO THE GUIDE SCHEDULE FOR CONSTRUCTION MATERIALS

Form MT-401 Sample Identification Card

Additional Job Nos. _____

Batch/Lot/Manuf. Nos. _____

_____

Remarks: _____

_____

_____

_____

_____

07/2019 QPL No. _____

From: _____

Address: _____

_____

_____

Materials Division
ARKANSAS DEPARTMENT OF TRANSPORTATION
11301 WEST BASELINE
LITTLE ROCK, ARKANSAS 72209

BAG _____ of _____ Bags

Job No/s. _____ Lab No. _____

Material Source/Mfr./Supplier: _____

Location: _____ Mfr.Lab No. _____

Date Sampled: _____ Sample of: _____

Sample From _____ County No. _____

Quantity Represented: _____ Type Const.: _____
(Do Not Use Job Qty.)

Tests Desired: _____ Std. Spec. No. _____

Sampled By: _____ CTTP No.: _____

Submitted By: _____ Attn: _____

SiteManager Sample ID: _____

Note: See Sampling and Testing Manual for details.

SIZE SAMPLES REQUIRED

Concrete Aggregate:
Fine - 50 lbs; Coarse - 200 lbs.
C.S.C.S.B.S. (Cl. 7 – 500 lbs.; Cement – 20lbs.)
Agg. Base Course (Max. Den) 200 lbs.
Mineral Aggregate for A.S.T. - 50 lbs.
Mineral Aggregate for ACHM Design:
Coarse - 110 lbs.
Intermediate - 75 lbs.
Fine - 30 lbs.
Ledge Stone - 150 lbs.
Soil:
Seeding - 10 lbs; Proctor - 200 lbs.
Asphalt: Cutback - 1 qt.
Asphalt Cement - 1 qt.
Emulsion – 1 gal.
Guard Cable – 2-6ft

Cement - 10 lbs.
Lime - 5 lbs
Fly Ash - 5 lbs.
Water - 1 gal.
Paint - 1 qt.
Reinforcing Bar - 4 ft. (2)
Wire Mesh - Full Width x 5 ft.
Bar Supports - 1 each size
Barbed Wire - 6 ft.
Farm Fence - 6 ft. x ht.
(1 per 50 rolls; Max. Total 7)
Chain Link Fabric - 6 ft. x ht.
(1 per 50 rolls; Min. 2
except when less than 10 rolls, only 1)
Smooth Wire - 6 ft.
Metal Posts & Rail-1 ea. size per 500.

SAMPLING

Policy Regarding Sampling and Testing Materials for the Benefit of Others

1. All material samples shall be taken by or under the observation and direction of a state inspector and submitted to the laboratory by state forces in the proper manner.

2. No samples shall be submitted by or for individual contracting firms as part of their materials exploration prior to award of contract.

3. We will assist the contractors or others in determining the quality of materials for projects under contract; however, field forces should exercise discretion in determining the amount of sampling and testing necessary to locate suitable materials for a specific project.

4. A test report is indicative of the properties of the sample tested. If the sample is not representative of the material being sampled, tests will fail to serve their intended purpose and may be misleading.

5. Sample before materials are mixed with on-hand materials.

6. Under no circumstances is material to be sampled by anyone other than an authorized representative of the Arkansas Department of Transportation when the results of tests on such samples are to be the basis of acceptance or rejection of the material.

7. Frequency of sampling should be in accordance with the current Guide Schedule for Desired Minimum Frequency of Sampling and Testing for Job Control.

SAMPLE SIZES

Type of Material to be submitted	Minimum Weight of Sample
Fine Aggregate for Concrete	50 lb (25 kg)
Coarse Aggregate for Concrete	200 lb (95 kg)
Base Course Material (Classes 1-3)	220 lb (100 kg)
Base (Classes 4-8) and Surface Course Material	75 lb (35 kg)
Base Course for Maximum Density Tests	75 lb (35 kg)
Mineral Aggregate for Bituminous Surface Treatment	50 lb (25 kg)
Mineral Aggregate for Asphalt Concrete Hot Mix Design:	
Coarse (Including OGABC, Cl. III)	110 lb (50 kg)
Intermediate	75 lb (35 kg)
Fine	30 lb (15 kg)
OGABC, Cl. I	275 lb (125 kg)
OGABC, Cl. II	165 lb (75 kg)
Ledge Stone	150 lb (70 kg) in pieces 6" to 8" (150 mm to 200 mm)
Soil for Maximum Density Tests	
Substantially all passing No. 4 sieve	35 lb (15 kg) (4.75mm sieve)
10% or more retained on No. 4 sieve	200 lb (95 kg) (4.75mm sieve)
Soil for gradation, liquid and plastic limits	
PI and group index	
Substantially all passing No. 4 sieve	10 lb (5 kg)
10% or more retained on No. 4 sieve	50 lb (25 kg)
Soil for Portland Cement Stabilization	
Substantially all passing No. 4 sieve	250 lb (115 kg)
10% or more retained on No. 4 sieve	500 lb (230 kg)

Type of Material to be submitted		Minimum Weight of Sample
Soil for Lime Stabilization		
	Substantially all passing No. 4 sieve	50 lb (25 kg)
	10% or more retained on No. 4 sieve	150 lb (70 kg)
Gravel or Stone for Portland Cement Stabilization		500 lb (230 kg)
Asphaltic Materials		
	Cutback	1 qt (1 l)
	Asphalt Binder	1 qt (1 l)
	Emulsified Asphalt	1 gal (4 l)
Water		1 gal (4 l)

Bituminous Mixture:

Nominal Max. Particle Size	Min. Weight, Uncompacted Sample, lb	Min. Size (Area) Compacted Sample, Sq. In.	Min. Weight of Test Specimen, grams
#4 (4.75mm)	4 lb (2 kg)	36 Sq.In. (23,250 sq mm)	500
3/8" (9.5mm)	8 lb (4 kg)	36 Sq.In. (23,250 sq mm)	1000
1/2" (12.5mm)	12 lb (6 kg)	60 Sq.In. (39,000 sq mm)	1500
3/4" (19 mm)	16 lb (8 kg)	100 Sq.In. (64,500 sq mm)	2000
1" (25 mm)	20 lb (10 kg)	144 Sq.In. (93,000 sq mm)	3000
1 1/2" (37.5mm)	25 lb (12 kg)	144 Sq.In. (93,000 sq mm)	4000

Asphalt density sample cores:
(ASTM D5361) Samples taken from the compacted pavement by core drill shall have a minimum nominal diameter of 4 in. and extend the full depth of the lift(s) being sampled. If test results appear to be erratic or biased in a way attributable to sample size, take larger samples.
Thickness shall be 3 times NMAS minimum required for bond breakers and leveling courses.

SAMPLING SOILS

Soils may be sampled by means of hand augers, post hole augers, power drill augers, shovels, other suitable hand tools or any other equipment which provides a representative portion of the layer being sampled.

When borrow pits will be used to obtain special or upgraded embankment material or selected material, the pit area must be adequately sampled prior to excavation. The drilling and sampling should be done far enough in advance of the planned excavation to permit the samples to be tested and analysis made of the information to determine whether or not the pit is suitable for use.

The test holes should be located so as to enclose an area of known depth and quality of material. It is not necessary for the holes to be located on a rectangular grid system with uniform spacing. Holes may enclose areas with regular or variable shapes such as triangles, rectangles or polygons with unequal sides. A minimum of three holes is necessary to enclose an area.

Sampling of test holes should begin at the surface and a sample taken of each different layer of soil encountered in the test hole. Each sample should be placed in a suitable container (doubled heavy paper bags, etc. Unlined cloth bags should not be used.) and properly identified.

Identification should include job number, pit name, hole name, hole number or station number, depth represented and type material (special embankment, SM-2, etc.) It is recommended that notes of the sampling be kept in a field notebook for future reference. Information recorded should include the usual job information (number, name, etc.) pit name, pit location and a log for each test hole with sampling depths and pertinent comments regarding different strata of materials encountered, underground water, presence of rock or boulders or any other information that would assist in working the pit.

A neat and reasonably accurate sketch of the pit with test hole locations and identification should be made and a copy submitted to the central materials laboratory with the samples. Test hole locations should be referenced to fences, trees or other landmarks which can be used to re-establish the location of the test holes. One copy of the sketch should be filed in the project records for future use.

Areas to be seeded or to produce sod mulch should be sampled in accordance with the governing specifications. This requires the submission of only one sample for each major soil area obtained by the combining of the samples taken at the rate of three per acre. Samples should be submitted to the Materials Division for determination of lime requirement.

Method Replaced with AASHTO R 90

SAMPLING BITUMINOUS MATERIALS

Bituminous materials may be sampled by any one of several satisfactory methods as long as a representative, uncontaminated sample is obtained. Immediately after sampling, the bituminous material should be placed in a clean container and immediately covered. The Materials Division will furnish containers for this purpose upon request. All samples should be completely identified as to source, grade, original tank number, laboratory number and date sample taken.

Tank transports may be sampled from a spigot, from the discharge line or other satisfactory methods. The sample should not be taken until approximately two gallons have been allowed to pass through the sampling spigot or the discharge line.

Bulk storage tanks and asphalt distributors should be sampled by lowering a suitable container fitted with a stopper or cover into the material. After the container has been lowered to the desired depth, the stopper or cover shall be removed by means of an attached string, wire or rod and the container allowed to fill. The sample should be obtained from at least one foot below the surface of the material. Suitable sampling spigots may be used if provided on storage tanks or distributors.

Asphalt cement and these materials are accepted by certification acceptance unless the source is unreliable or uncertified. In that instance, testing of the material will be required before it is used.

The District Materials Supervisors will pick up random samples of liquid asphalts and asphalt cements from the refineries or plants in his assigned area to assure that specification material is being shipped. Destination samples should be picked up in accordance with the "Manual of Field Sampling and Testing Procedures" Guide Schedule of Desired Minimum Frequency for Acceptance Sampling and Testing. Tests should be run immediately on any loads that are suspect. Asphalt cements and liquid asphalts are to be sent to the Materials Division for a complete analysis. Viscosity tests on emulsified asphalts are also to be run in the District laboratory with a copy of the report going to appropriate job supervisor, to Materials Division, to District Engineers and to Construction and Maintenance Engineer.

The following is the procedure to be followed in sampling and testing:

A. Asphalt Cements

1. Use only new clean metal double friction-top cans.

2. Containers shall not be washed, rinsed or wiped with an oily cloth. If they are not clean, they will not be used.

3. Obtain at least a 1 quart. (1 liter) sample. Care must be taken to assure that the samples are representative.

4. Clean outside of container with a clean, dry cloth.

5. With a felt tip pen or other suitable marker, identify each sample container with the usual information as indicated on sample identification card M-401. In addition, be sure to include carrier, trailer number, laboratory number, and date sample taken.

B. Cutback Asphalts

1. Use only new clean metal can with screw-on lids or double friction-top cans.

2. Containers shall not be washed, rinsed, or wiped with an oily cloth. If they are not clean, they will not be used.

3. Obtain 1 quart. (1 liter) sample. Care must be taken to assure that the samples are representative.

4. Clean outside of container with clean, dry cloth.

5. With a felt tip pen or other suitable marker, identify each sample container with the usual information as indicated on sample identification card M-401. In addition, be sure to include carrier, trailer number, laboratory number, and date sample taken.

C. Emulsified Asphalt

1. Use only new plastic jugs for sample containers.

2. Never clean or rinse jugs with a petroleum solvent or other liquid.

3. Obtain two 4 liter (1-gallon) samples from transport tanker after second distributor load has been transferred.

4. Samples shall be taken from transfer hose but should be taken as soon as pump has been stopped. Extreme care must be taken to assure that the samples are representative.

5. A clean funnel should be used to assist in filling jugs.

6. Fill jugs completely full and seal immediately.

7. The sample containers shall not be submerged in solvent, nor shall they be wiped with a solvent saturated cloth. Any spilled material on the outside of the containers shall be wiped with a clean, dry cloth immediately after sealing.

8. With a felt tip pen or other suitable marker, identify each sample container with the usual information as indicated on sample identification card M-401. In addition, be sure to include carrier, trailer number, laboratory number, and date sample taken.

9. Transport one sample to Materials Division immediately for complete analysis. Transport the other sample to the District lab and test for viscosity. Care should be

taken to avoid exposure to sunlight, heat and excessive shaking during transportation. Testing in the District lab should be done the same day as sampling.

10. If viscosity is within the specification limits, the material is acceptable. If outside the specified range, rerun the test on the one-gallon sample. If the viscosity for CRS-2, CRS-2P or CRS-2L still exceeds 500 seconds, repeat the test at 71 ºC (160 ºF) degrees. The viscosity at 71 ºC (160 ºF) shall be within the limits of 90 - 200 seconds. Acceptance or rejection will be based on the best of the results.

11. Notify Materials Division immediately of any failures to allow detection and correction of possible problems.

SAMPLING PORTLAND CEMENT, HYDRATED LIME AND MINERAL FILLER

These materials may be sampled in any manner in which a representative, “uncontaminated" sample can be obtained. Samples should be packaged in plastic lined cloth bags provided by the Materials Division or 4-liter (1 gallon) friction top cans.

Each sample should be properly identified by filling out and attaching card form M-401.

Samples should weigh approximately 5 kg (10 lb).

On job where hydrated lime is used to treat subgrade soils, one sample should be submitted to the central laboratory for each 250 tons delivered. Special care should be taken so as not to obtain a sample contaminated with subgrade material.

SAMPLING WATER

When water is to be used from a source such as lakes, streams or borrow pits, samples shall be taken from the vicinity of the suction inlet to the pump.

Samples should contain approximately 4 liters (1 gallon) and be placed in a clean plastic bottle with a lid which provides a positive seal.

Water obtained from a municipal water supply does not require sampling.

Method Replaced with AASHTO R 60

SAMPLING REINFORCING AND MISCELLANEOUS STEELS*

REINFORCING BARS: Samples 48 inches long shall be cut from each size bar from each producer. Lengths or pieces less than 48 inches cannot be tested.

WIRE MESH: Cut samples approximately five feet by width from each type of mesh.

SEVEN WIRE STRAND FOR PRESTRESSED CONCRETE: One sample shall be taken from one end of each reel or coil. The length of sample shall be approximately six (6) feet. Chemical and physical test results shall be furnished for each shipment by the manufacturer and forwarded to the Materials Division with the samples.

SAMPLING SPAN WIRE AND GUY WIRE: Two samples shall be taken from one end of each reel or coil. The length of the samples shall be approximately 6 feet.

BOLTS, NUTS AND WASHERS: Two complete units should be sampled at random from each size and or lot furnished.

CHAIRS AND BAR SUPPORTS: Chairs and bar supports with galvanized, plastic coated or stainless-steel feet should have one sample submitted for each size furnished. (These may be approved and certified by Resident Engineer).

*All samples must be tagged with the appropriate information.

SAMPLING PREFORMED EXPANSION JOINT FILLER, NON-EXTRUDING AND RESILIENT TYPES

Preformed expansion joint fillers shall be sampled to provide a 3 sq ft (0.4 sq m) sample for each thickness. One representative sample shall be selected from each shipment of 1,000 square feet or any fraction thereof of each thickness ordered. Samples shall be packaged for transportation in such a manner that there will be no danger of distortion or breakage.

Samples of self-expanding cork, in addition to the above, shall be kept dry as received and wrapped for transportation in a manner that will prevent the entrance of moisture.

SAMPLING GEOTEXTILE FABRIC

Geotextile fabric materials shall be sampled at the rate of one sample per shipment. The samples shall be cut from one randomly selected roll and shall contain a minimum of 3 sq yd (3 sq m) of material cut across the full width of the roll.

SAMPLING PREFORMED PLASTIC UNDERDRAIN

Preformed plastic underdrain pipe shall be sampled at the rate of three samples, each at least 6.5 feet (2 m) in length, selected at random from each shipment to the job site or one set of three samples per each 25,000 ft (7620 m) of pipe or part thereof if a shipment exceeds this amount.

SAMPLING FENCING MATERIALS

BARBED WIRE: A sample shall be taken at random for each 50 rolls and shall be approximately 2 m (6 ft) in length.

FARM FENCE: A sample shall be taken at random from each 50 rolls or fraction thereof, in a lot or a total of seven rolls, whichever is less. A lot shall consist of rolls of a single design, grade, coating type or class offered for inspection. Samples shall be approximately 6 ft (2 m) in length and shall extend the full width of the roll.

CHAIN LINK FENCE: A fabric sample shall be taken at random for each 50 rolls; however, in no case shall fewer than two (2) rolls from the entire quantity offered for inspection be sampled, except when the entire quantity offered for inspection is fewer than 10 rolls; then only one roll shall be sampled. Samples shall be approximately 6 ft (2 m) in length and shall extend full width of the roll.

SMOOTH WIRE FOR BRACING: A sample shall be taken for each 50 rolls at random. Samples shall be approximately 2 m (6 ft) in length.

METAL POSTS AND ACCESSORIES: Posts and accessories shall be sampled at random. One sample shall be taken of each post or accessory from each shipment of 500 pieces or less for the same shape offered for inspection.

CLASS C AND D FENCE MATERIALS: Wire and hardware used to construct Class C and D fence may be accepted and certified by the Resident Engineer.

SAMPLING WOODEN PRESSURED TREATED FENCE POSTS

The following procedure shall be used in obtaining core samples of wooden posts:

Wooden fence posts shall be sampled using a calibrated increment borer at the rate of **one sample of 20 wood cores minimum per treatment charge,** (or portion thereof) or per shipment, of each type preservative treatment (creosote, pentachlorophenol, or chromate copper arsenate).

No cores required if job has less than 50 posts.

The cores shall represent a random sample of all sizes of posts well distributed throughout the charge and shall be representative of the size mix in the charge. Only one core may be taken per post.

Cores are to be taken from the approximate longitudinal midpoint of the post and shall be drilled to the center of the post and at a right angle to the length of the post. Cores shall be a minimum of 2.0 inches in length. Cores containing cracks, knots or an internal defect, or crushed, broken or smeared with treating solution shall be discarded and not counted toward required 20 cores. Care should be taken to avoid nails and staples if samples are obtained from installed posts.

Samples should be handled carefully to preserve the integrity of the core and shall be placed in a suitable sealed container for transport to Materials Division. Containers may be obtained from the Materials Division. Cores should be marked in such a manner that the proper orientation may be determined. The serial number of the increment borer shall be indicated on the sample card, to allow for use of the borer's core diameter in the assay. If this has not been determined or the borer has been sharpened, contact the Materials Division Central Laboratory to allow for determination. Core diameter should be accurately determined to the nearest 0.001 inch.

Should the increment borer require maintenance and/or sharpening, it should be sent to the Materials Division Equipment Section Recalibration is required after any major maintenance or sharpening. Arrangements may be made by the post or timber supplier for presampling and testing by contacting the Materials Division.

Materials Division will then assign the appropriate DMS or Central Office personnel to perform the Post Yard sampling. When pre-testing is performed, the posts may be accepted by the Resident Engineer on the basis of the shipment being tagged with ARDOT identifying tags and telephone verification of the test results from Materials Division. Test reports will then be forwarded if not received by the Resident Engineer prior to receiving the shipment of posts on the job.

BITUMINOUS COATED CULVERT METAL PIPE(BCCM)

BCCM is accepted on Manufacturer's Certification (See Qualified Products List) when deemed necessary by the Materials Engineer, samples shall be taken for testing.

Thickness measurements are to be made in the field to determine compliance with the governing specifications which require a minimum thickness of coating of 0.05 inch measured on the crests of the corrugations.

This requirement applies to both inside and outside of the pipe. Gauges for this measurement are furnished by Materials Division.

Documentation of coating measurements should be recorded in the drainage books. Rejected material shall be noted in the job diary and marked REJECT".

After all BCCM pipe has been checked and used on the job the Resident Engineer shall certify, in writing, to the of Materials Engineer that the asphalt coating on all BCCM pipe incorporated into the job was checked and found to comply with the specifications.

SAMPLING GLASS BEADS

Glass beads for reflectorization shall be sampled at the rate of three 50 lb (23 kg) bags for each lot of 10,000 lb (45 kg) or less.

Every effort should be made to determine the lot number. Where lot numbers are not readily located or are not practical for other reasons, the beads should be sampled randomly at the rate of three bags per truckload or shipment.

If sampling from bulk containers, contact the Materials Division for assist, as sampling this type of container requires utilization of a special sample probe.

SAMPLING THERMOPLASTIC TRAFFIC LINE MATERIAL

Yellow and white thermoplastic material shall be randomly sampled at the rate of three 50 lb (23 kg) bags for each lot of 40,000 lb (18,000 kg) or less.

Every effort should be made to determine the lot number. Where lot numbers are not readily located or are not practical for other reasons, the thermoplastic should be sampled randomly at the rate of three bags per truckload or shipment.

NOTE: Care should be taken not to expose the sample to extreme heat.

SAMPLING MISCELLANEOUS MATERIALS

Materials in rolls such as treated cotton fabric, cotton duck, roll roofing, asphalt felt, and jute matting shall be sampled from the full width of a roll taken at random from the shipment or lot. The first foot (1 meter) of the roll shall be discarded and both ends of the sample shall be cut squarely across the strip. The sample shall be approximately 4 ft (1.5 m) in length.

Premolded joint filler shall be sampled at random and approximately 3 sq ft (0.3 sq m) should be included in the sample.

Preformed plastic gaskets for concrete pipe joints shall be sampled at the request of the Materials Division.

SAMPLING BOILED LINSEED OIL

Boiled linseed oil shall be sampled at the rate of one sample per lot/batch number. Secure a 1 gallon (4 liter) representative undiluted sample from one or more containers.

(Sample should not contain mineral spirits).

