AMRL
AASHTO Materials Reference Laboratory

Date Issued: April 11, 2014

Mr. John Thomas
Quality Control / IA Branch Manager
Oklahoma Department of Transportation
Materials Division
200 N.E. 21st Street
Oklahoma City, Oklahoma 73105-3204

Subject: AMRL On-Site Assessment of Materials Testing Laboratory

Dear Mr. Thomas:

The following is a confirmatory report on Assessment No. 649R, which was completed in your testing laboratory in Oklahoma City, Oklahoma on March 20, 2014, by Mike Wagner and Ryan LaQuay, a representative of the AASHTO Materials Reference Laboratory (AMRL). An examination of the Asphalt Binder, Emulsified Asphalt, Hot Mix Asphalt, Soil, Aggregate and Metals testing facilities was conducted during this assessment. In addition, the quality system of the laboratory was evaluated based on the criteria specified in AASHTO Standard Practice R18.

This report is also available to you in PDF format on the AMRL website, www.amrl.net, if your laboratory has registered for the site. Please contact us if you have any questions about registering for the website.

This letter and the accompanying report provide written evidence that your laboratory has been assessed. It is requested that this report not be used for advertising, publication, or promotional purposes.

Sincerely,

Steven E. Lenker, P.E.
Director, Construction Materials Reference Laboratories
AASHTO Materials Reference Laboratory

Enclosure

cc: Division Administrator, FHWA

REPORT ON MATERIALS TESTING LABORATORY ASSESSMENT:

Oklahoma Department of Transportation
Materials Division
200 N.E. 21st Street
Oklahoma City, Oklahoma 73105-3204

AMRL Assessor: **Mike Wagner and Ryan LaQuay**
Assessment Number: **649R**
Date of Assessment: **March 20, 2014**

GENERAL INFORMATION

The assessment covered by this report included a review of the Asphalt Binder, Emulsified Asphalt, Hot Mix Asphalt, Soil, Aggregate and Metals testing facilities. In addition, an examination of the laboratory's Quality System based on the criteria specified in AASHTO Standard Practice R18 was performed.

This report contains a "Summary of Findings" table for each of the areas examined during the assessment. A "Findings" section follows each "Summary of Findings" table, which describes deviations from specification requirements (nonconformities), states specific observations, and notes other relevant matters.

AMRL applied the most recent versions of AASHTO, ASTM or other governing standards available at the time of the assessment. At the conclusion of the assessment, the assessor presented a preliminary report summarizing the findings to the laboratory staff. The findings presented in this final report may vary slightly from those included in the preliminary report.

ASSESSMENT FINDINGS

Findings in this report are classified as **nonconformities**, ***observations***, or ***informational***. Definitions for these terms are provided below.

- **Nonconformities:** A finding that indicates policy or practice contrary to the requirements of applicable standards or documented quality system procedures.
- **Observations:** A minor failure in some part of the organization's quality management system, such as a single observed lapse in conformance to a standard test method, internal operating procedure, or standard documentation requirements. *NOTE: Observations are required to be addressed internally by the laboratory though its own internal corrective action process. Repeat observations can result in a nonconformity, which must be addressed through a formal corrective action process with the AASHTO Accreditation Program.*
- ***Informational:*** (**1**) Specific technical information provided for informational purposes only. (**2**) Information about pending or anticipated changes to test standards, AASHTO R 18, and the AAP Procedures Manual.

RESOLUTION OF FINDINGS

Resolving Nonconformities
Laboratories seeking AASHTO accreditation or wishing to maintain their accreditation status must **resolve** all findings labeled as "Nonconformities" within 90 calendar days of the issuance of this final report. The responses must include a description of the corrective action taken and substantiating evidence, such as records; copies of newly prepared or revised documents; equipment packing slips; calibration, standardization, and check records; and photographs. A **root cause analysis** may be required to resolve nonconformities. Repeat nonconformities will require more extensive responses.

RESOLUTION OF FINDINGS (CONT'D)

Corrective Action of Nonconformities and Root Cause Analysis
Resolving nonconformities requires corrective action as follows: (**1**) Take immediate interim action to isolate the effects of the problem, (**2**) Take immediate action to correct the problem, (**3**) Investigate the *root cause* of the problem, if needed, and (**4**) Implement permanent corrective action to prevent recurrence of the problem.