SAMPLING PAINT

Some paints may be approved prior to shipment to the job and may be used if properly identified and documented. All paints that cannot be properly identified as approved must be sampled and tested prior to use. Samples of paint shall be submitted to the Materials Division at least two weeks prior to intended use.

When paint is shipped in smaller quantity containers, the Engineer may randomly select one container from each Lot or Batch for each type of paint and submit the container to the Central Laboratory. On multiple component paints, a container of each component shall be submitted. When practical upon completion of testing, Materials Division personnel will arrange to return the remaining useable portion to the job.

Paint which is shipped in large containers will be sampled by Materials Division laboratory personnel at the approved storage site at or near the job. The Engineer shall make arrangements with the Materials Division for the sampling. The Engineer shall record the lot or batch number/s of the paint and the quantity. If mixing is required, site selected will have access to 110-volt commercial electric power to be provided by the Contractor. In lieu of commercial electric power, the Contractor may provide a suitable 110-volt portable generator.

The paint shall be thoroughly mixed to a homogeneous condition with special care being taken to re-incorporate all settled pigment from the bottom of the container. When possible, continuous mixing with a power-driven stirrer shall be maintained prior to sampling and throughout the sampling process to prevent pigment separation. When it is not practical to thoroughly mix paint in a tote, a sample can be pulled from the outlet valve after drainage of 5 to 10 gallons into a clean bucket. The drained paint can be returned to the tote. Following sampling of waterborne paints, a light layer of distilled water should be placed over the paint surface of the sampled container after sampling to minimize potential skinning. The container should be marked as having been sampled.

The minimum size sample for all paints is one quart (one liter) for each lot or each batch represented. Each sample shall be properly identified by the Manufacturer's name, lot number, batch number, quantity, and type of paint. Copies of any certifications included with the paint shall be submitted.

TEST METHOD FOR DELETERIOUS MATTER IN AGGREGATE

1. SCOPE

1.1 This test method provides a procedure for determining the percentage, by weight, of deleterious material contained in aggregate.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- M 92, Wire-Cloth Sieves for Testing Purposes
- M 231, Weighing Devices Used in the Testing of Materials
- R 90, Sampling of Aggregates
- R 76, Reducing Sample of Aggregate to Testing Size

3. SIGNIFICANCE AND USE

3.1 This test method is of primary significance in determining the acceptability of aggregate for use in Asphalt Concrete Hot Mix and Portland Cement Concrete.

4. APPARATUS

4.1 *Balance* - The balance shall have sufficient capacity, be readable to 0.1 percent of the sample mass, or better, and conform to the requirements of M 231.

4.2 *Sieves* - Sieves conforming to M 92.

4.3 *Hot Plate or Oven* - An oven providing free circulation of air and capable of maintaining a temperature of 230 ± 9 °F (110 ± 5 °C).

4.4 *Scratching Surface* – Shall consist of a non-glazed ceramic streak plate or mortar bowl.

5. PROCEDURE

5.1 Obtain a representative sample of the aggregate in accordance with AASHTO R 90 and R 76 to obtain a final weight after sieving as specified in Table 1 of Section 5.3.

5.2 Dry the sample to constant mass at a temperature of 230 ± 9 °F (110 ± 5 °C), allow to cool, and determine the mass of it to the nearest 0.1 percent of the total original dry sample mass.

5.3 Sieve the dried test sample over the No. 4 (4.75 mm) sieve in such a manner as to avoid breaking up any clay lumps which might be present. Obtain the weight of aggregate particles retained on the No. 4 (4.75 mm) sieve and record as the total weight of the test sample. Discard the portion of material passing the No. 4 (4.75 mm) sieve.

5.3.1 The weight of the sample, after sieving, should be in accordance with the following table:

Size of Particles in Sample	Weight of Sample (grams)
No. 4 to 3/8” (4.75mm to 9.5mm)	500
No. 4 to 1/2" (4.75 mm to 12.5 mm)	2000
No. 4 to 3/4” (4.75 mm to 19 mm)	3000
No. 4 to 1 1/2" (4.75 mm to 37.5 mm)	9000

5.4 Spread the aggregate sample (portion retained on the No. 4 (4.75 mm) sieve) out on a large sheet of heavy paper on a worktable so that the individual particles can be carefully examined.

5.5 By visual and physical classification, separate each type of deleterious matter such as clay lumps, slate, shale, friable particles, etc. from the remainder of the sample. Any particles which can be broken into finely divided particles with the fingers shall be classified as friable particles. A particle shall be counted as deleterious shale if it (1) consists of 100 percent shale, (2) has shale adhering to it which visually comprises 50 percent or more of the particle or (3) has shale within it which visually comprises 50 percent or more of the particle. Slate and shale can be identified by scratching against the non-glazed area of a mortar bowl or streak plate. A fragment of slate or shale will leave a colored mark on the surface of the mortar bowl or streak plate.

5.6 Obtain the weight of objectionable material removed from aggregate sample.

6. CALCULATION

6.1 The percentage of the deleterious matter present shall be calculated to the nearest 0.1 percent by dividing the weight of deleterious material by the weight of the total sample (portion retained on No. 4 (4.75 mm) sieve) and multiplying by 100.

$$C = (A / B) \times 100$$

where:

A = weight of deleterious material
B = weight of total sample (portion retained on No. 4 (4.75 mm) sieve
C = percentage of the deleterious matter

TEST METHOD FOR CRUSHED PARTICLES IN AGGREGATE

1. SCOPE

1.1 This test method provides a procedure for determination of percentage of crushed particles in aggregate.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- M92, Wire-Cloth Sieves for Testing Purposes
- M231, Weighing Devices Used in the Testing of Materials
- R 90, Sampling of Aggregates
- R 76, Reducing Sample of Aggregate to Testing Size

3. SIGNIFICANCE AND USE

3.1 This test method is of primary significance in determining the acceptability of aggregate for use in meeting the requirements of Section 303 of the Standard Specifications for Highway Construction.

4. APPARATUS

4.1 *Balance* - The balance shall have sufficient capacity, be readable to 0.1 percent of the sample mass, or better, and conform to the requirements of M 231.

4.2 *Sieves* - Sieves conforming to M 92.

4.3 *Hot Plate or Oven* - An oven providing free circulation of air and capable of maintaining a temperature of 230 ± 9 °F (110 ± 5 °C).

5. PROCEDURE

5.1 Obtain a representative sample of the aggregate in accordance with AASHTO R 90 and R 76 to obtain a final weight after sieving as specified in Table 1 of Section 5.3.1.

5.2 Dry the sample to constant mass at a temperature of 230 ± 9 °F (110 ± 5 °C), allow to cool, and determine the mass of it to the nearest 0.1 percent of the total original dry sample mass.

5.3 The sample shall be sieved over the Number (4.75mm), as specified, and the test performed on the coarse fraction retained on the respective sieve. A

representative sample shall be selected by quartering or splitting so as to obtain, after sieving, weights conforming to Table 1 of 5.3.1.

5.3.1

Table 1

Size of Particles	Weight of Sample (grams)
No. 4 to 1/2" (4.75 mm to 12.5 mm)	500
No. 4 to 3/4" (4.75 mm to 19.0 mm)	1000
No. 4 to 1 1/2" (4.75 mm to 37.5 mm)	1500

5.4 Weigh the representative sample obtained in 5.3.

5.5 The representative sample shall be spread in a thin layer on the bottom of a large container or on a large sheet of heavy paper. The particles with crushed faces shall be separated from those having no crushed faces.

6. CALCULATION

6.1 The particles with crushed faces shall be weighed.

6.2 The percentage of crushed particles present shall be calculated to the nearest 0.1 percent by dividing the weight of crushed face particles by the weight of the total sample (portion retained on No. 4 (4.75 mm) sieve), and multiplying by 100.

$$C = (A / B) \times 100$$

where:
A = weight of crushed face particles
B = weight of total sample [portion retained on No. 4 (4.75 mm) sieve]
C = percentage of crushed particles (Round to nearest whole number)

TEST METHOD FOR TOTAL INSOLUBLE RESIDUE IN COARSE AGGREGATE

1. SCOPE

1.1 This method is intended for the determination of acid insoluble material in coarse aggregates.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- M92, Wire-Cloth Sieves for Testing Purposes
- M231, Weighing Devices Used in the Testing of Materials
- R 90, Sampling of Aggregates
- R 76, Reducing Sample of Aggregate to Testing Size

3. SIGNIFICANCE AND USE

3.1 This test method is of primary significance in determining the acceptability of aggregate for use in meeting the requirements of Section 409 of the Standard Specifications for Highway Construction.

4. APPARATUS

4.1 *Balance* - The balance shall have sufficient capacity, be readable to 0.1 percent of the sample mass, or better, and conform to the requirements of M 231.

4.2 *Sieves* - Sieves conforming to M 92.

4.3 *Hot Plate or Oven* - An oven providing free circulation of air and capable of maintaining a temperature of 230 ± 9 °F (110 ± 5 °C).

4.4 800 mL Pyrex beaker.

4.5 Watch Glass (Pyrex)

5. MATERIALS

5.1 Reagent Grade Hydrochloric Acid

6. PROCEDURE

6.1 Obtain a representative sample of the aggregate in accordance with AASHTO R 90 and R 76.

6.2 Dry the sample to constant mass at a temperature of 230 ± 9 °F (110 ± 5 °C), allow to cool, and determine the mass of it to the nearest 0.1 percent of the total original dry sample mass.

6.3 The sample shall be sieved over the 3/4 in. (19.0mm) and No. 8 (2.36mm) sieve in order to obtain a final weight after sieving of approximately 200 grams. The test shall be performed on the coarse fraction retained on the No.8 (2.36mm) sieve.

6.4 A representative sample shall be selected by quartering or splitting so as to obtain, after sieving, a weight of 200 grams. Determine the sample mass to the accuracy specified in Section 4.1.

6.5 Place weighed sample into labeled 800 ml beaker.

6.6 Add 500 ml of 1:1 Hydrochloric Acid; cover with watch glass.

6.7 Bring to boil, and boil for 1 hr. If reaction not complete, repeat 6.6 - 6.7.

6.8 Remove from heat & cool for 1 hr.

6.9 Decant solution over No. 200 (75µm) sieve with tap water wash; place contents of beaker on the No. 200 (75µm) sieve, and wash with tap water.

6.10 Wash with Acetone.

6.11 Dry the sample to constant mass at a temperature of 230 ± 9 °F (110 ± 5 °C), allow to cool, for 1 hour, determine the mass of the sample retained on the #200 sieve to the nearest 0.1 percent of the total original dry sample mass.

7. CALCULATION

7.1 The percentage of insoluble particles retained on the No. 200 (75µm) sieve shall be calculated to the nearest 0.1 percent by dividing the weight of retained particles by the weight of the total sample (passing 3/4 in (19.0mm.) sieve and retained on No. 8 (2.36mm) sieve), and multiplying by 100.

$$C = (A / B) \times 100$$

where:

A = weight of particles retained on 75µm (Number 200) sieve
B = weight of total sample (passing 3/4 in (19.0mm.) sieve and retained on No. 8 (2.36mm) sieve)
C = percentage of insoluble particles

TEST METHOD FOR DETERMINING MOISTURE CONTENT BY SPEEDY MOISTURE TESTER

1. SCOPE

1.1 This method provides a procedure for determining the moisture content of soils or fine aggregates by using a calcium carbide gas pressure moisture tester. In general, samples having appreciable material retained on the 4.75 mm (#4) sieve should not be tested by this method. This test method generally follows AASHTO T 217.

2. REFERENCED DOCUMENTS

2.1 American Association of State Highway and Transportation Officials *(AASHTO) Standards:*

- AASHTO T 217, Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester.
- AASHTO M 231, Weighing Devices Used in the Testing of Materials.
- AASHTO R 11, Indicating Which Places of Figures Are to Be Considered Significant in Specified Limiting Values.
- AASHTO R 16, Regulatory Information for Chemicals Used in AASHTO Tests.
- AASHTO T 265, Laboratory Determination of Moisture Content of Soils.

3. SIGNIFICANCE AND USE

3.1 This test method is of primary significance in determining the acceptability of soil materials for use in meeting the requirements of Sections 210, 301, 302, and 306 of the Standard Specifications for Highway Construction.

4. APPARATUS

4.1 *Calcium Carbide Pressure Moisture Tester* - a chamber with attached pressure gage for the water content of specimens having a mass of at least 20 grams.

4.2 *Balance* – shall conform to M 231, Class G2.

4.3 Two 1.25 in. (31.75 mm) diameter steel balls.

5. MATERIAL

5.1 Calcium carbide reagent.

Note: The calcium carbide must be finely pulverized and should be of a grade capable of producing acetylene gas in the amount of at least 2.25 ft^3 / lb (0.14 m^3 / kg) of carbide. The "shelf life" of the calcium carbide reagent is limited, so it should be used according to the manufacturer's recommendations.

6. PROCEDURE

6.1 Place two steel balls 1.25 in. (31.75 mm diameter) inside the Body of the tester.

6.2 Place three level scoops (approx. 24 grams) of calcium carbide reagent in the Body of the moisture tester.

Note: The carbide reagent reacts violently with moisture and care should be exercised by the operator when using it.

6.3 Weigh a sample to be tested on the scale provided. The normal sample weight is 26 grams.

Note: If the moisture content of the sample exceeds the limit of the pressure gauge, (17 or 18 percent) a one - half size sample (13 grams) may be used by attaching the 13-gram weight provided to the weighing pan and doubling the obtained gauge reading, (2 X GAUGE READING). Even though the sample size may be one half, three (3) scoops of reagent should still be used. For low moisture contents, (Less than 5%), larger samples may be used. Two or three standard size samples (26 grams each) may be used, and the gauge reading divided by the number of samples used.

GAUGE READING
(NUMBER OF SAMPLES)

6.4 Place the weighed sample in the Cap of the tester. (Be certain cap is clean). Seal the tester by holding it horizontal to prevent any mixing of sample with reagent. Place the cap in position, bring stirrup around the cap and tighten the top screw. A pressure tight seal is critical.

6.5 Raise the moisture tester to a vertical position so that the soil in the cap will fall into the pressure vessel.

6.6 Mix the sample and reagent by shaking the tester vigorously so that all lumps will be broken up to permit carbide reaction with all available free moisture. The tester should be shaken with a rotating motion so that the steel balls will not damage the tester or cause soil particles to become embedded in the orifice leading to the pressure diaphragm. Repeat this procedure until the gauge needle stops and subsequent shaking produces no change in the gauge reading.

Note: For clay type soils the time to test may require up to ten minutes before the gauge needle stops. Three consecutive identical gauge readings (after shaking procedure) may be used to determine that the moisture content has been adequately determined.

6.7 When the gauge needle stops moving, read the dial (to nearest 0.1%) while holding the tester in a horizontal position with the gauge vertical and facing the operator.

6.8 Record the dial reading (To the nearest 0.1%).

Note: The dial reading represents the percentage of moisture by wet weight of material and must be converted to dry weight. (See 6.10).

6.9 With the cap of the tester pointed away from the operator, slowly release the gas pressure by loosening the top screw. Empty the tester and clean it. Examine the tested material for lumps. If the sample is not completely pulverized, the test should be repeated using a new sample.

7. CALCULATION

7.1 The percentage of moisture by dry weight of the sample shall be determined from the conversion chart provided (or the one included with) the tester kit.

Note: For sample weights other than the standard (26 grams) such as 13 grams the gauge reading must be adjusted before conversion from the chart. (see 6.3 notes) Newer gauges may use various standard sample weights.

7.2 The conversion chart should be used as shown by the example below.

Example:

A 13-gram clay sample has been tested and the gauge reading is 11.7%. Therefore: 11.7% X 2 = 23.4% corrected gauge reading.

From the conversion chart locate 23% in the left column.

Go across the 23% row until the 0.4% column is reached and record 30.5%.

8. CARE – CALIBRATION - REPAIR

8.1 The carbide moisture tester is a durable, precision instrument. To obtain accurate results and service life from the tester it is essential that the apparatus be kept clean, and the wooden case kept dry.

8.2 Should the moisture tester need repairs, replacement parts, or recalibration, the entire kit should be returned to the Materials Division for this service.

SPEEDY MOISTURE TESTER CONVERSION CHART

%	0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	1.0	1.1	1.2	1.3	1.4	1.6	1.7	1.8	1.9	2.0
2	2.1	2.2	2.3	2.4	2.5	2.7	2.8	2.9	3.0	3.1
3	3.2	3.3	3.4	3.5	3.6	3.8	3.9	4.0	4.1	4.2
4	4.3	4.4	4.5	4.6	4.7	4.9	5.0	5.1	5.2	5.3
5	5.4	5.5	5.6	5.7	5.8	6.0	6.1	6.2	6.3	6.4
6	6.5	6.6	6.7	6.8	6.9	7.1	7.2	7.3	7.4	7.5
7	7.6	7.7	7.8	7.9	8.0	8.2	8.3	8.4	8.5	8.6
8	8.7	8.8	8.9	9.0	9.1	9.3	9.4	9.5	9.6	9.7
9	9.8	9.9	10.0	10.1	10.3	10.4	10.5	10.6	10.8	10.9
10	11.0	11.1	11.3	11.4	11.6	11.7	11.8	11.9	12.1	12.2
11	12.3	12.4	12.6	12.7	12.9	13.0	13.1	13.2	13.4	13.5
12	13.6	13.7	13.8	14.0	14.1	14.2	14.3	14.5	14.6	14.8
13	14.9	15.0	15.2	15.3	15.5	15.6	15.7	15.9	16.0	16.2
14	16.3	16.4	16.5	16.7	16.8	16.9	17.0	17.2	17.3	17.5
15	17.6	17.7	17.9	18.0	18.2	18.3	18.4	18.6	18.7	18.9
16	19.0	19.1	19.3	19.4	19.6	19.7	19.8	20.0	20.1	20.3
17	20.4	20.6	20.7	20.9	21.0	21.2	21.3	21.5	21.6	21.8
18	21.9	22.1	22.2	22.4	22.6	22.7	22.8	23.0	23.1	23.3
19	23.4	23.6	23.7	23.9	24.0	24.2	24.4	24.5	24.7	24.8
20	25.0	25.2	25.3	25.6	25.8	25.8	25.9	26.1	26.2	26.4
21	26.5	26.7	26.9	27.0	27.2	27.4	27.6	27.7	27.9	28.0
22	28.2	28.4	28.5	28.7	28.8	29.0	29.2	29.3	29.5	29.6
23	29.8	30.0	30.2	30.3	30.5	30.7	30.9	31.0	31.2	31.3
24	31.5	31.7	31.9	32.0	32.2	32.4	32.6	32.8	32.9	33.1
25	33.3	33.5	33.7	33.8	34.0	34.2	34.4	34.6	34.9	35.1
26	35.3	35.4	35.6	35.7	35.9	36.0	36.2	36.4	36.5	36.7
27	36.9	37.1	37.3	37.5	37.7	37.9	38.1	38.3	38.4	38.6

TEST METHOD FOR MOISTURE CONTENT OF SOILS OR AGGREGATES

Method Replaced with AASHTO T 255 for Aggregates and AASHTO T 265 for Soils.

TEST METHOD FOR JAR SLAKE TEST

1. SCOPE

1.1 The test is intended to assess the resistance to weathering of rock samples by a simple and quick procedure. The basis for the test is that weak cemented or compacted argillaceous materials absorb moisture when subjected to a very basic, simulated Slake Durability Index (SDI) on the samples which are weakest and disaggregate (breakdown) readily.

2. REFERENCED DOCUMENTS

2.1 *Kentucky State Department of Transportation Test Methods:*
- Test Method 64-514-08

2.2 *Arkansas Department of Transportation Test Methods:*
- ARDOT TM 399, Test Method for Determination of Slake Durability Index

3. APPARATUS

3.1 Drying oven capable of maintaining a temperature of 230 ± 9 °F (110 ± 5 °C).

3.2 Beakers or at least 250 milliliter capacity.

3.3 Distilled or tap water.

4. SAMPLE

4.1 Representative samples may be obtained from drilled core samples, excavation sites, shot rock from quarries or other available sources.

4.2 Samples may be prepared for testing by crushing, splitting, and / or efficient means which will produce the desired size of sample.

4.3 Adequate information should be supplied with the samples to identify properly and exactly such as job number, station number, location, depth, and any other pertinent information which might be of value.

4.4 Select representative samples for testing from the original rock source.

5. PROCEDURE

5.1 Oven dry at 230 ± 9 °F (110 ± 5 °C) an approximately 50-gram sample of material for at least 6 hours, then let it cool at least 30 minutes at room temperature.

5.2 Immerse the sample in a beaker of distilled or tap water at least one-half inch below the surface.

5.3 Observe at 5, 10, 15, 30, 45 and 60 minutes for the first hour noting the time and behavior with each observation; then at intervals (2, 4, 6, 8, and 24 hours) thereafter.

6. REPORT

6.1 If sample breaks down completely, report SDI = 0.

6.2 If partial breakdown or no change occurs, report according to the following scheme. Slake Durability Index Test must then be performed (ARDOT Test Method 399).

6.2.1 Category Behavior

1. Degrades to pile of flakes or mud (complete Breakdown).
2. Breaks rapidly and/or forms many chips.
3. Breaks slowly and/or forms many chips.
4. Breaks rapidly and/or develops several fractures.
5. Breaks slowly and/or develops few fractures.
6. No change.

6.3 The report should also include an estimation of the rock's hardness based on the following classification:

6.3.1

Jar Index (JI)	Slake Durability Index (SDI)	Classification
6	95-100	Hard
*4, 5	50-94	Medium Hard
1, 2, 3	Less than 50	Soft

**Caution:*
The Jar Slake Test is only meant to be a quick indicator test and is not intended to be used instead of the SDI Test. The SDI Test should be used as the primary test for determining the true characteristics of the rock being evaluated.

TEST METHOD FOR DETERMINATION OF SLAKE DURABILITY INDEX

1. SCOPE

1.1 The test procedures are intended to assess the resistance to weathering of rock samples after being subjected to two (2) standard cycles or drying and wetting. The basis for the tests is that weakly cemented or compacted argillaceous materials absorb moisture when subjected to a simulated weathering. Moisture absorption by the soil-like rock may cause disaggregation in the form of powdering, spalling, or flaking of the sample surface, or separations along bedding planes.

2. REFERENCED DOCUMENTS

2.1 *Kentucky State Department of Transportation Test Methods:*
- Test Method 64-514-08

3. APPARATUS

3.1 Slake durability testing machine.

3.1.1 A test drum comprised of a 2.00 mm standard mesh cylinder of unobstructed length 100 mm and diameter 140 mm, with solid fixed base. The drum has a solid removable lid. The drum must be sufficiently strong to retain its shape during use, but neither the exterior of the mesh nor the interior of the drum should be obstructed for example, by reinforcing members.

3.1.2 A trough, to contain the test drum supported with axis horizontal in a manner allowing free rotation, capable or being filled with water to a level 20 mm below the drum axis. The drum is mounted to allow 40 mm unobstructed clearance between the trough and the base of the mesh. The principal features of the trough and drum assembly are illustrated below.

3.1.3 A motor drive capable of rotating the drum at speed of 20 rpm, the speed must be held to within 5 percent for a period of 10 minutes.

3.2 An oven capable of maintaining a temperature of 230 ± 9 °F (110 ± 5 °C) for a period of at least 12 hours.

3.3 A balance of suitable capacity capable of weighing to an accuracy of 1.0 grams.

3.4 Containers of at least 500 milliliter capacity. (Porcelain Pans, Beakers, or similar).

4. SAMPLE

4.1 Representative samples may be obtained from drilled core samples, excavation sites, shot rock from quarries or other available sources.

4.2 Samples may be prepared for testing by crushing, splitting, or any efficient means which will produce the desired size of sample.

4.3 Adequate information should be supplied with the samples to identify properly and exactly such as job number, station number, location, depth, and any other pertinent information which might be or value.

4.4 Select representative samples for testing from the original rock source.

5. PROCEDURE

5.1 Number containers.

5.2 Select samples and place them in numbered containers. Use 10 pieces of material in each container. Each piece should weigh 40 – 50 grams. The total sample should weight 450-550 grams.

5.3 Oven dry sample for at least 12 hours @ 230 ± 9 °F (110 ± 5 °C).

5.4 Weigh and record the weight of the sample (W1).

5.5 Place the oven dried sample in the test drum and mount in the trough. Adjust water level in the trough to 20 mm below the horizontal drum axis and rotate the drum at 20 revolutions per minute for 10 minutes.

5.6 Remove the sample from the drum and repeat Steps 5.3 and 5.5.

5.7 Remove the sample from the drum and oven dry sample for at least 12 hours @ 230 ± 9 °F (110 ± 5 °C).

5.8 Weigh and record the weight of the sample (W2).

6. CALCULATION

6.1 The Slake Durability Index is calculated as the percentage ratio of final to initial dry sample weights as follows:

$$\text{Slake Durability Index (SDI)} = (W2 / W1) \times 100$$

7. REPORT

7.1 The report should include the following information for each sample tested.

7.1.1 The Slake Durability Index (second cycle) to the nearest 0.1 percent.

7.1.2 The appearance of fragments retained in the drum.

7.1.3 Any special comments which might apply such as:

- Test samples produced from core samples.
- Samples contained Sandstone Layers
- Samples had thin silt and sand lenses cementing sample layers, etc.

DETERMINATION OF ASPHALT CONTENT OF ASPHALT MIXTURES BY THE NUCLEAR METHOD

1. SCOPE

1.1 This test method covers the quantitative determination of the asphalt binder content of asphalt mixtures by examining a sample with a device that utilizes neutron-thermalization techniques.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*
- T 287, Asphalt Binder Content of Asphalt Mixtures by the Nuclear Method
- T 168, Sampling Bituminous Paving Mixtures
- T 329, Moisture Content of Asphalt Mixtures by Oven

2.2 *Arkansas Department of Transportation Test Methods:*
- ARDOT 449A, Calibration of Asphalt Content Gauge Troxler 3241-C

2.3 *Arkansas Department of Transportation Special Provisions:*
- Submission of Asphalt Concrete Hot Mix Acceptance Test Results

3. APPARATUS

3.1 Nuclear Asphalt Content Gauge as described in AASHTO T 287.

3.2 Three or more stainless steel sample pans conforming to the gauge requirements.

3.3 Scales with a capacity of at least 12,000 grams and readable to 0.1 gram

3.4 Incidental equipment - thermometer, large spoon or trowel, gloves, safety equipment, etc.

3.5 Leveling plate – flat, rigid plate of metal [minimum thickness of 10 mm (0.4 in.)], Plexiglass [minimum thickness of 12.5 mm (0.5 in.), or nonabsorptive plywood [minimum thickness of 19 mm (0.75 in.)], slightly larger than the sample pans

4. HAZARDS

4.1 Operator must have attended the Nuclear Safety Class addressing the gauge being used and be in possession of his/her dosimeter badge as required by the Arkansas Department of Health before using the gauge. Accuracy depends

upon gauge calibration; great care should be taken in sample preparation and later measurements. Accurate calibration can be achieved by carefully following these instructions.

4.2 This apparatus may be sensitive to outside influences; therefore, any other source of neutron radiation shall be kept at least 10 m [30 ft.] from the apparatus during use. The area around the apparatus shall be kept free of large amounts of hydrogenous material, such as water, plastics, or asphalt during use.

5. PROCEDURE

5.1 Perform a background count with gauge. This should be an eight (8) minute or greater reading. The background count should be performed daily or whenever the gauge has been moved or the conditions within 1 m (3.3 ft) have changed.

5.2 If the background count has not changed by more the 1 percent from the previous background count, then the apparatus shall be considered stable and acceptable for use. If the gauge has been moved or if the surrounding conditions have changed, additional background counts must be obtained until the 1 percent standard is satisfied.

5.3 Record background counts on a daily log.

5.4 Ensure appropriate calibration information is activated in the gauge.

5.5 Obtain a representative sample of asphalt mixture in accordance with AASHTO T 168.

5.6 Place the asphalt mixture into the pan until it is about half full. Lightly tamp the asphalt mixture in the pan with a preheated spoon or spatula.

5.7 Place additional asphalt mixture into the pan until the required weight, as determined in mix design calibration (ARDOT 449A), is reached within ± 5 grams.

5.8 Place the leveling plate on top of the asphalt mixture immediately after filling the pan. Compact the sample into the pan until it is level with the top of the pan by pressing down on the plate. Sight across the top of the pan to ensure that the asphalt mixture does not protrude above the pan.

5.9 Verify that the weight is still within ± 5 grams of the calibration weight.

5.10 Measure the temperature of the sample. The sample shall be tested at the approximate temperature ± 10 °F (± 5.5 °C) of the calibration samples.

5.11 Place sample pan in gauge. Close and latch the door.

5.12 Run a 4, 8, or 16-minute test of the sample.

5.13 Remove sample pan from gauge and empty sample from pan (Additional tests can be performed on the same sample before removing it from the pan if desired. Results from multiple tests of the same sample will be reported as an average.) Record counts and asphalt content from gauge to the nearest 0.01%.

5.14 Determine moisture content of asphalt mixtures by oven method to the nearest 0.01%. (AASHTO T 329)

5.15 Subtract moisture content from gauge derived asphalt content and report to 0.1%. This is the reported asphalt content.

5.16 During production of asphalt a dry aggregate blank sample may be prepared and tested to ensure that changes in aggregate do not occur unnoticed.

5.17 After an interruption of mix production of more than 120 calendar days a verification of the mix calibration shall be performed by preparing a sample for testing in the gauge at the design asphalt content. A record with date, mix design number and mix design production dates shall be kept with the gauge calibration worksheets.

6. REPORT

6.1 Complete the Asphalt Plant Inspector's Workbook

6.2 Report the daily background count on the gauge log.

Nuclear Asphalt Content Gauge
Background Count Log

Date	Counts	Date	Counts	Date	Counts

CALIBRATION OF ASPHALT CONTENT GAUGE TROXLER 3241-C

1. SCOPE

1.1 This procedure covers the calibration of the asphalt binder content mixtures by testing a sample with a nuclear gauge.

1.2 Calibration samples are batched from percentages of aggregate, asphalt binder, Recycled Asphalt Pavement (RAP), and/or Recycled Asphalt Shingles (RAS) determined by the job mix design. Develop a new calibration curve whenever there is a change in the source of asphalt or aggregate, or a significant change in aggregate gradation.

1.3 Mix a minimum of three asphalt concrete samples:
- one at the design asphalt cement content
- one at 1.0% above the design asphalt cement content
- one at 1.0% below the design asphalt cement content

1.4 Mixing can be achieved by mechanical or hand-mixing. Hand-mixing is not recommended. Mechanically mix the aggregate and asphalt binder for a minimum of 2 minutes until they are thoroughly blended. Check the bottom and sides of the bowl for unmixed aggregate and asphalt binder. If necessary, mixing may be performed by hand in a large bowl. In this case, the mixing time shall be a minimum of 5 minutes, but it may be longer to ensure through mixing.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*
- T 287, Asphalt Binder Content of Asphalt Mixtures by the Nuclear Method

2.2 *Arkansas Department of Transportation Test Methods:*
- ARDOT 449, Test Method for Determination of Asphalt Content of Asphalt Mixtures by the Nuclear Method

3. APPARATUS

3.1 Nuclear Asphalt Content Gauge - Troxler Model 3241C

3.2 Three or more stainless steel sample pans conforming to the gauge requirements.

3.3 Asphalt Cement (AC) that will be used in the mix design (Approximately 1,800-2,300 grams of AC will be needed)

3.4 Aggregate to be used in the mix design, oven dried.

3.5 Oven, hot plate and/or infrared heater

3.6 Scales with a capacity of at least 12,000 grams and readable to 0.1 gram

3.7 Leveling plate – flat, rigid plate of metal [minimum thickness of 10 mm (0.4 in.)], Plexiglass [minimum thickness of 12.5 mm (0.5 in.), or nonabsorptive plywood [minimum thickness of 19 mm (0.75 in.)], slightly larger than the sample pans.

3.8 Thermometer with a temperature range of 10 to 260ºC (50 to 500ºF).

3.9 Containers capable of holding 10,000 grams of asphalt concrete hot mixes and of withstanding 350 °F.

3.10 Assorted small tools and items such as gloves, large mixing spoon or trowel, scoops, safety equipment, etc.

4. HAZARDS

4.1 Operator must have attended the Nuclear Safety Class addressing the gauge being used and be in possession of his/her dosimeter badge as required by the Arkansas Department of Health before using the gauge. Accuracy depends upon gauge calibration; great care should be taken in sample preparation and later measurements. Accurate calibration can be achieved by carefully following these instructions.

4.2 This apparatus may be sensitive to outside influences; therefore, any other source of neutron radiation shall be kept at least 10 m [30 ft.] from the apparatus during use. The area around the apparatus shall be kept free of large amounts of hydrogenous material, such as water, plastics, or asphalt during use.

5. MIX DESIGN CALIBRATION

5.1 Standardization - Perform 16-minute background count on the gauge. If the background count has not changed by more than 1 percent from the previous background count, then the apparatus shall be considered stable and acceptable for use. If the gauge has been moved or if the surrounding conditions have changed, additional background counts must be obtained until the 1 percent standard is satisfied.

5.2 Aggregate Preparation - Determine batch weights using the aggregate blend percentages in the mix design percentages. 8000 grams of dry aggregate/RAP/RAS should be used for each calibration pan. (See Figure 1)

5.3 Prepare four aggregate samples by blending the aggregates using the target mass determined in Section 5.2. Place them in separate pans designed for and capable of, transferring the dry aggregate into a mixing bowl with a minimum loss of aggregate. Place them in an oven set at the mixing temperature from the mix design.

Preparing samples with RAP and/or RAS: Combine hot (250 °F – 320 °F) aggregate to produce "blank" sample; add the unheated RAP portion of sample; place this mixture in heated oven to within ± 25 °F (± 14 °C) of the design mixing temperature for one hour. After one hour remove the sample and add RAS (if included in design) then thoroughly mix this aggregate and RAP/RAS sample.

5.4 "Blank" Pan - To determine the calibration weight for all sample pans, prepare a "blank" pan. Weigh a clean gauge-sample pan and/or tare the pan on the scale.

5.5 Fill the pan with dry, hot aggregate/RAP/RAS in 2 layers. The first layer should fill the pan approximately half full. Using a scoop, trowel, or mixing spoon, lightly tamp the aggregate paying special attention to work corner areas to eliminate air voids. Between layers, drop the pan onto the floor or table from an approximate height of 1 inch.

5.6 The second layer should fill pan just slightly over the top edge and using a straightedge, level the surface of the aggregate until the aggregate is even with the top edge of the pan. Weigh and record the net weight on calibration sheet to the nearest whole gram.

5.7 Determine temperature and record on calibration sheet, should be within 200 °F – 300 °F. Empty the calibration sample pan back into mixing bowl with any remaining aggregate. Remix aggregate by turning over with scoop at least 3 times.

5.8 Verify calibration weight by repeating steps 5.5 through 5.7 for a second blank sample. This net weight should be within ± 25 g of the first blank sample net weight. If not, repeat steps 5.5 through 5.7 until two samples are within tolerance. If within tolerance, use the last sample pan weight as the blank calibration weight.

5.9 Place the pan into the gauge and take a 16-minute count. Record the measured count. During production of asphalt a dry aggregate blank sample may be prepared and tested to ensure that changes in aggregate do not occur unnoticed.

5.10 An initial, or "butter" batch is prepared using an asphalt binder/aggregate blend approximating the real batches. This step is to put a light coat of asphalt on the mixing bowl to prevent loss during calibration. Discard material once this step is completed.

5.11 Determine the mass of the heated mixing bowl to the nearest 0.1 g.

5.12 Place a heated aggregate specimen, of the required mass to the nearest 0.1g, in the mixing bowl. Form a crater in the aggregate large enough to hold the asphalt. Place the mixing bowl on the scale. Add the required, preheated asphalt binder into the aggregate crater.

Example of Design with 5.3% AC

$$\text{Total Weight of Aggregate + Asphalt Binder Content} = \text{Total weight of aggregate blend} \Big/ \left[\frac{(100 - \text{asphalt binder content})}{100} \right]$$

$$8447.7\text{ g} = 8000\text{ g} \Big/ \left[\frac{(100 - 5.3)}{100} \right]$$

Adding asphalt binder for samples with RAP or RAS: The mix design will list the amount of new asphalt binder that should be added to the mix.

Example of Design with 5.3% AC, RAS contains 0.2% AC, RAP contains 0.1% AC

$$\text{Total Weight of Aggregate + Asphalt Binder Content} = \text{Total weight of aggregate blend/RAS/RAP} \Big/ \left[\frac{(100 - (\text{Design AC} - (\text{AC of RAS+RAP})))}{100} \right]$$

$$8421.1\text{ g} = 8000\text{ g} \Big/ \left[\frac{(100 - (5.3 - (0.2+0.1)))}{100} \right]$$

5.13 Remove the asphalt mixture from the mixing container and determine the weight of the empty mixing container to ensure that all material has been removed. The weight of the mixing container shall be within ± 5 g of the weight determined in Step 5.11. If it is not, scrape the bowl with a spatula and deposit the excess into the sample until the mixing container is within the tolerance.

5.14 Fill one sample pan with this mix. Fill the sample pan in two layers. For the first layer, fill sample pan approximately half full. Then, using a preheated spoon or spatula, lightly tamp the asphalt mixture paying special attention to lightly work the corner areas. For the second layer, fill sample pan to slightly heaping and weigh. Add or remove mix until the desired weight (determined in Step 5.8) is obtained.

5.15 Place the leveling plate on top of the asphalt mixture immediately after filling the pan. Compact the sample into the pan until it is level with the top of the pan by pressing down on the plate. Sight across the top of the pan to ensure that the asphalt mixture does not protrude above the pan. Verify that the weight is within ± 5 g of the calibration sample pan weight for all pans.

5.16 Determine temperature of sample and record; sample should be between 200 °F – 300 °F for testing. Calibrate at or near temperature field sample is expected to be; this will allow for the temperature loss of the sample between the time the sample is obtained and the time the sample is back at the lab for testing. The sample may be placed in the oven to retain temperature before the calibration procedure is started. DO NOT REHEAT SAMPLE ONCE THE CALIBRATION PROCEDURE HAS BEGUN.

5.17 Place sample in asphalt content gauge, close and latch door. Start a gauge derived, three-sample calibration using a 16-minute count.

5.18 Record Measure Count and percent (%) on calibration form.

5.19 Repeat Steps 5.12 through 5.18 for remaining calibration percentages.

5.20 Record "Fit Coefficient". The Fit Coefficient shall be 0.995 or greater to be acceptable. Review the calibration and record the A1, A2, A3 values.

5.21 Store calibration # and Mix ID using the digits in the mix design id after desired fit coefficient is obtained. Example: HM123-17 will be 12317

6. REPORT

6.1 Complete Calibration Worksheet found in Appendix.

6.2 Keep a log sheet of the Mix Designs stored in the gauge.

FIGURE 1

ARKANSAS DEPARTMENT OF TRANSPORTATION
AHTD 449A - Nuclear Asphalt Content Gauge - Calibration Record

Mix Design No.: _____ Plant/Location: _____

Type of Mix: _____ Asphalt Binder Type: _____

Design Expiration Date: _____ Asphalt Binder Source: _____

Gauge Serial No: _____ auge Background Count: _____

Mix Design % AC: _____ Mix Design % RAP: _____ *zero if design **does not** have RAP or RAS

x Design % AC *from RAP & RAS*: _____ Mix Design % RAS: _____

% AC Added, (Design %, -1%, | | | |

lix Batch Weight (grams 8000
*normally 8000 grams

Blank Sample Weight 1 _____ grams
Blank Sample Weight 2 _____ grams
Must be within ±25

% AC Calibration
(Design -1%, Design %, Design +1%)

Aggregate	Blend %	Dry Mix No AC	Dry Mix No AC
		Weight	Accum Wt
STO 001			
STO 002			
STO 003			
STO 004			
STO 005			
SA 001			
SA 002			
RAP			
RAS			
TOTAL	0	Aggr. Wt.	

*mix 4 or more pans as shown

Total weight for Aggregate & Asphalt Binder | | | |

Calibration Temperature _____ °F

Calibration Time 16 min.

Calibration Weight _____ grams

Calibration Number _____

				"DRY"
Asphalt Content				
Asphalt Content Reading	_____	_____	_____	_____
Measure Count	_____	_____	_____	_____

Fit Coefficient _____
Must be greater than 0.995

A1 _____

A2 _____

A3 _____

FIGURE 1A

ARKANSAS DEPARTMENT OF TRANSPORTATION
AHTD 449A - Nuclear Asphalt Content Gauge - Calibration Record

Mix Design No.: _____ Plant/Location: _____

Type of Mix: _____ Asphalt Binder Type: _____

Mix Design Expiration Date: _____ Asphalt Binder Source: _____

Gauge Serial No: _____ Gauge Background Count: _____

Mix Design % AC: 4.3 Mix Design % RAP: 0.2 *zero if design does not have RAP or RAS

Mix Design % AC *from RAP & RAS*: 0.2 Mix Design % RAS: 0.0

% AC Added, (Design %, -1%, +1%):	3.1	4.1	5.1

Mix Batch Weight (grams): 8000
*normally 8000 grams

Aggregate	Blend %	Dry Mix No AC Weight	Dry Mix No AC Accum Wt
STO 001	17	1360.0	1360.0
STO 002	30	2400.0	3760.0
STO 003	27	2160.0	5920.0
STO 004	13	1040.0	6960.0
STO 005		0.0	6960.0
SA 001		0.0	6960.0
SA 002		0.0	6960.0
RAP	11	880.0	7840.0
RAS	2	160.0	8000.0
TOTAL	100	Aggr. Wt.	8000.0

*mix 4 or more pans as shown

Blank Sample Weight 1: 7300 grams
Blank Sample Weight 2: 7315 grams
*Must be within ±25 g

% AC Calibration
(Design -1%, Design %, Design +1%)

	3.3%	4.3%	5.3%
Total weight for Aggregate & Asphalt Binder	8255.9	8342.0	8429.9

Calibration Temperature _____ °F

Calibration Time 16 min.

Calibration Weight 7315 grams

Calibration Number _____

Asphalt Content	3.3%	4.3%	5.3%	"DRY"
Asphalt Content Reading				
Measure Count				

Fit Coefficient _____
Must be greater than 0.995

A1 _____

A2 _____

A3 _____

Calibrated By: _____ CTTP No: _____ Calibration Date: _____

1. Determine the dry batch by multiplying 8000 grams by each aggregate/RAS/RAP percentage.

   (8000 x 0.17, 8000 x 0.30, 8000 x 0.27, 8000 x 0.13, 8000 x .011, 8000 x 0.02)

2. Calculate Accumulative Weight. This result should add up to Mix Batch Weight (8000 grams). Build four pans of with these batch weights.
3. Determine the Asphalt binder weight for each point using the formula in Section 5.12.
4. Fill out all the information on the form.