Note: Root cause analysis can be the most difficult and most important part of the corrective action process. Root cause analysis attempts to determine why the nonconformity occurred in the first place. Its focus is "Why did this happen?" Potential causes could include: insufficient staff training and skills; vague policies and procedures; inadequate frequencies for calibrating or checking equipment; and human error.

If more than 90 calendar days are needed to resolve a nonconformity, your laboratory must provide AMRL with a written plan for resolving the nonconformity including an estimated completion date and any evidence of action taken, such as equipment purchase orders. Plans for future resolution of nonconformities will be reviewed and may result in accreditation being granted, denied, suspended, or revoked. If your laboratory does not resolve a nonconformity within 180 calendar days of the issuance of the final report, and desires to maintain its accreditation, an additional on-site assessment may be required.

Resolving Observations
Laboratories are not required to provide written documentation to AMRL describing action taken to address findings identified as "Observations." The laboratory should, however, take necessary corrective action to address the observation to prevent possible recurrence. Repeat observations may result in nonconformities.

Resolving Informational Findings
Laboratories are not required to provide written documentation to AMRL describing action taken to address findings identified as "Informational."

For a complete explanation of the AASHTO Accreditation Program policies and procedures, please see the Procedures Manual located at www.amrl.net.

SUBMITTING RESPONSES TO FINDINGS

To respond to nonconformities contained in this report, log in to www.amrl.net using your laboratory's credentials and select the "My Tab" option at the top of the page. Select the "View My Accreditation Events" link at the top of the left-hand column and select the Accreditation Event that corresponds to the report number as issued in this report. Please follow the instructions included on this web page to submit responses to the nonconformities.

CONTACT INFORMATION

For general questions about the assessment program, please use the following contact information:

Contact Information		
AMRL 4441 Buckeystown Pike Suite A Frederick, MD 21704-7507	**Fax:** 240-436-4899 **Phone:** 240-436-4900	**Email:** aap@amrl.net

Laboratories Seeking AASHTO Accreditation
If your laboratory is not accredited by AASHTO, but desires AASHTO accreditation, your laboratory may obtain accreditation based on an application submitted subsequent to an on-site assessment provided: (**1**) the on-site assessment includes an AASHTO R 18 quality management system review of the applicable field(s), (**2**) the application is submitted within 90 calendar days of the date of issuance of this final report, and (**3**) nonconformities are resolved as described previously.

SUMMARY OF FINDINGS
GENERAL APPARATUS

The table below indicates the Standards observed and discussed during the assessment, and the conformance of the laboratory to specified requirements. A "- - - - - - -" in the Status columns indicates that this item was not included.

ITEM EVALUATED	STATUS
Mechanical Sieving Apparatus	**Satisfactory**
Ovens	**Satisfactory**
Literature	**Satisfactory**
Sample Reducing Apparatus	**Satisfactory**
Sieves	**See Finding (a)**
Thermometers	**Satisfactory**
General Purpose Balances	**Satisfactory**

FINDINGS

(a) Sieves

Observation
One of the four 300-µm (No. 50) sieves presented was in unsatisfactory condition. The molding was damaged. (This finding was resolved during the assessment. The sieve was removed from service.)

SUMMARY OF FINDINGS (ASPHALT BINDER)

The table below indicates the Standard test methods observed and discussed during the assessment, and the conformance of the laboratory to specified equipment and procedural requirements. A " - - - - - - -" in the Status columns indicates that the laboratory elected not to include this item as part of the assessment.