EXTRACTION OF BITUMINOUS MIXTURES BY THE VACUUM EXTRACTOR

1. SCOPE

1.1 This method provides a procedure for determining the asphalt content in bituminous mixtures using a vacuum extractor.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- T 164, Quantitative Extraction of Asphalt Binder from Hot-Mix Asphalt (HMA)
- T 168, Sampling Bituminous Paving Mixtures

3. APPARATUS

3.1 Vacuum extractor

3.2 Filter paper

3.3 Drying equipment

3.4 Balance - sensitive to 0.1 gram

3.5 Filtering aid - diatomaceous silica (J-M Celite 110)

3.6 Incidental equipment - containers, beakers, thermometers, spatula, brushes, etc.

3.7 Solvent: Approved biodegradable extractant. This extractant shall be non-halogenated, non-petroleum, non-toxic, and shall readily dissolve asphalt cement from paving mixtures and place it into solution. This extractant shall be easily rinsed from the remaining aggregate without forming a gel and the water containing the extractant rinsed from the aggregate shall readily pass through diatomaceous earth and filter.

4. HAZARDS

4.1 These solvents generally have flashpoints in range of 110° - 200°F. Use care if used around open flames. Carefully dispose of rags/paper towels used to clean up equipment or spills; spontaneous combustion of these items can occur.

5. PREPARATION OF TEST SPECIMEN

5.1 An uncompacted test specimen shall be the end result of quartering or splitting of a representative sample obtained in an approved manner. The size of the test specimen shall be governed by the nominal maximum size of mineral aggregate in the mixture. The approximate minimum size of test specimen shall be in accordance with the following table.

5.2 A compacted sample may be taken by coring, sawing, or other methods in such manner as to ensure a minimum disturbance of the material. If this sample is not sufficiently soft to separate, place in a large flat pan and warm to 230 ± 9 °F (110 ± 5 °C) until it can be separated. Split or quarter the sample until the mass of material required for the test is obtained. The approximate minimum size of test specimen shall be in accordance with the following table.

Nominal Max Particle Size	Minimum Weight of Uncompacted Sample (lb)	Minimum Area of Compacted Sample (Sq. In.)	Minimum Weight of Test Specimen (grams)
No. 4	4	36	1000
1/2"	12	60	1500
3/4"	16	100	2000
1”	20	144	3000
1 ½”	25	144	4000

5.3 Determine moisture content by drying a portion of the sample to a constant weight in an oven at a maximum temperature of 300 – 325 °F (149 – 163 °C).

5.4 Weigh the sample, record the weight and place the mixture in a metal beaker or other suitable container and allow cooling to approximately 200 °F. Add enough solvent to cover the sample and allow to soak (minimum of 15-20 minutes) while stirring occasionally until all asphalt is visually in solution.

6. PROCEDURE

6.1 Place a dry, tarred filter on the vacuum extractor, set the funnel ring in place and tighten the holding nuts snugly with the wrench provided.

6.2 Weigh 75-100 grams of oven-dried diatomaceous silica filtering aid into a 1000 ml Erlenmeyer flask and add approximately 800 ml of solvent, swirl until the diatomaceous silica is completely in suspension.

6.3 Immediately pour the diatomaceous silica and solvent on the filter. Turn on the vacuum pump and let it run until the pad formed by the diatomaceous silica is surface dry and begins to crack slightly.

Note: Any filtering aid that may adhere to the inside of the flask or beaker should be added to the filter pad by squirting solvent into the beaker in order to remove and "wash out" all the filtering aid.

6.4 Carefully decant the solvent from the specimen into the extractor with the pump running. Turn pump off when all solvent has passed through the filter.

Note: If the pumping process seems to be slow, turn off the pump and carefully stir the diatomaceous silica down to the filter pad. Care must be exercised when performing this, so that the filter pad is not damaged.

6.5 Pour enough solvent on the sample to cover all the aggregate, stir thoroughly and decant into the extractor as before. Repeat this step until the solvent in the sample is close to its original color.

6.6 Pour enough water on the sample to cover all the aggregate, stir thoroughly and decant into the extractor as before. Repeat this step until all solvent residue has been removed from the aggregate.

6.7 With the last wash, gently pour the entire specimen into the filter and wash the sample container carefully into the extractor with water. Gently distribute the sample evenly over the filter paper with a spatula and let the vacuum pump run a few minutes after the last wash to aid in drying the sample.

Note: Do not attempt to dry aggregate without thoroughly rinsing with water! Recommended drying temperature is 230 °F. Avoid drying over an open flame.

6.8 Scrape the aggregate away from the side of the funnel ring toward the center of the filter to avoid loss when clinging aggregate into the drying pan. Pick up the filter paper and aggregate by holding the filter paper on opposite sides and raising it straight up (Pick up the perforated filter paper support/screen with the filter paper, filter aid, and aggregate on it if there is a possibility the filter will tear.) Transfer the specimen to the drying pan and brush the clinging aggregate from the filter into the pan. Dry the aggregate thoroughly and weigh the filter and aggregate. Record the weight and subtract the weight of the filter and diatomaceous silica to determine the weight of the extracted aggregate.

7. CALCULATION

7.1 Calculate the percentage of bitumen by dividing loss in weight by the original weight of the specimen.

$$\text{Bitumen extracted} = [(S-A)/S] \times 100$$

Where: S = weight of test specimen
A = weight of extracted aggregate

7.2 The following pages contain a worksheet for sample calculations.

Note: Dispose of solvent residue by pouring it on the working face of the coarse aggregate stockpile or the cold feeds and processing through the asphalt plant in the course of normal operations. Do not accumulate this residue over several days' use.

ARKANSAS DEPARTMENT OF TRANSPORTATION

MATERIALS DIVISION

ASPHALT MIXTURE EXTRACTION WORKSHEET

Job No.: **Mix No.:**

Date Sampled: **Date Tested:**

Lot/ Sublot No.: **Type Mix:**

ASPHALT CONTENT		
1.	Wt. of Sample	
2.	Wt. of Extract. Aggr.	
3.	Wt. of Filter Aid	
4.	Wt. of Ash & Filter Correction	
5.	Corrected Wt. of Aggr. = [2. – 3. + 4.]	
6.	Wt. of Apparent Asphalt	
7.	Percent Asphalt = [6. / 1.] x 100	
8.	Percent Asphalt w Moist. Corre = [7. – 19.]	

ASH-FILTER & FILTER CORRECTION		
9.	Wt. of Filter Paper, Before	
10.	Wt. of Filter Paper, After	
11.	Wt. of Filter Change = [10. – 9.]	
12.	Ash (Centrifuge Method, Add 0.5 gram)	
13.	Total Correction = [11. + 12.]	

MOISTURE CORRECTION		
14.	Wt. of Pan + Spoon + Sample	
15.	Wt. of Pan + Spoon	
16.	Wt. of Sample = [14. – 15.]	
17.	Wt. of Pan + Spoon + Dry Sam	
18.	Wt. of Moisture = [14. – 17.]	
19.	Percent Moisture = [18. / 16.] x 100	

Tested by:

CTTP No.:

Comments:

AGGREGATE SIEVE ANALYSIS

Total Wt. of Aggregate: _____

Wt. After Washing: _____

Sieve (mm)	Wt. Retained / % Retained / % Passing	Job Mix
37.5	/ /	
25	/ /	
19	/ /	
12.5	/ /	
9.5	/ /	
4.75	/ /	
2.36	/ /	
1.18	/ /	
0.6	/ /	
0.3	/ /	
0.150	/ /	
0.075	/ /	
0.075	Wt. Passing: % AC:	

EXTRACTION OF BITUMINOUS MIXTURES BY CENTRIFUGE EXTRACTORS

1. SCOPE

1.1 This method provides procedures for determining the asphalt content in bituminous mixtures using centrifuge extractors.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- T 164, Quantitative Extraction of Asphalt Binder from Hot-Mix Asphalt (HMA)
- T 168, Sampling Bituminous Paving Mixtures

3. APPARATUS

3.2 Vacuum extractor

3.2 Filter paper

3.3 Drying equipment

3.4 Balance - sensitive to 0.1 gram

3.5 Incidental equipment - containers, beakers, thermometers, spatula, brushes, etc.

3.6 Solvent: Approved biodegradable extractant. This extractant shall be non-halogenated, non-petroleum, non-toxic, and shall readily dissolve asphalt cement from paving mixtures and place it into solution. This extractant shall be easily rinsed from the remaining aggregate without forming a gel and the water containing the extractant rinsed from the aggregate shall readily pass through diatomaceous earth and filter.

4. HAZARDS

4.1 These solvents generally have flashpoints in range of 110 °F – 200 °F. Use care if used around open flames. Carefully dispose of rags/paper towels used to clean up equipment or spills; spontaneous combustion of these items can occur.

5. PREPARATION OF TEST SPECIMEN

5.1 An uncompacted test specimen shall be the end result of quartering or splitting of a representative sample obtained in an approved manner. The size of the test specimen shall be governed by the nominal maximum size of mineral aggregate in the mixture. The approximate minimum size of test specimen shall be in accordance with the following table.

5.2 A compacted sample may be taken by coring, sawing, or other methods in such manner as to ensure a minimum disturbance of the material. If this sample is not sufficiently soft to separate, place in a large flat pan and warm to 230 ± 9 °F (110 ± 5 °C) until it can be separated. Split or quarter the sample until the mass of material required for the test is obtained. The approximate minimum size of test specimen shall be in accordance with the following table.

Nominal Max Particle Size	Minimum Weight of Uncompacted Sample (lb)	Minimum Area of Compacted Sample (Sq. In.)	Minimum Weight of Test Specimen (grams)
No. 4	4	36	1000
1/2"	12	60	1500
3/4"	16	100	2000
1”	20	144	3000
1 ½”	25	144	4000

5.3 Determine moisture content by drying a portion of the sample to a constant weight in an oven at a maximum temperature of 300 – 325 °F (149 – 163 °C).

5.4 Weigh the sample, record the weight, and place the mixture in a metal beaker or other suitable container and allow cooling to approximately 200 °F. Add enough solvent to cover the sample and allow to soak (minimum of 15 – 20 minutes) while stirring occasionally until all asphalt is visually in solution.

6. PROCEDURE

6.1 Place the weighed specimen in the extractor bowl and allow the specimen to cool to approximately 200 °F.

6.2 Cover the specimen in the bowl with solvent and allow sufficient time for the solvent to disintegrate the specimen. Place a filter paper, which has been dried and weighed, in position on the bowl and attach the bowl cover and clamp tightly. Place a beaker under the drain to collect the extract.

6.3 Start the centrifuge revolving slowly and gradually increase the speed (Maximum 3600 rpm) until the solvent flows from the drain in a slow trickle. When the solvent ceases to flow, allow the machine to stop. Add approximately

200 ml solvent and repeat the procedure. Keep repeating until the extract is close to its original color.

6.4 Cover the specimen in the bowl with water and allow time for the specimen to soak in the water. Centrifuge the sample as in Step 5.3 until the water ceases to flow. Repeat this step until solvent residue has been removed from the aggregate.

6.5 Remove the bowl from the extractor and remove the cover from the bowl.

6.6 Carefully remove the filter paper from the bowl and brush as much mineral matter as possible into a pan into which the aggregate from the extractor bowl has been placed. Dry the filter paper and the aggregate specimen.

6.7 Weigh the dried filter paper.

Note: Do not attempt to dry aggregate without thoroughly rinsing with water (step 6.4). Recommended drying temperature is 230 °F. Avoid drying over an open flame!

6.8 Weigh the extracted aggregate.

7. CALCULATIONS

7.1 Calculate the percent of bitumen as follows:

Percent Bitumen = [S - (A + F + 0.5)] / S

Where S = Weight of test specimen
A = Weight of extracted aggregate
F = Weight of gain of filter paper
0.5 = Ash correction factor

TEST METHOD FOR WATER SENSITIVITY FOR COMPACTED BITUMINOUS MIXTURES

1. SCOPE

1.1 This test method is applicable to the evaluation of the effects of water on the strength of compacted bituminous mixtures. A numerical index of reduced strength is obtained by comparing the Marshall Stability at 60 °C (140 °F) of cured specimens with that of duplicate specimens that have been immersed in water at 60 °C (140 °F) under a condition of vacuum saturation. This method may also be used at test temperatures other than those indicated above.

2. REFERENCED DOCUMENTS

2.1 This ARDOT Test Method is a modification of the Asphalt Institute Test Procedure.

2.2 American Association of State Highway and Transportation Officials (AASHTO) Standards:

- T 245, Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus.

3. APPARATUS AND MATERIALS

3.1 Equipment required for testing of specimens is listed in AASHTO T 245, “Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus”.

3.2 A 6 in. (150 mm) breaking head is required **[not the standard 4 in. (100 mm) breaking head]**. Specimens will be compacted utilizing a Superpave Gyratory Compactor (SGC).

3.3 *Vacuum Chamber* - The vacuum chamber may be any container capable of withstanding partial vacuums lower than 30 mm Hg absolute pressure and large enough to hold a minimum of two 6 in. (150 mm) diameter test specimens. A twenty-two-quart pressure cooker is satisfactory. A platform is required to allow the access of water to all sides of the specimens.

3.4 *Vacuum System* - A laboratory vacuum pump or aspirator for evacuating the air from the vacuum chamber to at least 30 mm Hg, and a manometer or pressure gauge for measuring the vacuum in the chamber, shall be provided.

3.5 *Water Bath(s)* - A constant-temperature water bath capable of maintaining temperature at 140 ± 1.8 °F (60 ± 1 °C) and of sufficient capacity to immerse a

minimum of two specimens and provide water for immersing specimens in the vacuum chamber shall be used. Two separate water baths may also be used.

3.6 Test Specimens

3.6.1 At least four specimens at the recommended asphalt content shall be prepared by utilizing a Superpave Gyratory Compactor (SGC). The test specimens will be compacted to N_{des}.

4. PROCEDURE

4.1 The test specimens are separated into two groups identified as Group A and Group B. Weigh the samples to the nearest 0.1 gram. Test the Group A specimens as described in paragraph 4.2 and test the Group B specimens as described in paragraph 4.3.

4.2 Group A are tested according to AASHTO T 245.

Note: If stability of the specimens is greater than 10,000 lb (44 kN) additional samples (both Group A & B) must be prepared and tested utilizing an indirect tensile strength breaking head.

4.3 Group B - Within 24 hours after fabrication, place Group B specimens in the vacuum chamber. Connect the vacuum source and leave the specimens under vacuum for one hour after the manometer or gage indicates a partial vacuum of 30 mm Hg, or less absolute pressure. At the end of the one-hour period, open the hose clamp or valve on the line leading to the 140 ± 1.8 °F (60 ± 1 °C) water bath and allow to enter slowly into the vacuum chamber. After specimens are completely submerged in water, the vacuum shall be released. The specimens shall be transferred in a water filled container in a submerged condition to the water bath maintained at 140 ± 1.8 °F (60 ± 1 °C). The specimens shall remain in the bath for 24 hours. At the end of 23 hours, determine water absorption of specimens as described in paragraph 4.4. The stability of the specimens shall be determined according to AASHTO T 245. (**See Note in paragraph 4.2)**

4.4 Water absorption shall be determined one hour before testing for Marshall stability. Specimens shall be removed one at a time from the 140 ± 1.8 °F (60 ± 1 °C) water bath and the surface-dry weight of each specimen shall be determined by quickly blotting the specimen's surface with a damp towel and weighing. Return specimens to the water bath immediately, and after one hour proceed with Marshall stability determination.

5. CALCULATIONS

5.1 Calculate water absorption of each immersed-in-water specimen as follows:

$$\text{Water Absorption, percent} = \frac{B - A}{A} \times 100$$

Where:

A = weight in grams of dry specimen before 24-hour Immersion (from paragraph 4.1)

B = weight in grams of surface-dry specimen after 23-hour immersion

5.2 The numerical index of water sensitivity shall be expressed as the percentage of stability retained after water immersion. It shall be calculated for the asphalt content as follows:

$$\text{Retained Stability, percent} = \frac{S_B}{S_A} \times 100$$

Where:

S_A = average Marshall stability of Group A

S_B = average Marshall stability of water-immersed specimens (Group B)

6. REPORT

6.1 The report shall include the following average values for the asphalt content:

6.1.1 Average unit weight in lb/cu.ft. (kg/cu m) and air voids in percent for Groups A and B specimens.

6.1.2 Marshall Stability in lb (kN) and flow value in 0.01 in. (0.1 mm) for Groups A and B specimens.

6.1.3 Retained stability, percent.

6.1.4 Water absorption, percent, is calculated, but not reported.

Note: The stabilities obtained in testing specimens compacted utilizing a SGC will be significantly greater than specimens prepared with a Marshall Compaction apparatus.

TEST METHOD FOR SOLVENT WASHING AND SIEVE ANALYSIS OF ASPHALT CONCRETE

1. SCOPE

1.1 This method provides a procedure for the determination of particle size distribution of aggregates from bituminous mixtures from which the asphalt cement has been removed.

2. REFERENCE

2.1 This ARDOT Test Method is a modification of the Asphalt Institute Test Procedure

3. APPARATUS AND MATERIALS

3.1 Drying equipment

3.2 Containers

3.3 Sieves

3.4 Solvent

3.4.1 Approved biodegradable solvent (These solvents generally have flashpoints in the range of 140°-200° F (60°-93° C). **USE CARE IF USED AROUND OPEN FLAMES.** Odors from these solvents may be nauseous to some people, use laboratory ventilation.

3.5 Sample

3.5.1 The sample shall normally consist of the entire sample or a reduced sample of asphalt concrete which has been tested for asphalt cement content in accordance with ARDOT Test Method 449. (Asphalt Content of Asphalt Mixtures by the Nuclear Method). Asphalt mixes with a Nominal Maximum Particle Size of 1½" (37.5 mm) or greater will require a separate sample taken for this test. See Table 1 for minimum sample size.

Table 1

Nominal Maximum Particle Size (inches)	Minimum Weight of Sample (lb)	Minimum Weight of Test Specimen
½"(12.5 mm)	12 lb (5.4 kg)	1500 grams
¾"(19mm)	16 lb (7.2 kg)	2000 grams
1"(25mm)	20 lb (9.0 kg)	3000 grams
1 ½"(37.5 mm)	25 lb (11.3 kg)	4000 grams
2 ½"(62.5 mm)	25 lb (11.3 kg)	4000 grams

Note: The test specimen may be divided into suitable increments, tested, and the results appropriately combined if the mass of the test specimen exceeds the capacity of the equipment.

4. PROCEDURE

4.1 Record percent (%) asphalt cement content and weigh and record test sample weight.

4.2 The test sample after being tested for asphalt cement content (ARDOT TM 449) shall be placed in a suitable container and allowed to cool to approximately 200° F (93° C). Cover the sample with solvent and allow to soak while stirring occasionally until all asphalt cement is visually in solution.

4.3 Pour the solvent over nested No.8 (2.36 mm) and No.200 (0.075 mm) sieves, taking care to avoid, as much as possible, the decantation of coarse particles of the sample. The solvent should be caught in a container for later disposal. Repeat the solvent washing operation until the solvent is close to its original color. Return all material retained on the sieves to the sample container.

4.4 Repeat Steps 4.2-4.3 using water to rinse solvent residue from the aggregate (A small amount of liquid detergent mixed with the aggregate before rinsing may help remove solvent residue.).

4.5 Dry the washed sample to constant weight, allow to cool and weigh to the nearest 0.1 gram.

4.6 Sieve the sample over sieves of the various sizes required by the specifications including the No. 200 (0.075 mm) sieve. The total weight of material retained on each sieve shall be recorded. Determine total weight of aggregate by multiplying the sample weight determined in Step 4.1 by the percent of aggregate in the sample [100% - (% AC content)]. The weights retained shall be converted to percentages by dividing the total weight of aggregate. The weight of aggregate passing the No. 200 (0.075 mm) includes the material passing the No. 200 (0.075 mm) during the solvent and the water washings (Steps 4.3 & 4.4) and that passing the No. 200 (0.075 mm) during the dry sieving (Step 4.6).

5. REPORT

5.1 The results of the sieve analysis shall be reported as percent passing each sieve. Percentages shall be reported to the nearest whole number except for the No. 200 (0.075 mm) which shall be reported to the nearest 0.1 percent.

TEST METHOD FOR IN-PLACE DENSITY AND PERCENT COMPACTION OF ASPHALT CONCRETE HOT MIX USING A NUCLEAR GAUGE

1. SCOPE

1.1 This test is designed to measure the density and the degree of compaction of Asphalt Concrete Hot Mix (ACHM) using a portable nuclear density testing device. Results may be obtained rapidly allowing for improvement in the compaction process through use of the gauge. ***One reported compaction test shall be the average of a minimum of three compaction results; each compaction result shall be based upon a gauge density reading taken a separate random location.*** *These gauges contain nuclear sources that require Arkansas State Department of Health licensing and special training before they may be utilized.*

2. REFERENCE

2.1 *American Society for Testing and Materials (ASTM):*

- D 2950, Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods

3. APPARATUS

3.1 Nuclear device equivalent to that described in ASTM D 2950.

3.2 Reference Standard and air gap spacer may be provided with each gauge for checking the gauge operation by providing a stable condition for a reproducible count rate. The standard may also serve as a surface voids correction plate for use on rough textured surfaces.

3.3 Standardization of Nuclear Gauge

3.3.1 To be run each day before gauge use. (See Note 1. at the end of this test method.)

3.3.2 Place the standard on asphalt concrete surface course at least 10 feet (3 m) away from any large object and at least 60 feet (18.3 m) from any other nuclear gauge.

3.3.3 Place the gauge on the spacer and/or on the reference standard, apply power to the unit and wait the required time period for all circuits to stabilize (Refer to operator's manual for turn on and warm up procedures).