Test Method	Designation	AASHTO/Other	ASTM
Pressurized Aging Vessel (PAV)	**R28 / D6521**	**Satisfactory**	-----
Solubility of Asphalt Materials in Trichloroethylene	**T44 / D2042**	**Satisfactory**	-----
Penetration of Bituminous Materials	**T49 / D5**	**See Finding (a)**	-----
Float Test for Bituminous Materials	**T50 / D139**	**See Finding (b)**	-----
Ductility of Bituminous Materials	**T51 / D113**	**Satisfactory**	-----
Softening Point of Bitumen (Ring-and-Ball)	**T53 / D36**	**See Finding (c)**	-----
Distillation of Cut-Back Asphaltic Products	**T78 / D402**	**See Finding (d)**	-----
Flash Point With Tag Open-Cup Apparatus	**T79 / D3143**	**See Finding (e)**	-----
Kinematic Viscosity of Asphalts	**T201 / D2170**	**Satisfactory**	-----
Viscosity by Vacuum Capillary	**T202 / D2171**	**Satisfactory**	-----
Specific Gravity of Asphalt Cement	**T228 / D70**	**Satisfactory**	-----
Rolling Thin-Film Oven Test	**T240 / D2872**	**See Finding (f)**	-----
Specific Gravity of Liquid Asphalts by Hydrometer	**T295 / D3142**	**Satisfactory**	-----
Elastic Recovery Test	**T301 / D6084**	-----	**Satisfactory**
Bending Beam Rheometer (BBR)	**T313 / D6648**	**Satisfactory**	-----
Dynamic Shear Rheometer (DSR)	**T315 / D7175**	**Satisfactory**	-----
Viscosity of Asphalt Binder Using Rotational Viscometer	**T316 / D4402**	**Satisfactory**	-----
Multiple Stress Creep and Recovery (MSCR)	**----- / D7405**	-----	**Satisfactory**

FINDINGS

(a) Penetration of Bituminous Materials

AASHTO T49-2007

Nonconformities

Two of the four needles presented (Needle No. E-463 and E-085) was in unsatisfactory condition. The needles were bent.

A towel was placed on the base of the penetrometer during testing. This may affect the levelness of the sample.

Observation

Three penetration needles are required for testing materials having penetration values greater than 200. Two satisfactory needles were presented. Two satisfactory needles were presented.

(b) Float Test for Bituminous Materials

AASHTO T50-2009

Nonconformity

The method specifies that the time between placing the collar and float assembly on the water and the water breaking through the material shall be determined. The timer was stopped when the collar and float assembly became completely immersed.

(c) Softening Point of Bitumen (Ring-and-Ball)

AASHTO T53-2009

Nonconformity

The rate of temperature rise of the bath was not maintained at 5.0 ± 0.5°C (9.0 ± 1.0°F) per minute after the first three minutes of testing. The rate of temperature rise of the bath varied from 6 to 9°F per minute.

(d) Distillation of Cut-Back Asphaltic Products

AASHTO T78-2005

Nonconformity

The drip rate from the tip of the adapter below 260°C (500°F) was not maintained at 50 to 70 drops per minute. The drip rate varied from 60 to 108 drops per minute. A similar finding was noted during the previous assessment, Report 413N. This indicates that the previous action taken to resolve the issue may not have been effective.

(e) Flash Point With Tag Open-Cup Apparatus

AASHTO T79-1996(2004)

Nonconformity

The rate of temperature rise of the sample was not maintained at 1.0 ± 0.3°C (2.0 ± 0.5°F) per minute. The rate of temperature rise varied from 0.8 to 3.1°F per minute. A similar finding was noted during the previous assessment, Report 413N. This indicates that the previous action taken to resolve the issue may not have been effective.

(f) Rolling Thin-Film Oven Test

AASHTO T240-2013

Nonconformities

The thermometer was not located 2 in. (50.8 mm) from the right side of the oven. The thermometer was located 15 mm from the right side of the oven.

The presence of asphalt on the outside of the change in mass bottles was not noted on the test report.

SUMMARY OF FINDINGS (EMULSIFIED ASPHALT)

The table below indicates the Standard test methods observed and discussed during the assessment, and the conformance of the laboratory to specified equipment and procedural requirements. A " - - - - - - -" in the Status columns indicates that the laboratory elected not to include this item as part of the assessment.

Test Method	Designation	AASHTO/Other	ASTM
Settlement and Storage Stability	**T59 / D6930**	**Satisfactory**	-----
Sieve Test	**T59 / D6933**	**Satisfactory**	-----
Residue by Evaporation	**T59 / D6934**	**Satisfactory**	-----
Particle Charge	**T59 / D7402**	**Satisfactory**	-----
Saybolt Viscosity at 25°C (77°F)	**T59 / D7496-D88**	**See Finding (a)**	-----
Saybolt Viscosity at 50°C (122°F)	**T59 / D7496-D88**	**See Finding (b)**	-----

FINDINGS

(a) Saybolt Viscosity at 25°C (77°F)

AASHTO T59-2013
Informational
The correction factor for two of the four viscometer tubes presented was greater than one percent. These viscometers should not be used for referee testing.