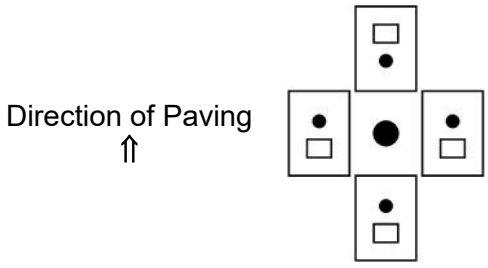
3.3.4 After the warmup period, standardize the gauge as per the manufacturer's instructions.

3.3.5 If the reading is outside limits, check to see that the gauge does not rock on the spacer or the standard block, and that there are no other gauges in the area. Then retake the reading. If an acceptable reading cannot be obtained in repeated attempts, contact the manufacturer.

3.4 Calibration Procedures – Job Correction Factor

3.4.1 Prior to use on each project compare each nuclear gauge to a minimum of five (5) core densities for each mix design used on the project. The gauge readings should be taken at the same timer interval following laydown as that which will occur between laydown and acceptance testing.

A minimum of four (4) gauge readings should be taken from the same location (within 1ft. (.3 m) of core) as each of the core density samples. It may be necessary to spread a fine sand over the surface of coarse mixes to eliminate the influence of surface voids. Level the sand with scraper plate. (Surface roughness may cause a lower than actual density determination.) Take gauge readings at the "12 o'clock", "3 o'clock", "6 o'clock", and "9 o'clock" positions around the core. During the determination of the correction factor, align the gauge so that an axis between the density source and the detectors is parallel to the direction of laydown and the source is closer to the lay down operation for the gauge readings at the "3 o'clock", "6 o'clock", and "9 o'clock" positions. Align the gauge so that an axis between the density source and the detectors is parallel to the direction of lay down and the source is further from the lay down operation for the gauge reading at the "12 o'clock" position. Determine the difference between each core density and the average of the four-gauge readings taken at the core location. This is the core correction factor. Average the five core correction factors to obtain a Job Correction Factor. If this Job Correction Factor is more than 1 lb/cu. ft. (16 kg/cu m) apply to all densities determined by the gauge for that particular mix design. If this Job Correction Factor is less than 1 lb/cu. ft. (16 kg/cu m) do not use a Job Correction Factor, read and report the densities directly from the gauge for that particular mix design. (EACH GAUGE MUST HAVE A CORRECTION FACTOR ON EACH PROJECT FOR EACH MIX DESIGN WITH WHICH IT IS USED). When the average of the gauge readings is less than the core sample density the Job Correction Factor shall be added to the Wet Density determined by the gauge. (See the form at the end of this test method.) Record Job Correction Factor with the appropriate plus or minus sign. See Note 2.



Calibration of the nuclear gauge using the direct transmission mode should follow procedures in this method but will require drilling four holes in the asphalt layer where the density is being taken at the positions indicated above.

3.5 There is an apparent change in surface texture of the ACHM pavement overnight which could affect gauge readings. The core densities therefore may be several lb/cu ft (kg/cu m) different from the gauge readings if there is a time difference between the time following laydown of the gauge readings and the time following laydown that the core is taken. Gauge readings taken a day or more following laydown will not agree with the gauge readings taken shortly after laydown.

4. PROCEDURE

4.1 The density / percent compaction (%) of each sublot will be the average result from gauge readings taken at a minimum of three (3) random locations in the sublot. One gauge reading will be made at each of the random locations.

4.2 Record station and distance from the outside edge of the asphalt mat (Do not make tests within 1.5 ft. (0.5 m) of the asphalt mat's edges) of each gauge reading. Determine locations (minimum of 3 per sublot) using ARDOT TM 465*, Procedures for Sampling by Random Number Tables.*

4.3 Take one reading (Wet Density) at each of the locations, apply the Job Correction Factor to each reading, and report to the nearest 0.1 lb/cu ft (1.6 kg/cu m). Determine the Max. Sp. Grav. at each location based upon best available AC content information for the location (Contractor's or ARDOT Inspector's Max. Sp. Grav. result for sublot). Report percent compactions based upon corrected gauge density and the Max. Sp. Grav.

4.4 Procedure-Density Testing Moisture/Density Gauge (Backscatter Method)

4.4.1 General - The Backscatter Method is used with asphalt concrete hot mixes.

4.4.2 Set the timer switch to "*FAST*" or "*NORMAL*" ("NORMAL" if pavement temperature less than 120 °F (48 °C)), set the depth switch to "*BS*", and set moisture correction switches to "*0*".

4.4.3 With programmable gauges set the maximum theoretical density in the gauge. (Determine according to Step 5.2.)

4.4.4 Place the gauge on the surface of the asphalt, choosing a smooth flat surface with a minimum of voids for best results. The gauge should be aligned as in the "6 o'clock" calibration position, with the source closer to the paving operation. Check by placing a hand on opposite corners of the base of the gauge and attempt to rock the gauge. If it was necessary to spread a fine sand over the surface of coarse mixes to eliminate the influence of surface voids during calibration, use the fine sand during testing. Level the sand with scraper plate. (Surface roughness may cause a lower than actual density determination.)

4.4.5 Repeat the above procedure for each test.

4.4.6 Place the source rod in the "*BACKSCATTER*" position and press the "*MEASURE*" key. At the end of the count time, Wet Density will be displayed. With a zero (0) correction factor the percent compaction will be displayed on programmable gauges by depressing the "*SHIFT*" and "*%MA*" keys.

4.5 Procedure – Density Testing Thin Lift Gauge (Normal Mode)

4.5.1 General – The Normal Mode is recommended on mixes with 40% or more fines (40% passing the No. 10 (2.00 mm) sieve).

4.5.2 Enter the desired time interval, pavement thickness, and voidless (Max. Theoretical) density. (Based on Contractor's or ARDOT Inspector's Max. Sp. Grav. result for sublot.)

4.5.3 Place the gauge on the surface of the asphalt choosing a smooth flat surface with a minimum of voids for best results. The gauge should be aligned as in the "6 o'clock" calibration position, with the source closer to the paving operation. Check by placing a hand on opposite corners of the base of the gauge and attempt to rock gauge.

4.5.4 Place the source rod in the "*MEASURE*" position and press the "*START*" key. At the end of the count time, Density and Percent Voids or Percent Maximum Density will be displayed.

4.5.5 Repeat the above procedure for each gauge reading.

4.6 Procedure – Density Testing Thin Lift Gauge (Surface Voids Mode)

4.6.1 General - The Surface Voids (SV) Mode is recommended on mixes with less than 40% fines (less than 40% passing the No. 10 (2.00 mm) sieve). In normal use the SV Mode should be used by placing the gauge on the magnesium standard block for readings. The 40% passing the No. 10 (2.00 mm) sieve is a guideline. This mode should not be used unless it is deemed more accurate than the normal mode by correlating with drilled cores as per the Note at the end of this test method.

4.6.2 Put the gauge in the Surface Void Mode.

4.6.3 Enter the desired time interval, pavement thickness, and void-less (Max. Theoretical) density. (Determine according to Step 5.2.)

4.6.4 Place the magnesium standard block on top of the surface to be measured. Place the gauge on top of the magnesium block choosing a relatively smooth flat surface with a minimum of voids and check for rocking. The gauge should be aligned as in the "6 o'clock" calibration position, with the source closer to the paving operation. Place the source in the "MEASURE" position.

4.6.5 Press the "*START*" key to take a reading. When counting is finished, the SV Density ("*Surface Void Mode*" Density) is calculated and displayed.

Thickness is not specified for the SV mode. The SV mode measures the top 1.5 to 2 inches (40 to 50 mm) of asphalt pavement.

4.6.5 Move the gauge to the next test location and press "*START* "to initiate the next reading. Repeat this procedure for each gauge reading.

4.7 Direct Transmission Mode

4.7.1 Prepare the site in accordance with the procedure in step 4.4.1. Using a crayon, mark the outline or footprint of the gauge. Use the guide/scraper plate as a template and drill a hole to a depth of at least 0.28 in. (7 mm) deeper than the measurement depth.

4.7.2 Place the gauge on the test site and lower the probe to a depth not to exceed the thickness of the lift of pavement being measured. Position the gauge by pulling it towards the scalar so that the probe is firmly against the side of the hole.

4.7.3 Take a one-minute test and record (wet density).

4.7.4 Repeat the above procedure for each gauge reading.

5. REPORT

5.1 Report Density to the nearest 0.1 lb/cu.ft. (1.6 kg/cu.m). The percent compaction is based upon the Maximum Specific Gravity (G_{mm}) (Contractor's or ARDOT Inspector's Maximum Specific Gravity result for sublot) and the average corrected gauge density.

$$\% \text{ Compaction} = \frac{\text{Average Gauge Density}}{\text{Max. Spec Gravity } (G_{mm}) \times 62.4 \text{ lb/cu.ft. } (1000 \text{ kg/cu.m.})}$$

Use the value for Maximum Specific Gravity most recently determined by testing as the basis for calculating Maximum Specific Gravities. (See example procedure at the end of this Test Method).

5.3 Report the percent compaction to the nearest 0.1%.

5.4 Report the average of all compaction results (minimum of three) as the percent (%) compaction for the test if:

A. All of the compaction results or two of three of the compaction results for the sublot are equal to or greater than the minimum specified and are equal to or less than the maximum specified (all results or two of three of the results comply with specifications).

B. All of the compaction results for the sublot are below the minimum specified or greater than the maximum specified (no results comply with specifications).

C. If one or two of the compaction results for the sublot are below the minimum specified or greater than the maximum specified and the remaining compaction result/s are out of specification but in the opposite direction determine the average compaction result by adding the arithmetic differences between each compaction result and the minimum or maximum specified. Average the sum and add to the minimum or maximum specified, as appropriate, and report that value as the average of the compaction results.

As an example, compaction results are: 91%, 97%, 90%; add the following:

1% (92%-91%), 1% (97%-96%), 2% (92%-90%);

the average is: 4% / 3 = 1.3%.

The reported average of the compaction results would be 90.7% =[(92%-1.3%)].

5.5 If two (2) of the sublot compaction results are below the minimum specified or greater than the maximum specified report the average of these two non-complying compaction results as the percent (%) compaction for the test.

5.6 If one (1) of the sublot compaction results is more than 2% below the minimum specified or more than 2% greater than the maximum specified report this percent (%) compaction results as the percent (%) compaction for the test. See Section 410,(b), (1) of the Standard Specifications.

Note:

1. A study performed by a state Department of Transportation indicates that a thin lift gauge standardization procedure should be performed only on an asphalt concrete surface course.

The density of magnesium is 109 lb/cu ft (1746 kg/ cu m) and this is the value (± 2 lb/cu ft (± 32 kg/cu m)) that should be obtained during the standardization of the thin lift gauge.

2. If available on the thin lift gauge, the operators should utilize the *Special Calibration* gauge function which allows the gauge to be specifically calibrated by altering gauge constants for a particular asphalt concrete hot mix.

Unless otherwise recommended by the manufacturer the special calibration procedure should include a minimum of five core densities and 20-gauge densities (four gauge readings taken adjacent to each core). Follow the manufacturer's recommended procedures for performing a *Special Calibration* of the gauge.

PROCEDURE FOR THE DETERMINATION OF VOIDS IN MINERAL AGGREGATE (VMA) AND AIR VOIDS

1. SCOPE

1.1 This method provides a procedure for the determination of the Voids in the Mineral Aggregate (VMA) and Air Voids. VMA consists of all of the volume of the compacted mixture not occupied by aggregate. This includes the volume occupied by both air voids and the effective (non-absorbed) binder content. Air Voids consist of the air pockets present between the binder coated aggregate particles. Both Air Voids and VMA are expressed as a percent by volume of the total volume of the compacted mixture.

2. REFERENCED DOCUMENTS

2.1 *Arkansas Department of Transportation Test Methods:*

- ARDOT TM 449, Determination of Asphalt Content of Asphalt Mixtures by the Nuclear Method
- ARDOT TM 449A, Calibration of Asphalt Content Gauge Troxler 3241-C

2.2 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- T 166, Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
- T 209, Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- T 269, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
- T 308, Determining the Asphalt Binder Content of Hot-Mix Asphalt (HMA) by the Ignition Method
- T 312, Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor

3. PROCEDURE

3.1 Asphalt mix samples shall be obtained from loaded truck at the asphalt plant.

3.2 Perform sample preparation and testing as specified in the appropriate AASHTO or ARDOT test method as listed in Section 2 Reference.

4. CALCULATION

4.1 VMA is calculated using the following formula:

$VMA = VMA_e$ – Correction Factor

Where:

$VMA_e = 100 – [(G_{mb} \times P_s) / (G_{se})]$

$G_{se} = P_s / [(100/G_{mm}) - (P_b/G_b)]$

VMA_e is "effective" VMA. Effective VMA is easier to determine than "actual" VMA because it is calculated with G_{se} rather than G_{sb}. G_{se} can be calculated using information that is already known, whereas determining G_{sb} is a time-consuming process. When effective VMA is calculated, it must be adjusted to actual VMA using a correction factor. This correction factor is the difference between the effective and actual VMA determined in the mix design process.

VMA Correction Factor is shown on the mix design.

G_{mb} is the bulk specific gravity of the compacted mixture. It shall be determined by AASHTO T 166. Specimens used in this method shall be prepared by AASHTO T 312. An average value obtained from two specimens shall be used in this calculation.

G_{mm} is the maximum theoretical specific gravity of the asphalt mixture. G_{mm} shall be determined by AASHTO T 209. An average value obtained from two specimens shall be used in this calculation.

P_b is the amount of binder in the mixture expressed as a percentage of the total weight of the mixture. P_b shall be determined by ARDOT TM 449/449A or AASHTO T 308.

P_s is the amount of aggregate in the mixture expressed as a percentage of the total weight of mixture. That is, $P_s = 100 – P_b$.

G_{se} is the effective specific gravity of the aggregate.

G_b is the specific gravity of the asphalt binder at 77 ºF (25 ºC). This value can be obtained from the asphalt binder shipping tickets. ***Shipping tickets may show Specific Gravity at 60 ºF (15.6 ºC); to convert to Specific Gravity at 77 ºF (25 ºC) multiply Specific Gravity by 0.9941.***

4.2 Air Voids are calculated using the following formula:

$AV = 100 \text{ X } [1-(G_{mb}/G_{mm})]$

Where:

G_{mb} and G_{mm} are as described above.

5. REPORT

5.1 Report VMA and Air Voids to the nearest 0.1%.

APPENDIX

Arkansas Department of Transportation
MATERIALS DIVISION
Little Rock, Arkansas

DETERMINATION of VOIDS IN MINERAL AGGREGATE(VMA)
and
AIR VOIDS

Report/Sublot No.: _____ Date: _____

Job No.:_____

F.A.P.: _____

Job Name: _____

Mix Design No.: _____

Type Mix: _____

Calculations:

$G_{mb}1$ = _____ $G_{mb}2$ = _____
Avg G_{mb} = ($G_{mb}1$ + $G_{mb}2$)/2 = _____

$G_{mm}1$ = _____ $G_{mm}2$ = _____
Avg G_{mm} = ($G_{mm}1$ + $G_{mm}2$)/2 = _____

P_b = _____ P_s = 100 – P_b = _____ G_b = _____

VMA Correction Factor = _____

G_{se} = P_s / [(100/G_{mm}) – (P_b/G_b)] = _____ / [(100/_____)-(_____ / _____) = _____

VMA_e = 100 – [(G_{mb} X P_s) / (G_{se})] = 100 – [(_____ X _____) / (_____)] = _____

VMA = VMA_e – VMA Correction Factor = (_____ - _____) = _____
AIR VOIDS = [1 – (G_{mb} / G_{mm})] X 100 = [1- (_____ / _____)] X 100 = _____

REPORTED VMA = _____

REPORTED AIR VOIDS = _____

Tested by: _____ CTTP No.:_____

PROCEDURE FOR SAMPLING BY RANDOM NUMBER

1. SCOPE

1.1 This procedure is used in obtaining random representative samples of materials. Sample size is specified in the individual test method or in the Sampling section of the "Manual of Field Sampling and Testing Procedures".

2. DEFINITIONS

2.1 Lot: An isolated quantity of material from a single source. A measured amount of construction assumed to be produced by the same process.

Examples of lots are: 1000 metric tons of Open Graded Portland Cement Base Course or 3000 tons of asphalt concrete hot mix (ACHM).

2.2 Sublot: A portion of a Lot. Under some circumstances, a lot may be divided into sublots for sampling purposes.

2.3 Sample: A small part of a Lot or a Sublot which represents the whole. A sample may be made up of one or more increments or test portions.

2.4 Random: An occurrence that happens without aim or reason, depending entirely on chance.

2.5 Random Number: A number selected entirely by chance as from a table of random sampling numbers.

2.6 Random Number Table: A set of numbers chosen at random, by chance, which are generated from an infinite population of numbers. Every digit has an equal chance of occurrence.

3. PROCEDURE A

(Using Random Number Tables on projects let before March 1, 2012). Procedure Deleted January 1, 2018, due to no active projects that were let before March 1, 2012.

4. PROCEDURE B

(Using SiteManager Random Number Generator on projects let after March 1, 2012) Procedure Deleted March 30, 2018, due to no active projects that were let before March 1, 2012.

5. PROCEDURE C

(Using SiteManager Random Number Generator on projects let after September 11, 2013.

Note: If the first sublot of the day is to be sampled do not use the random location if the sample would be located in the first 5% of the sublot; select another random number or random number pair.

5.1 This procedure can be used when samples are to be obtained on the basis of quantity or location. Random numbers are to be generated and viewed using the SiteManager Access Reports System (SARS). Refer to the SiteManager Users Guide located on the Department's LAN at \\csd4\construc\siteman\manuals for detailed instructions on how to generate a random number.

5.1.2 Refer to the SiteManager Users Guide's section on Random Number for proper documentation requirements for adding comments, sample ID's, stations, offsets and remarks. The SiteManager Sample ID and test number should be documented as a minimum in the Random Number Report (Final).

5.1.3 The resulting values will represent the quantity or location to be sampled for each increment. If a Random Number is produced that places the sample outside the specified limits, the sample should be moved as minimally as possible to place the test within an acceptable sampling area.

5.1.3.1 On ACHM pavements, do not sample for density within 1.5 ft (0.5 m) of the mat's longitudinal joint or edge. No deviation in this sampling practice shall be made regarding the presence of any underlying joint(s).

TEST METHOD FOR THE VERIFICATION OF SLURRY SEAL CALIBRATION

1. SCOPE

1.1 This test method provides a method for verifying the calibration of the mixing machine used for slurry seal.

1.2 The mixing machine after calibration will be operated over a test strip, which will be part of the project, for at least 500 feet or until continuous operation of all aspects of slurry seal mixing are taking place.

2. REFERENCED DOCUMENTS

2.1 *Arkansas Department of Transportation Test Methods:*

- ARDOT TM 450, Method of Test for Extraction of Bituminous Mixtures by the Vacuum Extractor

3. APPARATUS

3.1 Two (2) one gallon plastic containers with handles

3.2 Large flat bottom pan approximately 2 feet by 2 feet with 2 inch sides

3.3 Extraction testing equipment-see ARDOT TM 450

4. PROCEDURE

4.1 Upon achieving continuous operation of the mixing machine, a sample of the slurry mixture will be obtained by passing the gallon plastic container through the discharge stream. A second sample will be obtained after the mixing machine has traveled an additional 100 feet. Both samples should fill the gallon plastic containers at least half full.

4.2 After arriving at the field laboratory, the two samples will be washed out of the containers, using sufficient water to remove all fines, into the flat bottom pan.

4.3 The slurry material in the flat bottom pan will be dried at a low temperature, no higher than approximately 150° F (65° C) until the free moisture is evaporated.

4.4 The slurry material will then be poured onto a quartering cloth and quartered until a sample of 1500 grams is obtained.

4.5 The residual asphalt content and gradation will be determined in accordance with ARDOT TM 450.

4.6 Results of the extraction test will be compared with the mix design values. If the test values are within the tolerance range of the mix design the slurry mixing machine's calibration is verified.

TEST METHOD FOR CHECKING SLURRY SEAL CONSISTENCY

1. SCOPE

1.1 This test method provides a method for determining the percent of emulsion and gradation of aggregate placed within a sublot or lot by the mixing machine.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- T 2, Sampling of Aggregates
- T 11, Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates

2.2 *International Slurry Surfacing Association*

- A105 (Revised) February 2010, Recommended Performance Guidelines for Emulsified Asphalt Slurry Seal

3. APPARATUS

3.1 The proportioning devices are usually revolution counters or similar devices and are used in material calibration and determining the material output at any time.

4. PROCEDURE

4.1 At the beginning and end of each sublot or lot selected by the Resident Engineer the revolution counter will be read.

4.2 Using calibration factors developed for the mix design to the nearest hundredth, the quantity of emulsion and aggregate used within the sublot, or lot will be calculated and percent of emulsion determined.

4.3 An aggregate sample will be obtained from the project stockpile at a point in time which will correspond to the time the revolution counter is read. Sample in accordance with AASHTO T 2.

4.4 EXAMPLE

Revolution counter reading at beginning of sublot is 125.

Revolution counter reading at end of sublot is 210.

Number of revolutions in sublot is 210 - 125 = 85.

Using calibration factors:

4.1 lb emulsion per revolution.

33.06 lb dry aggregate per revolution.

From mix design

65% asphalt residue for each 100% of emulsion.

Calculation:

Aggregate: 85 rev x 33.06 lb per rev = 2810.1 lb

Emulsion: 85 rev x 4.1 lb per rev = 348.5 lb

% Residual Asphalt: (348.5 lb / 2810.1 lb) x 65% = 8.1%.

4.5 The aggregate is to be tested for gradation in accordance with AASHTO T 11 and T 27.

TEST METHOD FOR ASPHALT CONCRETE COLD PLANT MIX

1. SCOPE

1.1 This method provides a procedure for determining a mix design for asphalt concrete cold plant mixes.

2. APPARATUS

2.1 Mixing apparatus - Mechanical mixer and metal pan or bowl of sufficient capacity. Hand mixing may also be used.

2.2 Oven - Thermostatically controlled to maintain required temperature.

2.3 Miscellaneous equipment such as thermometers, balances, spatulas, brown paper, and gloves for handling hot equipment.

3. PROCEDURE

3.1 Determine mix aggregate gradation based upon the gradation limits in Table 411-1 of Subsection 411.03 of the Department's Standard Specification for Highway Construction

3.2 Estimate the asphalt content through the following formula:

$$p = 0.03(a) + 0.07(b) + 0.2(c) + 0.215(d)$$

where:
p = Asphalt Content
a = percent of aggregate retained on the No.50 (0.300 mm) sieve,
b = percent of aggregate passing the No.50 (0.300 mm) sieve and retained on the No.100 (0.150 mm),
c = percent of aggregate passing the No.100 (0.150 mm) sieve and retained on the No.200 (0.075 mm),
d = percent of aggregate passing the No.200 (0.075 mm) sieve

3.3 Blend aggregate fractions together based on the mix design.

3.3.1 Combine dry stockpile samples into a 10 lb sample. Combine according to stockpile cold feeds as determined in Step 3.1.

3.3.2 Sieve combined aggregate sample utilizing the ½", #4, #8, and #50sieves. Put the aggregate retained on the #4 sieve, the #8 sieve, the #50 sieve,

and the aggregate passing the #50 sieve in separate pans. Determine percent (%) retained / passing for each sieve.

3.3.3 Combine aggregate from each pan into three combined aggregate samples; the three combined aggregate samples should weigh 1000g less the weight of the asphalt [1000 – estimated asphalt content, 1000 – (estimated asphalt content – 0.5%), and 1000 – (estimated asphalt content + 0.5%)].

3.3.4 Aggregate from each of the pans (Step 3.3.2) should be added according to the mix design and the percent (%) retained on each of the sieves (#4, #8, and #50) and the percent (%) passing the #50 sieve.

3.4 Preheat asphalt, aggregate and mixing bowl. Preheat and mix specimens according to the following temperatures or as recommended by the manufacturer.

MC-250	40-95°C(100-200°F)
MC-800	85-120°C(185-250°F)
MC-3000	105-120°C(225-250°F)
Seasonal Type	40-80°C(100-175°F)

3.5 Mix three specimens of the cold mix with a mechanical mixer or by hand mixing at a temperature which is at the midpoint of the design mixing range. Each specimen shall be approximately 1000 grams (weighed to the nearest 0.1 gram). One of the specimens shall contain asphalt content as estimated in Step 3.2, p (Asphalt Content). One of the remaining two specimens shall contain 0.5% less asphalt content (p - 0.5%) and the third specimen shall contain 0.5% more asphalt content (p + 0.5%).

3.6 After mixing pour each specimen on a separate piece of brown paper placed on a table or flat surface and spread so that the specimen is level with the table or flat surface.

3.7 Let each specimen remain on paper undisturbed for 24 hours.

4. DETERMINATION OF ASPHALT CONTENT

4.1 The necessary asphalt content is determined by manually testing each specimen as follows:

4.1.1 Manually grasp and lift opposite sides of the brown paper so that the specimen flows to the center of the paper. Then alternately raise and lower each side of the paper so that the specimen is mixed back together. Raise each of the opposite sides of the paper so that the specimen is again in the center of the paper and set the paper and specimen back on the table. The specimen should “crawl” or settle slightly after being set back on the table.

4.1.2 Manually grasp a handful of the specimen and squeeze into a ball and release pressure on the specimen. The specimen should remain in a ball.

4.1.3 Examine the area of the brown paper where the specimen was setting during the 24 hour period. The paper should show definite marks where the mix had touched the paper; too much asphalt will show some blotting or runoff of asphalt.

4.2 Determine desired asphalt content based on steps 4.1.1 through 4.1.2.

5. REPORT

5.1 Report desired asphalt content with aggregate gradation of the cold plant mix. Asphalt content should be reported to the nearest tenth of a percent.

TEST METHOD FOR DETERMINING RUTTING SUSCEPTIBILITY USING A LOADED WHEEL TESTER (LWT)

1. SCOPE

1.1 This method describes a procedure for testing the rutting susceptibility of asphalt-aggregate mixtures using the Loaded Wheel Tester (LWT).

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 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 practices and determine the applicability of regulations prior to use.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- T 168, Standard Practice for Sampling Bituminous Paving Mixtures
- T 166, Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- T 209, Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- T 269, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Mixtures
- T 312, Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
- R 30, Mixture Conditioning of Hot Mix Asphalt (HMA)

2.2 APA Users Group—Determining Rutting Susceptibility Using the Asphalt Pavement Analyzer (revised 1/14/2000)

3. APPARATUS

3.1. Loaded Wheel Tester (LWT)-A thermostatically controlled device designed to test the rutting susceptibility of hot mix asphalt by applying repetitive linear loads to compacted test specimens through pressurized hoses.

3.1.1 The LWT shall be thermostatically controlled to maintain the test temperature and conditioning chamber at any set point between 4 °C and 72 °C within 1 °C (39 °F and 162 °F within 1 °F).

3.1.2 The LWT shall be capable of independently applying loads up to 534 N (120 lb) 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 LWT shall be capable of testing six cylindrical specimens simultaneously.

3.1.5 The LWT shall have a programmable master cycle counter which can be preset to the desired number of cycles for a test. The LWT 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 19.0 mm (3/4 inch), 5.17 MPa (750 psi) W.P. GL 07148. The hoses should be replaced when any of the outer rubber casings has worn through, and threads are exposed. Follow the LWT manufacturer's instructions for the technique on replacing hoses.

3.2 Balance, 12,000-gram (30 lb) capacity, accurate to 0.1 gram (0.0002 lb).

3.3 Mixing utensils (bowls, spoon, spatula)

3.4 Ovens for heating aggregate and asphalt cement.

3.5 Compaction (Superpave Gyratory Compactor, SGC) device and molds

4. PROCEDURE

4.1 Preparation of Test Specimens

4.1.1 Number of test specimens - Two, four, or six cylindrical specimens, 150 mm diameter x 75 mm (6 in diameter x 3 in. mm). Up to three tests of cylindrical specimens may be performed during one test cycle.

4.1.2 Roadway Core Specimens

4.1.2.1 Roadway core specimens shall be 150 mm diameter with all surfaces of the perimeter perpendicular to the surface of the core within 5 mm (0.2 in.). Cores shall be trimmed with a wet masonry saw to a height of 75 ± 3 mm (3 ± 0.1 in). If the core has a height of less than 75 ± 3 mm (3 ± 0.1 in), plaster of Paris may be used to achieve the proper height. Testing shall be conducted on the uncut face of the core.

4.1.3 Plant Produced Mixtures

4.1.3.1 Samples of plant-produced mixtures shall be obtained in accordance with AASHTO T 168. Mixture samples shall be reduced to the appropriate test size and compacted while the mixture is still hot. Reheating of loose plant mixture should be avoided.

4.1.3.2 Specimens shall be compacted according to paragraph 4.5.

4.1.4 Laboratory Prepared Mixtures

4.1.4.1 Mixture proportions are batched in accordance with the desired Job Mix Formula.

4.1.4.2 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 binders, use the mixing temperature recommended by the binder manufacturer.

4.1.4.3 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.

4.1.4.4 Test samples shall be aged two hours at compaction temperature or in accordance with the Mixture Conditioning for Volumetric Mixture Design in AASHTO R 30.

4.1.4.5 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.

4.1.4.6 Specimens shall be compacted according to paragraph 4.5.

4.1.5 Laboratory Compaction of Specimens

4.1.5.1 One of several SGC's may be used to compact specimens in the laboratory. Details regarding the procedures for compacting specimens in each device should be referenced to the equipment manufacturer's instructions. Dwell shall be zero (0), no dwell.

4.1.5.2 Laboratory prepared specimens shall be compacted to contain 7.0 ± 1.0% air voids and with a final height of 75 ± 5 mm (3 ± 0.1 in).

4.1.5.3 Compacted specimens should be left at room temperature, approximately 25 °C (77 °F) to allow the entire specimen to cool for a minimum of 3 hours.

4.2 Determining the Air Void Contents

4.2.1 Determine the bulk specific gravity of the test specimens in accordance with AASHTO T 166.

4.2.2 Determine the maximum specific gravity of the test mixture in accordance with AASHTO T 209.

4.2.3 Determine the air void contents of the test specimens in accordance with AASHTO T 269.

4.3 Selecting the Test Temperature

4.3.1 The test temperature shall be set to 64 ºC (147 ºF) unless otherwise specified.

4.4 Specimen Preheating

4.4.1 Place the specimens in the molds.

4.4.2 Specimens shall be preheated at the test temperature, 64 ºC (147 ºF) (unless otherwise specified) in the temperature calibrated LWT test chamber or in a separate calibrated oven for a minimum of 4 hours. Specimens should not be held at elevated temperatures for more than 24 hours prior to testing.

4.5 Procedure (Main)

4.5.1 Set the hose pressure gage 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).

4.5.2 Stabilize the testing chamber temperature at the test temperature selected in Paragraph 6.

4.5.3 Secure the preheated, molded specimens in the LWT. The preheated LWT chamber should not be opened more than 6 minutes when securing the test specimens into the machine. Close the chamber doors and allow 10 minutes for the temperature to re-stabilize prior to starting the test.

4.5.4 Apply 25 cycles to seat the specimens before the initial measurements. Make adjustments to the hose pressure as needed during the 25 cycles.

4.5.5 Open the chamber doors, unlock and pull out the sample holding tray (Steps 4.5.5 – 4.5.12 are to be followed if a manual determination of rut depths is to be obtained.).

4.5.6 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.

4.5.7 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 five locations on the template. (For cylindrical specimens, the center measurement is not used). 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 (0.0004 in.).

4.5.8 Repeat steps 4.5.6 and 4.5.7 for each beam or set of cylinders in the testing position. All measurements shall be completed within six minutes.

4.5.9 Push the sample holding tray in and secure. Close the chamber doors and

allow 10 minutes for the temperature to equalize.

4.5.10 Set the PRESET COUNTER to the number of test cycles.

4.5.11 Start the test. When the test reaches the number of cycles set on the counter (8000 cycles unless otherwise specified), the LWT will stop and the load wheels will automatically retract.

4.5.12 Repeat steps 4.5.5 to 4.5.11 as necessary to take final readings.

Note: Some Loaded Wheel Testers have been equipped with automatic measurement systems which makes steps 4.5.5 through 4.5.11 unnecessary. Some users have reported significant differences in rut depths between the automatic measurements and manual measurements.

5. CALCULATIONS

5.1 The rut depth at each location is determined by subtracting the final measurement from the initial measurement.

Note: Some Loaded Wheel Tester have been equipped with automatic measurement systems which makes steps 4.5.5 through 4.5.11 unnecessary.

5.2 Determine the average rut depth for each test position. For cylindrical specimens, use the average of all four measurements to calculate the average rut depth.

5.3 Calculate the average rut depth from the three test positions. Also, calculate the standard deviation for the three test positions.

5.4 Outlier evaluation – When testing two specimens, if the rut depths vary more than 2.0 mm (0.08 in.) from each other, the results may be discarded, and new specimens prepared and tested. If four or more cylindrical specimens are tested and the standard deviation for the set is greater than or equal to 2.0 mm (0.08 in.), 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.

5.5 The LWT rut depth for the mixture is the average of two, four, or six cylindrical specimens.

6. REPORTING

6.1 The test report shall include the following information:

6.1.1 The laboratory name, technician name, and date of test.

6.1.2 The mixture type and description.

6.1.3 Specimen type.

6.1.4 Average air void content of the test specimens.

6.1.5 The test temperature.

6.1.6 The average rut depths to the nearest 0.1 mm (0.04 in.) at 8000 cycles.

ANNEX

A. CALIBRATION

(For Pavement Technology, Inc. (PTI) Asphalt Pavement Analyzer)

The following items should be checked for calibration no less than once per year: (1) preheating oven, (2) LWT temperature, (3) LWT wheel load, and (4) LWT hose pressure. Instructions for each of these calibration checks are included in this section.

B. TEMPERATURE CALIBRATION OF THE PREHEATING OVEN.

B.l The preheating oven must be calibrated with a NIST traceable thermometer (an ASTM 65C calibrated thermometer is recommended) and a metal thermometer well to avoid rapid heat loss when checking the temperature.

B.2 Temperature Stability

B.2.l Set the oven to the chosen temperature, 64 ºC (147 ºF). 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.

B.2.2 Thirty minutes after obtaining the first reading, obtain another reading of the thermometer. Record this temperature. If the readings from step A2.l and A2.2 are within 0.4 ºC (0.8 ºF), then average the readings. If the readings differ by more than 0.4 ºC (0.8 ºF), then continue to take readings every thirty minutes until the temperature stabilizes within 0.4 ºC (0.8 ºF), on two consecutive readings.

B.3 Temperature Uniformity

B.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 ºC (0.8 ºF).

B.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 ºC (0.8 ºF), then the oven temperature is relatively uniform, and it is suitable for use preheating LWT samples. If the average of the readings at the two locations differs by more than 0.4 ºC (0.8 ºF), then you must find another oven that will hold this level of uniformity and meets calibration.

B.4 Temperature Accuracy

B.4.1 Average the temperatures from the two locations. If that average temperature is within 0.4 ºC of the set point temperature on the oven, then the oven is reasonably accurate, and calibration is complete.

B.4.2 If the set point differs from the average temperature by more than 0.4 ºC (0.8 ºF), 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, 64 ºC (147 ºF),

B.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 ºC, and the average of the two consecutive readings are within 0.4 ºC of the desired test, 64 ºC (147 ºF), then the oven has been properly adjusted and calibration is complete. If these two conditions are not met, then repeat steps A1.4.2 and A1.4.3.

C. LWT TEMPERATURE CALIBRATION

C.1 The LWT must be calibrated with a NIST traceable thermometer (an ASTM 65C calibrated thermometer is recommended) and a metal thermometer well to avoid rapid heat loss when checking the temperature.

C.2 Temperature Stability

C.2.1 Turn on the LWT main power and set the chamber temperature controller so that the temperature inside the testing chamber is about 64 ºC (147 ºF). Also, set the water temperature controller to achieve approximately 64 ºC (147 ºF) water temperature. Place the thermometer in the well and place them on the left side of the shelf where the samples and molds will be tested. (Note-it may be helpful to remove the hose rack from the LWT during temperature calibration to avoid breaking the thermometer.)

C.2.2 It usually takes about five hours for the LWT 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.

C.2.3 Thirty minutes after obtaining the first reading, obtain another reading of the thermometer. Record this temperature. If the readings from step A2.2.2 and A2.2.3 are within 0.4 ºC (0.8 ºF), then average the readings. If the readings differ by more than 0.4 ºC (0.8 ºF) then continue to take readings every thirty minutes until the temperature stabilizes within 0.4 ºC (0.8 ºF) on two consecutive readings.

C.3 Temperature Uniformity

C.3.1 To check the uniformity of the temperature in the LWT chamber, move the thermometer and well to the right side of the shelf 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 ºC (0.8 ºF).

C.3.2 Compare the average of the two readings at the left side with the average of the stabilized temperature at the right side. If the average temperatures from the two locations are within 0.4 ºC (0.8 ºF), then the LWT temperature is relatively uniform, and it is suitable for use. If the average of the readings at the two locations differs by more than 0.4 ºC (0.8 ºF) then consult with the manufacturer on improving temperature uniformity.

C.4 Temperature Accuracy

C.4.1 Average the temperatures from the two locations. If that average temperature is within 0.4ºC (0.8ºF) of the desired temperature of 64ºC (147 ºF), then the LWT temperature is reasonably accurate, and calibration is complete.

C.4.2 If the average temperature differs from the desired temperature of 64 ºC (147 ºF) by more than 0.4 ºC (0.8 ºF), then adjust the LWT temperature controller so that the thermometer and well will be at the desired temperature of 64 ºC (147 ºF).

C.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 ºC (0.8 ºF), and the average of the two consecutive readings are within 0.4 ºC (0.8 ºF) of the desired test temperature of 64 ºC (147 ºF), then the LWT 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 A2.4.2 and A2.4.3.

D. LWT WHEEL LOAD CALIBRATION OF THE AIR CYLINDERS AT THE THREE TEST POSITIONS

D.1 The LWT wheel loads will be checked with the calibrated load cell provided with the LWT 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 LWT at room temperature. A sheet is provided to record the calibration loads.

D.1.1 Remove the hose rack from the LWT

D.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. Do not lock sample tray in place.

D.1.3 Raise and lower the wheels 20 times to heat up the cylinders.

D.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 (4.1 in.).

D.1.5 Position the load cell under one of the wheels. Place wooden blocks or dummy samples under the other two wheels. (Alternatively, place two empty specimen molds, inverted, under the other two wheels.)

D.1.6 Zero the load cell.

D.1.7 Lower all wheels by turning the cylinder switch to CAL.

D.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 indention on the load cell bar (where the screw is located).

D.1.9 After the load cell has been properly centered, adjust the pressure in the cylinder to obtain 445 ± 5 N (100 ± 1 lb). Allow three minutes for the load cell reading to stabilize between adjustments. Record the pressure and the load.

D.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.

D.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.

D.1.12 Repeat steps A3.l.5 through A.3.1.11 for each wheel/cylinder.

D.1.13 Return the load cell to the first wheel and repeat steps A3.1.5 through A3.1.11

D.l.14 Place the load cell under the second wheel and repeat steps A3.1.5 through A3.1.11. A3.l.15 Place the load cell under the third wheel and repeat steps A3.1.5 through A3.1.11. The current cylinder pressures will be used to set wheel loads to 100 Lb.

E. REPLACEMENT OF THE LWT HOSES

E.1 New hoses shall be placed in service in accordance with 3.1.6.

E.1.1 Remove the hose rack from the LWT.

E.1.2 Remove the used hoses from the hose rack. Place the new hoses on the barbed nipples and secure with the hose clamps.

E.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 affect the contact pressure and hose life.

E.1.4 Place the hose rack back into the LWT and make sure that the hoses are aligned beneath the wheels.

E.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 55ºC (131ºF) or higher.

F. LWT HOSE PRESSURE CHECK

F.1 The air pressure in the LWT test hoses shall rechecked with a NIST traceable test gauge or transducer with a suitable range. The check shall be made while the LWT 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).

TEST METHOD FOR OPEN GRADED ASPHALT BASE COURSE

1. SCOPE

1.1 This method provides a procedure for determining asphalt content of an Open Graded Asphalt Base Course.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- T 209, Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- R 30, Mixture Conditioning of Hot Mix Asphalt (HMA)

3. APPARATUS

3.1 Balance – with ample capacity, and with sufficient sensitivity to enable the specific gravity of samples of uncompacted paving mixtures to be calculated to at least four significant figures.

3.2 Mixing apparatus – Mechanical mixer and metal pan or bowl of sufficient capacity. Hand mixing may also be used.

3.3 Oven – Thermostatically controlled to maintain required temperature.

3.4 Miscellaneous equipment such as a mechanical mixer or mixing tool, thermometers, balances, spatulas, metal containers, brown paper, and gloves for handling hot equipment.

3.5 Water bath – for immersing the specimen / Rice container in water while suspended under the balance. It shall be equipped with an overflow outlet for maintaining a constant water level.

3.6 Vacuum container, vacuum pump, residual pressure manometer (or vacuum gauge traceable to NIST) and related equipment described in AASHTO T 209, “Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures”.

4. PROCEDURE

4.1 Determine the aggregate gradation to ensure compliance with gradation requirements (Types 1 - 4) in Section 417 of the Department’s Standard Specification for Highway Construction, Edition of 2003.

4.2 Based on the aggregate gradation, prepare two aggregate samples (see Appendix) and place in oven at 325° F (163° C) until thoroughly heated. *(Total mineral aggregate, TMA, will vary depending on % asphalt cement requirement for Types 1-4 OGBC – see below).* Mix with % of asphalt cement that is midpoint of requirement for Types 1-4 (i.e.: 2.75% for Type 4) and mix at 300° F (149° C) until properly coated. Total weight of the specimen should be 2000 grams.

Example:

TMA = 1945 grams

AC = 55 grams

Total Wt. = 2000 grams

Note: Type 4 OGBC is required and % asphalt cement is 2.5%–3.0%.

55 grams of asphalt cement is 2.75% (midpoint).

4.3 Determine theoretical maximum specific gravity (Rice) of both specimens. One specimen to be cured or conditioned according to AASHTO R-30 “Mixture Conditioning of Hot Mix Asphalt (HMA)” before testing (Gmm_c) and the other specimen to be tested uncured or unconditioned (Gmm_u). The specific gravity (Gb) of the asphalt cement must also be known.

Example:
Gmm_u = 2.462
Gmm_c = 2.485
Gb = 1.036

100 / 2.462 = 40.617
100 / 2.485 = 40.241
40.617 – 40.241 = 0.376
Absorbed asphalt binder = 0.376 * 1.036 = 0.389
Optimum asphalt binder content = 2.75 + 0.389 = 3.139

5. REPORT

5.1 Report optimum asphalt binder content (in this example, 3.1%) and effective asphalt binder content (2.75%)

OPEN GRADED BASE COURSE BATCH SHEET								
OGBC TYPE _IV____								
		% AC						
SIEVE	JOB MIX	2.75						
75.0 mm (3")								
63.0 mm (2.5")								
50.0 mm (2")								
37.5 mm (1.5")								
25 mm (1")	0							
19 mm (3/4")	0	0						
12.5 mm (1/2")	30	584						
9.5 mm (3/8")	56	1089						
4.75 mm (#4)	96	1867						
2.36 mm (#8)	98	1906						
0.150 mm (#100)								
TMA<MF								
MF								
TMA		1945						
AC WT.		55						
TOTAL WT.		2000						
SAMPLE #	COLD FEED	WT.		LAB #				
				JOB #				
				AC BRAND				
				AC GRADE	PG 64-22			
TOTALS	100	15						
MIX 2 SAMPLES FOR RICE								
RUN 1 UNCURED								
CURE SAMPLE #2 IN OVEN FOR 2 HOURS								

TEST METHOD FOR AGGREGATE SURFACE AREA FOR ASPHALT FILM THICKNESS

1. SCOPE

1.1 This procedure is used to estimate the asphalt film thickness for a bituminous mixture. The calculated asphalt film thickness is the volume of the effective asphalt divided by the calculated surface area of the aggregate.