(b) Saybolt Viscosity at 50°C (122°F)

AASHTO T59-2013
Informational
The correction factor for two of the four viscometer tubes presented was greater than one percent. These viscometers should not be used for referee testing.

SUMMARY OF FINDINGS (HOT MIX ASPHALT)

The table below indicates the Standard test methods observed and discussed during the assessment, and the conformance of the laboratory to specified equipment and procedural requirements. A " - - - - - - -" in the Status columns indicates that the laboratory elected not to include this item as part of the assessment.

Test Method	Designation	AASHTO/Other	ASTM
Reducing Samples of Hot-Mix Asphalt	**R47 / -----**	**Satisfactory**	**-----**
Recovery of Asphalt from Solution by Abson Method	**R59 / D1856**	**Satisfactory**	**-----**
Mechanical Analysis of HMA	**T30 / D5444**	**Satisfactory**	**-----**
Quantitative Extraction of Asphalt Binder from HMA	**T164 / D2172**	**Satisfactory**	**-----**
Bulk Specific Gravity of Compacted Hot Mix Asphalt	**T166 / D2726**	**Satisfactory**	**-----**
Maximum Specific Gravity of Hot Mix Asphalt Paving Mixtures	**T209 / D2041**	**See Finding (a)**	**-----**
Percent Air Voids in Bituminous Paving Mixtures	**T269 / D3203**	**Satisfactory**	**-----**
Moisture-Induced Damage of HMA (Tensile Strength Ratio)	**T283 / D4867**	**Satisfactory**	**-----**
Asphalt Content by Ignition Method	**T308 / D6307**	**Satisfactory**	**-----**
Hot Mix Asphalt Superpave Gyratory Compactor	**T312 / D6925**	**See Finding (b)**	**-----**
Hamburg Wheel-Track Test	**T324 / -----**	**Satisfactory**	**-----**
Moisture Content of HMA by Oven	**T329 / -----**	**Satisfactory**	**-----**
Bulk Specific Gravity Using Vacuum Sealing Method	**T331 / D6752**	**Satisfactory**	**-----**

FINDINGS

(a) Maximum Specific Gravity of Hot Mix Asphalt Paving Mixtures

AASHTO T209-2012

Nonconformity

After removing the entrapped air, the mass of the entire sample in air was not determined. Floating pieces of sample material were discarded during the weighing-in-air procedure.

(b) Hot Mix Asphalt Superpave Gyratory Compactor

AASHTO T312-2012

Nonconformity

The records presented for gyratory molds did not indicate that nine diameter measurements were recorded in the specified locations in accordance with T312 (2011) Annex A. Three diameter measurements were recorded. In addition, the mold diameter measurements were not recorded to the nearest 0.0025 mm (0.0001 in). The mold diameters were recorded to the nearest 0.01 mm.

SUMMARY OF FINDINGS (SOIL)

The table below indicates the Standard test methods observed and discussed during the assessment, and the conformance of the laboratory to specified equipment and procedural requirements. A " - - - - - - -" in the Status columns indicates that the laboratory elected not to include this item as part of the assessment.

Test Method	Designation	AASHTO/Other	ASTM
Dry Preparation of Samples	**R58 / D421**	**Satisfactory**	**Satisfactory**
Particle Size Analysis of Soils by Hydrometer	**T88 / D422**	**Satisfactory**	**Satisfactory**
Liquid Limit of Soils (Atterberg Limits)	**T89 / D4318**	**Satisfactory**	**Satisfactory**
Plastic Limit of Soils (Atterberg Limits)	**T90 / D4318**	**Satisfactory**	**Satisfactory**
Moisture-Density (Proctor) of Soils, Standard Effort	**T99 / D698**	**Satisfactory**	**Satisfactory**
Specific Gravity of Soils	**T100 / D854**	**Satisfactory**	**Satisfactory**
Sand Equivalent Test	**T176 / D2419**	**Satisfactory**	**Satisfactory**
Moisture-Density (Proctor) of Soils, Modified Effort	**T180 / D1557**	**Satisfactory**	**Satisfactory**
California Bearing Ratio	**T193 / D1883**	**See Finding (a)**	**See Finding (a)**
Unconfined Compressive Strength of Soil	**T208 / D2166**	**See Finding (b)**	**See Finding (b)**
One-Dimensional Consolidation of Soils	**T216 / D2435**	**Satisfactory**	**Satisfactory**
Oversize Particle Correction	**T224 / D4718**	**Satisfactory**	**-----**
Direct Shear of Soils	**T236 / D3080**	**Satisfactory**	**-----**
Moisture Content of Soils	**T265 / D2216**	**Satisfactory**	**Satisfactory**
Nuclear Density and Moisture Gauge for Soil	**T310 / D6938**	**Satisfactory**	**See Finding (c)**
Classification of Soils (Unified System)	**----- / D2487**	**-----**	**Satisfactory**
Description and Identification of Soils (Visual-Manual)	**----- / D2488**	**-----**	**Satisfactory**
Slake Durability of Shales and Weak Rocks	**----- / D4644**	**-----**	**Satisfactory**
Shrinkage Factors of Soils by Wax Method	**----- / D4943**	**-----**	**Satisfactory**
Point Load Strength Index of Rock	**----- / D5731**	**-----**	**Satisfactory**