1.2 The calculated surface area of the aggregate consists of multiplying the total percentage passing each sieve size by a "surface-area factor". The accumulated products represent the equivalent surface area in terms of square meters per kilogram. All surface-area factors must be used in the calculation. Also, a different series of sieves will require different surface area factors.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*

- T 168, Standard Practice for Sampling Bituminous Paving Mixtures
- T 166, Standard Test Method for Bulk Specific Gravity, and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- T 209, Standard Test Method for Theoretical Maximum Specific Gravity, and Density of Bituminous Paving Mixtures
- T 269, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Mixtures
- T 312, Preparing and Determining the Density of Hot-Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
- R 30, Mixture Conditioning of Hot Mix Asphalt (HMA)
- T270, Centrifuge Kerosene Equivalent and Approximate Bitumen Ratio (ABR)

2.2 *Asphalt Institute Asphalt Mix Design Methods, MS-2*

3. APPARATUS

3.1 Balance – with ample capacity, and with sufficient sensitivity to enable the specific gravity.

3.2 Oven – Thermostatically controlled to maintain required temperature.

3.3 Miscellaneous equipment such as a mechanical mixer or mixing tool, thermometers, balances, spatulas, metal containers, brown paper, and gloves for handling hot equipment.

3.4 Water bath – for immersing the specimen / pycnometer in water while suspended under the balance. It shall be equipped with an overflow outlet for maintaining a constant water level.

3.5 *Sieves* - Sieves conforming to M 92.

3.6 Vacuum container, vacuum pump, residual pressure manometer (or vacuum gauge traceable to NIST) and related equipment described in AASHTO T 209, "Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures".

4. PROCEDURE

4.1 Determine the job mix formula gradation, bulk specific gravity of the aggregate and the compacted mixture, asphalt content, specific gravity of the asphalt and the asphalt absorption.

5. CALCULATION

5.1 Calculate the volume of effective asphalt as follows:

$$Pbe = Pb - \frac{(Gse - Gsb) \times Ps \times Gb}{Gse \times Gsb}$$

5.2 Surface Area, (SA): The gradation of the aggregate or blend of aggregates employed in the mix is used to calculate the surface area of the total aggregate. This calculation consists of multiplying the total percent passing of each sieve size (in decimal form) by a "surface-area factor" as set forth in Table 1. Sum these products and the total will represent the equivalent surface area of the sample in terms of square meters per kilogram (square feet per pound). It is important to note that all the surface area factors must be used in the calculation. Also, if a different series of sieves is used, different surface-area factors are necessary.

Note: These surface-area factors have been used to calculate an average film thickness using the volume of asphalt binder in the mix. Although this determination of asphalt film thickness can provide a broad, relative indication of mix durability, the Asphalt Institute strongly recommends against comparing this calculated value with specific mix design criteria because of inherent inaccuracies. These surface-area factors do not take into account the specific aggregate shape but are intended only as an index factor. In addition, in a compacted mixture, some of the asphalt and fine particle mastic is actually shared by adjacent particles rather than each being in an isolated state as assumed.

Table 1: Surface Area (SA) Factors

Total % Passing Sieve No.	Max Size	(a) No. 4	(b) No. 8	(c) No.16	(d) No. 30	(e) No.50	(f) No.100	(g) No. 200
SA m^2/kg	0.41	0.41	0.82	1.64	2.87	6.14	12.29	32.77
SA (ft^2/lb)	(2)	(2)	(4)	(8)	(14)	(30)	(60)	(160)

Surface-area factors shown are applicable only when all the above-listed sieves are used in the sieve analysis.

Example tabulation demonstrates the calculation of surface area by this method.

Sieve Size	**Percent Passing**	**SA Factor m^2/kg**	**SA Factor (ft^2/lb)**	**SA m^2/kg**	**SA (ft^2/lb)**
19.0 mm (¾ in.)	100	.41	(2)	.41	(2.0)
9.5 mm (3/8 in.)	90				
4.75 mm (No.4)	75	.41	(2)	.31	(1.5)
2.36 mm (No. 8)	60	.82	(4)	.49	(2.4)
1.18 mm (No. 16)	45	1.64	(8)	.74	(3.6)
600 µm (No. 30)	35	2.87	(14)	1.00	(4.9)
300 µm (No. 50)	25	6.14	(30)	1.54	(7.5)
150 µm (No. 100)	18	12.29	(60)	2.21	(10.8)
75 µm (No. 200)	6	32.77	(160)	1.97	(9.6)
Total surface area				8.67	(42.3)

Because of the relatively small surface area of larger aggregate sizes, a single surface-area factor of 0.41 m^2/kg (2 ft^2/lb) is used to account for the surface area of all of the material retained on the 9.5 mm sieve, regardless of the maximum aggregate size.

Surface area (m^2/kg) = 0.41 + 0.41a + 0.82b + 1.64c + 2.87d + 6.14e + 12.29f + 32.77g

5.3 Total Volume AC = 10^6 x (Pb/100) / (Gb_{77} x Water $Density_{77}$)
5.4 Volume of Abs. AC = 10^6 x (Pba/100) x (1-(Pb/100)) / (Gb_{77} x Water $Density_{77}$)
5.5 Volume of Effective AC = Total Volume AC (mL/kg) – Volume Abs. AC (mL/kg)
5.6 Asphalt Film Thickness (AFT) = Volume Eff. AC / (SA x (1 – Pb/100)))

6. REPORT

6.1 The Asphalt Film Thickness results are presented within the mix design summary report.

TEST METHOD FOR PETROGRAPHIC ANALYSIS OF NON-CARBONATE AGGREGATE

1. SCOPE

1.1 This test method provides a procedure for determination of percentage, by weight, of material that is non-carbonate.

2. REFERENCE DOCUMENTS

2.1 American Association of State Highway and Transportation Officials (AASHTO) Standards:

- M 92, Wire-Cloth Sieves for Testing Purposes
- M 231, Weighing Devices Used in the Testing of Materials
- T 2, Sampling of Aggregates
- T 11, Materials Finer Than (No. 200) 75-µm Sieve in Mineral Aggregates by Washing
- T 248, Reducing Sample of Aggregate to Testing Size

3. SIGNIFICANCE AND USE

3.1 This test method is of primary significance in determining the acceptability of aggregate for use in meeting the requirements of Section 409 of the Standard Specifications for Highway Construction.

4. APPARATUS

4.1 *Balance* - The balance shall have sufficient capacity, be readable to 0.1 gram and conform to the requirements of M 231.

4.2 *Sieves* - Sieves conforming to M 92.

4.3 *Oven* - An oven providing free circulation of air and capable of maintaining a temperature of 230 ± 9 °F (110 ± 5 °C).

5. PROCEDURE

5.1 Obtain a representative sample of the aggregate in accordance with AASHTO T 2 and T 248 to obtain a final weight after sieving as specified Section 5.4.

5.2 The sample shall be washed over the No. 200 (0.075mm) sieve in accordance with AASHTO T 11.

5.3 Dry the sample to constant mass at a temperature of 230 ± 9 °F (110 ± 5 °C), allow to cool, and determine the mass of the sample to the nearest 0.1 gram.

5.4 The sample shall be sieved over the 3/4-inch (19.0mm) and the Number 8 (2.36mm) sieves. Discard the material retained on the 3/4-inch (19.0mm) sieve and material passing the Number 8 (2.36mm) sieve. The test shall be performed on the coarse fraction retained on the No. 8 (2.36mm) sieve. A representative specimen shall be selected by quartering or splitting to obtain, after quartering / splitting, a minimum 1000 grams.

5.5 Spread the aggregate specimen out on a large sheet of heavy paper on a worktable so that individual particles can be carefully examined.

5.6 By visual and physical classification, separate the carbonate material from non-carbonate material. Any particle that is a composition particle will be considered as carbonate material. Make visual observations of conchoidal fractures (aggregate surface breaks with curved concavities) for each particle which provides an indication of non-carbonate material. A magnifying glass may be helpful to examine the aggregate surface. Conduct a physical test by holding an aggregate piece and physically attempting to scratch a glass plate. Chert and other silica material will be harder than a glass surface. Limestone is softer and will not scratch the glass surface.

5.7 Obtain weight of non-carbonate material removed from the aggregate specimen.

5.8 Determine insoluble content of non-carbonate material using ARDOT Test Method 306. Non-carbonate material shall have an insoluble residue of not less than 85%. If non-carbonate material has insoluble residue less than 85%, then report specimen as being all carbonate material.

6.0 CALCULATION

6.1 The non-carbonate particles shall be weighed.

6.2 The percentage of the non-carbonate particles present shall be calculated to the nearest 0.1 percent by dividing the weight of the non-carbonate particles by the weight of the representative specimen obtained in 5.4 and multiplying by 100.

$$C = (A / B) \times 100$$

where:

A = weight of non-carbonate particles

B = weight of representative specimen (portion quartered / split) from that retained on No. 8 (2.36 mm) sieve.

C = percentage of non-carbonate particles (Round to nearest whole percent)

7.0 REPORT

7.1 Refer to Form 1 TM-490 for reporting test results.

7.2 Refer to Form 2 TM-490 for Maintaining History of Quarry Products.

ARDOT Test Method 490

Standard Form for Reporting Petrographic Analysis Of Non-Carbonate Aggregate (Chert Count)

Producer/Supplier Name: _____ **Aggregate Type:** _____

Quarry Location: _____ **Aggregate Size:** _____

Approved Minimum % Chert: _____ **Formation Name:** _____

Date Tested	Lab Number	Sample Location	Quantity Represented (Tons)	Total Dry Wt. Of Sample (B)	Wt. Of Non-Carbonate Rock (A)	% Chert (A/B)*100	ARDOT Test Method 306 Insoluble Residue (%)	Pass/Fail	Technician	CTTP #	Signature

ARDOT Form 1- TM-490

Quarry Production Log

Producer/Supplier Name: _____ **Aggregate Type:** _____

Quarry Location: _____ **Aggregate Size:** _____

Approved Minimum % Chert: _____ **Formation Name:** _____

Month	Total Quarry Production Of This Product (Tons)	ARDOT Job Number	Total Quantity Shipped to This Job Number (Tons)	Comments	Technician	CTTP #

ARDOT Form 2- TM-490

ARDOT 530-07

TEST METHOD FOR THE COMPARISON OF FINE AGGREGATE COMPRESSIVE STRENGTH OF HYDRAULIC CEMENT MORTAR

1. SCOPE

1.1 This method provides a procedure for determining the compressive strength of cubes made with a fine aggregate and comparing it to the compressive strength of cubes made with a standard sand in the same cement mortar. Portland cement will be used in the method.

2. REFERENCED DOCUMENTS

2.1 *American Association of State Highway and Transportation Officials (AASHTO) Standards:*
- T 106, Compressive Strength of Hydraulic Cement Mortar
- T 162, Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency

2.2 *American Society of Testing and Materials (ASTM):* C 778, Specification for Standard Sand

3. APPARATUS AND MATERIALS

3.1 As outlined and referenced in AASHTO T 106

3.2 Sample — Fine aggregate sample shall be dry.

3.3 Materials for Compressive Strength — Standard Sand (ASTM C 778): Graded 20-30

3.4 Temperature and Humidity — As outlined in AASHTO T 106

3.5 Test Specimens — Three compressive strength cubes of the fine aggregate sample and three compressive strength cubes of the standard sand sample.

4. PROCEDURE

4.1 Preparation of Specimen Mold — As detailed in AASHTO T 106

4.1.1 Procedure for Mixing Mortars — As detailed in AASHTO T 106

4.2 Procedure for Compressive Strength Test — As detailed in AASHTO T 106. Cure specimens for seven (7) days

5. CALCULATION

5.1 Calculate compressive strengths as in AASHTO T 106

5.2 Divide the average compressive strength of the three fine aggregate specimens by the average compressive strength of the standard sand specimens. The average compressive strength of the fine aggregate specimens shall have an average compressive strength of 95% of the average compressive strength of the standard sand specimens at 7 days.

6. REPORT

6.1 Report percentage (%) to the nearest whole number.

PROCEDURE FOR COMBINING AGGREGATE GRADATIONS

1. SCOPE

1.1 This procedure is designed to be used when the aggregate gradations for a portland cement concrete (PCC) mix must be mathematically combined to create a theoretical combined gradation. This combined gradation is based on the relative percent volume in the mix.

1.2 Each individual aggregate is sampled and tested individually. Each gradation shall start with the largest appropriate sieve for that material and shall include all the consecutive smaller sieve sizes through the #200 sieve. They shall include: 1½ in. (37.5 mm), 1 in. (25 mm), ¾ in. (19 mm), ½ in. (12.5 mm), 3/8 in. (9.5 mm), #4 (4.75 mm), #8 (2.36 mm), #16 (1.18 mm), #30 (0.600 mm), #50 (0.300mm), #100 (0.150 mm), and #200 (0.075 mm) sieves.

2. PROCEDURE

2.1 The following steps outline the procedure to be used to determine this combined gradation:

2.1.1 The percent volume of each of the aggregates is determined from the volume proportions of the mix design. The relative proportion of each aggregate of the total aggregate is determined by dividing the individual aggregate portion in the mix by the total aggregate portion in the mix.

Example:
A mixture design has the following mix proportions by volume:

Cement	0.115
Water	0.163
Entrained Air	0.060
Fine Aggregate	0.272
Coarse Aggregate	0.390
Total	1.000

The total aggregate portion is: 0.272 + 0.390 = 0.662

The relative portion for each aggregate by volume is determined as follows:

Fine Aggregate (0.272/0.662) = 0.411

Coarse Aggregate (0.390/0.662) = 0.589

Check the total aggregate relative portions. They should equal 1.000.

2.1.2 These volume proportions are then adjusted by the specific gravity of the aggregates, since gradations are based on percent weight retained on each sieve. The relative weight is determined by multiplying each aggregate's volume proportion by its specific gravity. These relative weights are then summed to obtain a total weight. The proportion by weight is then determined by dividing each aggregate's relative weight by **the total weight.**

Example:

Aggregate	Proportion By Volume	Specific Gravity Weight	Relative	Proportion By Weight
Fine	0.411	2.61	1.07271	(1.07271/2.62767) = 0.408
Coarse	0.589	2.64	1.55496	(1.55496/2.62767) = 0.592
Total	1.000		2.62767	

2.1.3 For each individual aggregate gradation multiply the percent retained on each sieve by the proportion by weight. This is the Adjusted % Retained.

Example:

Coarse Aggregate

Sieve Inch (mm)	% Retained	Relative Volume	Adjusted % Retained
1½ (37.5)	0.0	0.592	0.0
1 (25.0)	8.1	0.592	4.8
¾ (19.0)	23.0	0.592	13.6
½ (12.5)	37.6	0.592	22.3
3/8 (9.5)	19.0	0.592	11.2
No. 4 (4.75)	9.3	0.592	5.5
No. 8 (2.36)	1.8	0.592	1.1
No. 16 (1.18)	0.5	0.592	0.3
No. 30 (0.600)	0.1	0.592	0.1
No. 50 (0.300)	0.2	0.592	0.1
No. 100 (0.150)	0.1	0.592	0.1
No. 200 (0.075)	0.1	0.592	0.1
Minus 200 (0.075)	0.2	0.592	0.1

Similar calculations are done for the fine aggregate.

2.1.4 Determine the theoretical combined gradation from the individual gradations by totaling the percent retained of all aggregates for each sieve size. This is the theoretical combined percent retained for each sieve. The total of these percentages retained should equal 100.0. If the total is off due to rounding, prorate the rounding error. The theoretical combined gradation, percent passing, may be calculated by subtracting the cumulative % retained for each sieve, beginning with 100. The following table shows the calculations:

Sieve Inch (mm)	**Coarse Agg.**	**Fine Agg.**	**Theoretical Combined Gradation % Retained**	**Prorated % Retained**	**% Retained Cumulative**	**Theoretical Combined Gradation % Passing**
1½ (37.5)	0.0		0.0	0.0	0.0	100
1 (25.0)	4.8		4.8	4.8	4.8	95.2
¾ (19.0)	13.6		13.6	13.7	18.5	81.5
½ (12.5)	22.3		22.3	22.4	40.9	59.1
3/8 (9.5)	11.2	0.0	11.2	11.2	52.1	47.9
No. 4 (4.75)	5.5	2.0	7.5	7.5	59.6	40.4
No. 8 (2.36)	1.1	4.1	5.2	5.2	64.8	35.2
No. 16 (1.18)	0.3	5.6	5.9	5.9	70.7	29.3
No. 30 (0.600)	0.1	12.9	13.0	13.1	83.8	16.2
No. 50 (0.300)	0.1	12.0	12.1	12.2	96.0	4.0
No. 100 (0.150)	0.1	3.1	3.2	3.2	99.2	0.8
No. 200 (0.075)	0.1	0.2	0.3	0.3	99.5	0.5
Minus 200 (0.075)	0.1	0.4	0.5	0.5	100.0	0.0
Total			**99.6**	**100.0**		

The theoretical combined gradations are used in graphically displaying aggregate blends of PCC mixture designs and for plotting 0.45 power control charts to compare target gradation with working ranges of the mix design.

TEST METHOD FOR FLEXIBILITY OF TRAFFIC PAINT

ARDOT Test Method 701A-15 is equivalent to ASTM D2205-85 (2010), Elongation, except for the following provisions:

1. Replace references to ASTM D1737 with ASTM D522.
2. Allow test specimen to air dry 18-24 hours, bake 2 hours at 122 ± 3.6° F (50 ± 2° C), and cool before conducting the test with a 1/2 in. (12.7 mm) mandrel.

TEST METHOD FOR WATER RESISTANCE OF TRAFFIC PAINT

ARDOT Test Method 701D-15 is equivalent to ASTM D2205-85 (2010), Water Resistance, except for the following provisions:

1. ASTM D1647 Method A shall be used with the exceptions as stated in D2205 using a 15 mil (380 µm) wet film.

TEST METHOD FOR CONTRAST RATIO OF TRAFFIC PAINT

ARDOT Test Method 701G-15 is equivalent to ASTM D2205-85 (2010), Hiding Power, except for the following provisions:

1. Replace references to Procedure A, Method 4121 of U.S. Federal Test Method Standard 141B with ASTM D2805.

MATERIAL CERTIFICATION FOR JOB DOCUMENTATION

The items on the following list may be approved by the Resident Engineer as to compliance with the specifications and/or quantities.

1. Dumped Riprap

2. Quarry run stone fill

3. Agricultural lime (at option of Resident Engineer, samples may be submitted for testing).

4. Vehicular Gates

5. Fencing (Material from an approved suppliers and at option of Resident Engineer, samples submitted for testing).

6. Metal Slab Bolsters

7. Metal High Chairs

NOTE: Metal high chairs and slab bolsters in contact with exterior surfaces of concrete shall be galvanized, stainless steel, or have plastic coated tips. If the tips are plastic coated, the coating must cover all parts of the leg within 1/2 inch of the concrete surface. Proper dimensions and type of coating should be determined for each of the two items prior to certification of these materials.

8. Mulch Cover

9. Traffic Signal Equipment (Traffic Division approves the proposed equipment and forwards to the Resident Engineer for job approval).

    a. Actuated Controllers
    b. Vehicle Detectors
    c. Traffic Signal Heads
    d. Pedestrian Signal Boxes
    e. Luminaire Assemblies
    f. Electrical Wire
    g. Ground Rod
    h. Conduit

    Span wire support poles, traffic signal mast arms and poles, and traffic signal pedestal poles, and anchors and connection hardware (Std. Spec. Sections 712, 714, and 715) are certified by a Professional Engineer.

10. Traffic Control Devices (Temporary Construction Signing) will be accepted by the Department on the basis of a certificate from the Contractor as to their full compliance with the specifications and a visual inspection as to their effectiveness and condition.

    Items included under Traffic Control Devices are:
    Signs
    Barricades
    Traffic Drums
    Precast Concrete Barrier
    Temporary Pavement Markings (Excluding Paint)
    Temporary Pavement Markings

11. Impact Attenuation Barriers

12. Crash Cushions

13. Automatic Flood Gates

14. Liquid Asphalt for Prime, Tack, and Asphalt in Bituminous Surface Treatment.

15. Fly Ash.

16. Ground granulated Blast-Furnace Slag

17. Modified Portland Cement.

18. Portland Cement.

The above is a list of common items for R.E. approval. However, there may be some unusual items not listed which require certification. If you have any questions, please contact the Materials Division.

METHOD OF DOCUMENTATION OF ACCEPTANCE: The Resident Engineer shall complete Materials Form 170 to the extent necessary to document the approval of common materials. One copy of the Form is retained in the project file.

Sample Form M 170

Date: _____

TO: Job File
FROM: _____, Resident Engineer
Job: _____, Miscellaneous Materials Certification

I hereby certify that the materials listed below in the quantity shown conform to or exceed the material specification required by the Standard Specifications and/or Special Provisions and/or Plans.