FINDINGS

(a) California Bearing Ratio

AASHTO T193-2013 / ASTM D1883-2007

Nonconformities

The penetration piston was not seated after one surcharge weight [ASTM: one 2.27-kg annular weight] had been placed on the specimen. The piston was seated after two surcharge weights had been placed on the specimen.

The surcharge weight used during the penetration procedure was not equal to the surcharge weight used during the soaking period. One annular surcharge weight and one slotted surcharge weight was used during the penetration procedure and two annular weights were used during the soaking period.

(b) Unconfined Compressive Strength of Soil

AASHTO T208-2010 / ASTM D2166-2013

Nonconformity

The load was not applied to produce an axial strain rate of 0.5 to 2 percent per minute. The rate of axial strain varied between 0.3 to 0.8 percent per minute.

(c) Nuclear Density and Moisture Gauge for Soil

ASTM D6938-2010

Informational

The calibration records presented for the nuclear gauge (Serial No. 32291) indicated that the calibration had been performed using a three-block procedure.

SUMMARY OF FINDINGS (AGGREGATE)

The table below indicates the Standard test methods observed and discussed during the assessment, and the conformance of the laboratory to specified equipment and procedural requirements. A " - - - - - - -" in the Status columns indicates that the laboratory elected not to include this item as part of the assessment.

Test Method	Designation	AASHTO/Other	ASTM
Sampling Aggregate	**T2 / D75**	**Satisfactory**	-----
Material Finer Than 75-µm (No. 200) Sieve	**T11 / C117**	**Satisfactory**	-----
Bulk Density and Voids in Aggregate	**T19 / C29**	**Satisfactory**	-----
Organic Impurities in Sands	**T21 / C40**	**Satisfactory**	-----
Sieve Analysis of Aggregates	**T27 / C136**	**Satisfactory**	-----
Fine Aggregate Specific Gravity and Absorption	**T84 / C128**	**Satisfactory**	-----
Coarse Aggregate Specific Gravity and Absorption	**T85 / C127**	**Satisfactory**	-----
Abrasion of Coarse Aggregate	**T96 / C131**	**Satisfactory**	-----
Clay Lumps and Friable Particle Percentage	**T112 / C142**	**Satisfactory**	-----
Sand Equivalent Test	**T176 / D2419**	**Satisfactory**	-----
Aggregate Durability Index	**T210 / D3744**	**Satisfactory**	-----
Reducing Samples of Aggregate to Test Size	**T248 / C702**	**Satisfactory**	-----
Moisture Content of Aggregate by Oven Drying	**T255 / C566**	**Satisfactory**	-----
Uncompacted Void Content of Fine Aggregate	**T304 / C1252**	**Satisfactory**	-----
Resistance to Abrasion by Micro-Deval (Coarse Aggregate)	**T327 / D6928**	**Satisfactory**	-----
Fractured Particles in Coarse Aggregate	**T335 / D5821**	-----	**Satisfactory**
Flat, Elongated, or Flat and Elongated Particles	**----- / D4791**	-----	**Satisfactory**

FINDINGS

None.