ABS /PVC Pipe for Underdrain Laterals:	L.F.
Agricultural Lime:	Tons
Blotter Course:	C.Y. or Tons
Dumped Riprap:	C.Y. or Tons
Erosion Matting Staples:	Each
Fencing (Type C & D):	L.F.
Gabion Stone:	C.Y. or Tons
High Chairs:	Each
Mail Boxes and Hardware:	Each
Mulch Cover:	Acres
Mulch Netting:	Sq. Yd.
Rock Buttress:	C.Y. or Tons
Quarry Run Stone Fill:	Tons
Slab Bolsters:	L.F.
Sod Mulch:	C.Y.
Solid Sodding:	Sq. Yd.
Vehicular Gates:	Each Gate
Traffic Signal Equipment:	
a. Actuated Controllers:	Each
b. Vehicle Detectors:	Each
c. Traffic Signal Heads:	Each
d. Pedestrian Signal Heads:	Each
e. Luminaire Assemblies:	Each
f. Nonmetallic Rigid Conduit, Schedule 40:	L.F.
g. Metallic Rigid Conduit:	L.F.
h. Feeder Wire:	L.F.
i. Loop Wire:	L.F.
j. Loop Wire In Duct:	L.F.
k. Signal Cable:	L.F.
l. Ground Rod:	Each
m. Electrical Conductor (Signals, Signs, etc.):	L.F.

Other:

APPENDIX

TO CONVERT	INTO	MULTIPLY BY
ACRE-FEET	GALLON	325900
ACRES	SQ. FT.	43560
CHAIN	INCHES	792
CHAIN	METERS	20.12
CHAIN	YARDS	22
CIRCUMFERENCE	RADIANS	6.283
CUBIC FEET	CU. INCHES	1728.0
CUBIC FEET	CU. YARDS	0.037
CUBIC FEET	GALLONS	7.4805
CU. FEET/SEC.	GALLONS/MIN.	448.831
CUBIC INCHES	CU. FEET	0.0005787
CUBIC INCHES	GALLONS	.0043
CUBIC INCHES	CU. YARDS	0.00002143
CUBIC YARDS	CU. FEET	27
CUBIC YARDS	CU. INCHES	46656
DAYS	SECONDS	86400
DEGREES	QUADRANTS	0.0111
DEGREES	RADIANS	0.01745
DEGREES	SECONDS	3600
FEET OF WATER	POUNDS/SQ. FOOT	62.4
FEET/SEC.	MILES/HR.	0.681
FEET/100 FEET	PERCENT GRADE	1
GALLONS	CU. FEET	0.1337
GALLONS	CU. INCH	231
GALLONS	CU. YARDS	0.004951
GALLONS OF WATER	POUNDS OF WATER	8.345
GALLONS/MIN.	CU. FT./SEC.	0.00228
GRAMS	POUNDS	0.002205
HORSEPOWER	FT.LB./SEC.	550
HOURS	DAYS	0.04167
HOURS	WEEKS	0.005952
INCHES	MILE	.00001578
INCHES	YARDS	0.02778
MILES	FEET	5280
MILES	INCHES	63360
MILES	YARDS	1760
MILES/HR.	FEET/MIN.	88
MILS	INCHES	0.001
MINUTES(ANGLE)	DEGREES	0.01667
MINUTES(ANGLE)	QUADANTS	0.0001852
MINUTES(ANGLE)	RADIANS	0.0002909
MINUTES(ANGLE)	SECONDS	60

TO CONVERT	INTO	MULTIPLY BY
OUNCES	GRAMS	28.3495
OUNCES	POUNDS	0.0625
PINTS	GALLONS	0.125
POUNDS	GRAMS	453.59
POUNDS	OUNCES	16
POUNDS OF WATER	GALLONS	0.1198
POUNDS/SQ. IN.	POUNDS/SQ.FT.	144
QUADRANTS	DEGREES	9
QUADRANTS	MINUTES	5400
QUADRANTS	RADIANS	1571
QUADRANTS	SECONDS	324000
QUARTS	GALLONS	0.25
RADIANS	DEGREES	57.3
RADIANS	MINUTES	3438
RADIANS	QUADRANTS	0.6366
RADIANS	SECONDS	206300
RADIANS/SEC.	DEGREES/SEC.	57.3
ROD	CHAINS	0.25
SECONDS(ANGLE)	DEGREES	0.0002778
SECONDS(ANGLE)	MINUTES	0.01667
SECONDS(ANGLE)	QUADRANTS	.000003087
SECONDS(ANGLE)	RADIANS	000004848
SQ. FEET	ACRES	0.00002296
SQ. FEET	SQ. INCHES	144
SQ. FEET	SQ. MILES	0.0000000359
SQ. FEET	SQ. YARDS	0.1111
SQ. INCHES	SQ. YARDS	0.0007716
SQ. MILES	ACRES	640
SQ. MILES	SQ. FEET	2788000
SQ. MILES	SQ. FEET	3098000
SQ. YARDS	SQ. FEET	9
SQ. YARDS	SQ. INCHES	1296
SQ. YARDS	SQ. MILES	0.0000003228
TEMPERATURE(C) +273	ABSOLUT. TEMP.	1
TEMPERATURE(C) +17.78	TEMPERATURE(F)	1.8
TEMPERATURE(F) +460	ABS. TEMP.(F)	1
TONS	POUNDS	2000
YARDS	MILES	.0005682

January 2024

U.S. - Metric Conversions

From:	To:	Multiply by:
Length		
Inches	Centimeters	2.540
Feet	Meters	0.304
Miles	Kilometers	1.609
Yards	Meters	0.914
Mass		
Ounces	Grams	28.350
Pounds	Kilograms	0.453
Long Tons	Tonnes	1.016
Short Tons	Tonnes	0.907
Area		
Square Inches	Square Centimeters	6.452
Square Feet	Square Meters	0.092
Acres	Hectares	0.404
Square Miles	Square Kilometers	2.590
Square Yards	Square Meters	0.836
Volume		
Cubic inches	Cubic Centimeters	16.390
Cubic Feet	Cubic Meters	0.028
Capacity		
Pints (Liquid)	Liters	0.473
Gallons (Liquid)	Liters	3.785

Metric - U.S. Conversions

From:	To:	Multiply by:
Length		
Centimeters	Inches	0.393
Meters	Feet	3.281
Kilometers	Miles	0.621
Meters	Yards	1.094
Mass		
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Tonnes	Long Tons	0.984
Tonnes	Short Tons	1.102
Area		
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.760
Hectares	Acres	2.471
Square Kilometers	Square Miles	0.386
Square Meters	Square Yards	1.196
Volume		
Cubic Centimeters	Cubic inches	0.061
Cubic Meters	Cubic Feet	35.310
Capacity		
Liters	Pints (Liquid)	2.114
Liters	Gallons (Liquid)	0.264

REINFORCING STEEL
(UNCOATED AND EPOXY COATED BARS)

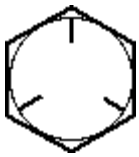
See Qualified Products List for approved producers, fabricators and epoxy coaters.

English Bar Size

English Bar Size Designation	Nominal Area inch^2	Nominal Weight lb/ft	Nominal Diameter inch
#3	0.11	0.376	0.375
#4	0.20	0.668	0.500
#5	0.31	1.043	0.625
#6	0.44	1.502	0.75
#7	0.6	2.044	0.875
#8	0.79	2.67	1.0
#9	1.0	3.4	1.128
#10	1.27	4.303	1.27
#11	1.56	5.313	1.41
#14	2.25	7.65	1.693
#18	4.0	13.6	2.257

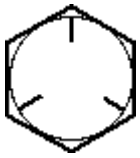
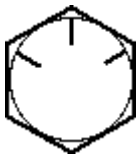
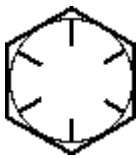
Metric Bar Size

Metric Bar Size Designation	Nominal Area cm^2	Nominal Weight kg/m	Nominal Diameter cm
#10	0.71	0.52	0.95
#13	1.29	0.994	1.27
#16	2.00	1.55	1.59
#19	2.84	2.24	1.91
#22	3.87	3.041	2.22
#25	5.10	3.97	2.54
#29	6.45	5.06	2.87
#32	8.19	6.40	3.23
#36	10.06	7.90	3.58
#43	14.52	11.4	4.30
#57	25.81	20.2	5.73

ASTM Bolt Designations				
ASTM standard	Size range	Tensile strength, ksi	Material	Head marking
A307	1/4 thru 4	60	Low carbon steel	
A325 Type 1	1/2 thru 1 1-1/8 thru 1-1/2	120 105	Medium carbon steel, quenched & tempered	
A325 Type 2	1/2 thru 1 1-1/8 thru 1-1/2	120 105	Low carbon martensite steel, quenched & tempered	
A325 Type 3	1/2 thru 1 1-1/8 thru 1-1/2	120 105	Weathering steel, quenched & tempered	
A449	1/4 thru 1 1-1/8 thru 1-1/2 1-3/4 thru 3	120 105 90	Medium carbon steel, quenched & tempered	
A490 Type 1	1/4 thru 1-1/2	150	Alloy steel, quenched & tempered	
A490 Type 3	1/4 thru 1-1/2	150	Weathering steel, quenched & tempered	

Often one will find "extra" marks on a bolt head--marks in addition to those shown above. Usually, these marks indicate the bolt's manufacturer.

ASTM A325 Type 2 bolts have been discontinued but are included above because they can be found in existing structures. Their properties can be important in failure investigations.

SAE Bolt Designations				
SAE Grade No.	Size range	Tensile strength, ksi	Material	Head marking
1 2	1/4 thru 1-1/2 1/4 thru 3/4 7/8 thru 1-1/2	60 74 60	Low or medium carbon steel	
5	1/4 thru 1 1-1/8 thru 1-1/2	120 105	Medium carbon steel, quenched & tempered	
5.2	1/4 thru 1	120	Low carbon martensite steel, quenched & tempered	
7	1/4 thru 1-1/2	133	Medium carbon alloy steel, quenched & tempered	
8	1/4 thru 1-1/2	150	Medium carbon alloy steel, quenched & tempered	
8.2	1/4 thru 1	150	Low carbon martensite steel, quenched & tempered	

COUNTY CODES

1	Arkansas
2	Ashley
3	Baxter
4	Benton
5	Boone
6	Bradley
7	Calhoun
8	Carroll
9	Chicot
10	Clark
11	Clay
12	Cleburne
13	Cleveland
14	Columbia
15	Conway
16	Craighead
17	Crawford
18	Crittenden
19	Cross
20	Dallas
21	Desha
22	Drew
23	Faulkner
24	Franklin
25	Fulton
26	Garland
27	Grant
28	Greene
29	Hempstead
30	Hot Spring
31	Howard
32	Independence
33	Izard
34	Jackson
35	Jefferson
36	Johnson
37	Lafayette
38	Lawrence
39	Lee
40	Lincoln
41	Little River
42	Logan
43	Lonoke
44	Madison
45	Marion
46	Miller
47	Mississippi
48	Monroe
49	Montgomery
50	Nevada
51	Newton
52	Ouachita
53	Perry
54	Phillips
55	Pike
56	Poinsett
57	Polk
58	Pope
59	Prairie
60	Pulaski
61	Randolph
62	St. Francis
63	Saline
64	Scott
65	Searcy
66	Sebastian
67	Sevier
68	Sharp
69	Stone
70	Union
71	Van Buren
72	Washington
73	White
74	Woodruff
75	Yell

CALIBRATION OF ROLLING STRAIGHT EDGE

1. SCOPE

1.1 This method covers the calibration of the 10 foot Rolling Straight Edge and/or the Hi/Low Detector.

2. APPARATUS

2.1 The rolling straight edge is a machine for detecting points on the surface of a roadway which deviate from the prevalent level or grade. It is constructed for checking both concrete and asphalt surfaces. Basically, the device consists of an I-beam body 10 feet long with 8" support wheels at the ends and a 6 " detector wheel at the mid-point. The front 8" wheel is steerable so that the device can be controlled on the surface. The middle wheel detects any vertical deviation of the surface from a straight line between the supporting wheels mounted on the device ends. The vertical deviations are shown by a movable pointer over a visible scale. The scale is mounted above the detecting wheel and centered on the I-beam in front of the steering handle. Variations or deviations are magnified 16 times on the scale, which is graduated in 1/8 inch increments. This allows for a deviation of up to 1/4 inch high or low to be measured.

3. CALIBRATION EQUIPMENT NEEDED

1. 11 foot I-Beam, straight

2. 12 feet *of* nylon cord

3. Set of six metal shims, marked accordingly
   2 at 1/8 inch
   2 at 3/16 inch
   2 at 1/4 inch

4. 12-inch level

4. PRE-CALIBRATION CHECK

4.1. Wheels (Two 8-inch wheels and one 6 inch wheel)

A. Check wheels for cleanness, they should have NO material clinging to them.

B. Check wheels for roundness, smoothness, and proper diameter (8-inch

support wheels and 6 inch detector wheel).

C. Check wheel bushings' wear to determine excess slack and ease of rotation.

D. Check and/or adjust scraper plates on all wheels to 1/16-inch clearance between wheel surface and scraper plate.

E. Check and grease all wheels as needed.

4.2. I-Beam

A. Check I-beam for trueness and straightness (This may be accomplished by placing a 1/4-inch shim on each end of the I-beam and stretching a nylon cord across the shims and measuring the distance from the cord to the beam along the beam's entire length.

Note: Beam must be straight).

4.3. Scale and Pointer-Hand Assembly.

A. Check scale face for straightness and that it is clearly marked with equally spaced divisions.

B. Check pointer-hand for trueness and freeness of operation.

C. Check all linkages between the detector wheel and the pointer hand assembly for wear and that nothing is bent or binds during full movement.

D. Check scale movement (+ and -) of pointer-hand. This be accomplished by blocking the front or rear support wheel off the ground by at least 12 inches and moving the detector wheel up and down.

5. CALIBRATION

5.1. Place aluminum I-beam on flat level ground making sure the beam is level and rests firmly on the ground over its entire length.

5.2. Place the rolling straight edge on the aluminum I-beam and place the 12-inch level across the straight edge close to the T-handle and observe that the straight edge remains level during the calibration procedure.

5.3. Make sure the pointer-hand is now setting on zero without the use of any shims (if pointer-hand is not setting on zero adjust the pointer-detector assembly until the pointer-hand does read zero). After adjusting the pointer-detector assembly you must recheck pointer-hand for full plus and minus range movement.

5.4. Now check straight edge "High" readings. This is accomplished by placing the 1/8 inch shim under the detector wheel and making sure the pointer hand reads 1/8 inch, if the unit does not read the correct amount *DO NOT ADJUST THE POINTER-DETECTOR LINKAGE* as this will move the zero point. Check all the

different size shims (3) under the detector wheel making sure the pointer- hand reads correctly for each shim.

NOTE: If any reading is not correct go back to Pre-Calibration Check Procedure and recheck for worn bearings and linkages.

5.5. Check straight edge "Low" reading by placing a 1/8 inch shim under each of the support wheels, the straight edge should read 1/8 inch low. If the unit does not read the correct amounts *DO NOT ADJUST THE POINTER-DETECTOR LINKAGE* as this will move the zero point. Check all the different shims sizes (3) under the support wheels making sure the pointer-hand reads correctly for each shim size. NOTE: If any reading is not correct go back to Pre-Calibration or worn bearings and linkages. Check Procedure and recheck.

STEEL PILING INSPECTION

1. SCOPE

1.1 The following information concerning proper identification of steel piling is forwarded for use in inspection of steel piling delivered to a project:

H-Piles

Standard Specification 805.03 (c) – Unless otherwise specified, steel piles shall consist of structural shapes of the section shown on the plans and shall comply with AASHTO M 270, Grade 36 (250)

- *AASHTO M 270* – "Material identification shall include the composition type for Grade 50W in addition to that required by AASHTO M 160 (ASTM A6)."
- *AASHTO M 160* (ASTM A6) "Shapes shall be marked with the heat number, size of section, length, and mill identification on each piece. The manufacturer's name, brand, or trademark shall be shown in raised letters at intervals along the length. In addition, shapes shall be identified with the ASTM designation and grade, either by marking each piece individually or, if bundled……." (H-piles would not be bundled)

Color coding is required for AASHTO M 270, Grade 50 (ASTM A572, Grade 50) – green and yellow.

Stenciling, stamping (steel die stencils), or substantial tags, applied by the manufacturer are acceptable forms of identification marks. Any paint, chalk, or crayon marks applied by hand are not acceptable for primary identification but may are considered supplementary. H-piles also require the manufacturer's name, brand, or trademark be shown in raised letters.

Steel Shell Piles

Standard Specification 805.03 (d) – Unless otherwise specified, plain round steel shells shall comply with ASTM A252, Grade 2. Shells shall be welded or seamless steel pipe. Steel shell piles shall be marked by the manufacturer near both ends of the pile. Marking shall be in accordance with ASTM A252.

- *ASTM A252* - Product Marking: "Each length of pipe piles shall be legibly marked by stenciling, stamping, or rolling to show: the name or brand of the manufacturer; the heat number; the process of manufacture (seamless, flash welded, fusion welded, or electric resistance welded); the type of helical seam (helical-lap or helical-butt), if applicable; the outside diameter,

nominal wall thickness, length, and weight per unit length; the specification designation; and the grade."

Stencils, stamps, or rolling of identification marks by the shell pile manufacturer are the only acceptable forms of identification. Any marking by hand such as chalk, paint, or crayon, is considered supplementary.

<u>Overall</u> – PILING FOR WHICH THE MANUFACTURER'S MARKING IS ILLEGIBLE, IMPROPER, OR INCOMPLETE SHOULD BE REJECTED AND NOT USED ON THE PROJECT.

SECTIONAL AREA AND WEIGHT OF WELDED WIRE FABRIC

Note: The below listing of smooth and deformed wire sizes represents wires normally selected to manufacture welded wire fabric styles to specific areas of reinforcement. Wire sizes other than those listed below, including larger sizes, may be available if the quantity required is sufficient to justify manufacture.

The number following the prefix W or the prefix D identifies the cross-sectional area of the wire in hundredths of a square inch. The nominal diameter of a deformed wire is equivalent to the diameter of a smooth wire having the same weight per foot as the deformed wire.

WIRE SIZE NUMBER		NOMINAL DIAMETER	NOMINAL WEIGHT	AREA - SQ. IN. PER FOOT OF WIDTH FOR VARIOUS SPACINGS						
				CENTER TO CENTER SPACING						
SMOOTH	DEFORMED	INCHES	LBS/LIN. FT.	2"	3"	4"	6"	8"	10"	12"
W31	D31	0.628	1.054	1.860	1.240	0.930	0.620	0.465	0.372	0.310
W30	D30	0.618	1.020	1.800	1.200	0.900	0.600	0.450	0.360	0.300
W28	D28	0.597	0.952	1.680	1.120	0.840	0.560	0.420	0.336	0.280
W26	D26	0.575	0.934	1.560	1.040	0.780	0.520	0.390	0.312	0.260
W24	D24	0.553	0.816	1.440	0.960	0.720	0.480	0.360	0.288	0.240
W22	D22	0.529	0.748	1.320	0.880	0.660	0.440	0.330	0.264	0.220
W20	D20	0.504	0.680	1.200	0.800	0.600	0.400	0.300	0.240	0.200
W18	D18	0.478	0.612	1.080	0.720	0.540	0.360	0.270	0.216	0.180
W16	D16	0.451	0.544	0.960	0.640	0.480	0.320	0.240	0.192	0.160
W14	D14	0.422	0.476	0.840	0.560	0.420	0.280	0.210	0.168	0.140
W12	D12	0.390	0.408	0.720	0.480	0.360	0.240	0.180	0.144	0.120
W11	D11	0.374	0.374	0.660	0.440	0.330	0.220	0.165	0.132	0.110
W10.5		0.366	0.357	0.630	0.420	0.315	0.210	0.157	0.126	0.105
W10	D10	0.356	0.340	0.600	0.400	0.300	0.200	0.150	0.120	0.100
W9.5		0.348	0.323	0.570	0.380	0.285	0.190	0.142	0.114	0.095
W9	D9	0.338	0.306	0.540	0.360	0.270	0.180	0.135	0.108	0.090
W8.5		0.329	0.289	0.510	0.340	0.255	0.170	0.127	0.102	0.085
W8	D8	0.319	0.272	0.480	0.320	0.240	0.160	0.120	0.096	0.080
W7.5		0.309	0.255	0.450	0.300	0.225	0.150	0.112	0.090	0.075
W7	D7	0.298	0.238	0.420	0.280	0.210	0.140	0.105	0.084	0.070
W6.5		0.288	0.221	0.390	0.280	0.195	0.130	0.097	0.078	0.065
W6	D6	0.276	0.204	0.360	0.240	0.180	0.120	0.090	0.072	0.060
W5.5		0.264	0.187	0.330	0.220	0.165	0.110	0.082	0.066	0.055
W5	D5	0.252	0.170	0.300	0.200	0.150	0.100	0.075	0.060	0.050
W4.5		0.240	0.153	0.270	0.180	0.135	0.090	0.067	0.054	0.045
W4	D4	0.225	0.136	0.240	0.160	0.120	0.080	0.060	0.048	0.040
W3.5		0.211	0.119	0.210	0.140	0.105	0.070	0.052	0.042	0.035
W3		0.195	0.102	0.180	0.120	0.090	0.060	0.045	0.036	0.030
W2.9		0.192	0.098	0.174	0.116	0.087	0.058	0.043	0.035	0.029
W2.5		0.178	0.085	0.150	0.100	0.075	0.050	0.037	0.030	0.025
W2.1		0.162	0.070	0.126	0.084	0.063	0.042	0.031	0.025	0.021
W1.4		0.135	0.049	0.084	0.056	0.042	0.028	0.021	0.017	0.014