SUMMARY OF FINDINGS (METALS)

The table below indicates the Standard test methods observed and discussed during the assessment, and the conformance of the laboratory to specified equipment and procedural requirements. A " - - - - - - -" in the Status columns indicates that the laboratory elected not to include this item as part of the assessment.

Test Method	Designation	AASHTO/Other	ASTM
Zinc Coatings on Iron and Steel: Thickness of Zinc (Stripping)	**M111-T65 / A123-A90**	**Satisfactory**	-----
Zinc Coatings on Iron and Steel: Thickness of Zinc (Magnetic)	**M111 / A123-E376**	**Satisfactory**	-----
Welded Plain Steel Wire: Weld Shear	**M55 / A1064**	**Satisfactory**	-----
Welded Plain Steel Wire: Tensile Strength	**M55-T244 / A1064-A370**	**Satisfactory**	-----
Deformed Steel Wire: Tensile Strength	**M225-T244 / A1064-A370**	**Satisfactory**	-----
Welded Deformed Steel Wire: Weld Shear	**M221 / A1064**	**Satisfactory**	-----
Welded Deformed Steel Wire: Tensile Strength	**M221-T244 / A1064-A370**	**Satisfactory**	-----
Carbon-Steel Bars, Deformed and Plain: Tensile Strength	**M31-T244 / A615-A370**	**Satisfactory**	-----

FINDINGS

None.

SUMMARY OF FINDINGS
QUALITY SYSTEM CRITERIA

The table below indicates the Standards observed and discussed during the assessment, and the conformance of the laboratory to specified requirements. A "- - - - - - -" in the Status columns indicates that this item was not included.

Standard Practice R18 Management Requirements

ITEM EVALUATED	STATUS
Quality Management System	**Satisfactory**
Document Control	**Satisfactory**
Organization	**Satisfactory**
Staff	**Satisfactory**
Technician Training and Evaluation	**See Finding (a)**
Internal Audits	**See Finding (b)**
Corrective Action	**Satisfactory**
Records Retention	**Satisfactory**

Standard Practice R18 Technical Requirements

ITEM EVALUATED	STATUS
Equipment	**Satisfactory**
Equipment Calibration, Standardization, Check, and Maintenance Records	**See Finding (c)**
Sample Management	**Satisfactory**
Test Records and Reports	**Satisfactory**
Subcontracting	**Satisfactory**
Assuring the Quality of Results	**Satisfactory**

Additional Quality System Evaluations

ITEM EVALUATED	STATUS
ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates	-----
ASTM D3666 - Standard Specification for Agencies Testing and Inspecting Road and Paving Materials	-----
ASTM D3740 - Standard Practice for Agencies Testing Soil and Rock	-----
ASTM E329 - Standard Specification for Agencies Testing Materials Used in Construction	-----

FINDINGS

(a) Technician Training and Evaluation

Nonconformities

Records of competency evaluation activities for Phillip Lawrence indicated that the evaluations had not been performed in the 12-month interval specified by the laboratory's quality manual for test method T295. Records indicated that the evaluations were last performed in November 2012. (Section 5.5.3)

The competency evaluation records presented for Dan Stottlemyre indicated that evaluations had not been performed for test method T224 (Section 5.5.3).

Records of competency evaluation activities for Dan Stottlemyre indicated that the evaluations had not been performed in the 12-month interval specified by the laboratory's quality manual for the following methods (Section 5.5.3): D1883, T176, T193, and T210. Records indicated that the evaluations were last performed in 2011.

The competency evaluation records presented for Chris Clarke indicated that evaluations had not been performed for test method D2488 (Section 5.5.3).

The competency evaluation records presented for Shelly Maddox indicated that evaluations had not been performed for test method D2487 (Section 5.5.3).

The competency evaluation records presented for Garrett Massey indicated that evaluations had not been performed for test method T85 (Section 5.5.3).

(b) Internal Audits

Nonconformity

Records of findings from internal audits were not current (Section 5.6.3). Records indicated that an internal audit was last performed in 2012.

(c) Equipment Calibration, Standardization, Check, and Maintenance Records

Nonconformities

The calibration, standardization, or check interval specified for ductility and elastic recovery molds (T51, D6084) was greater than the 12-month interval specified in R18 (Section 6.1.2.1). The interval specified was 60 months.

Calibration, standardization, or check intervals were not specified for vacuum measurement gauge (T331) (Section 6.1.2.1).

The calibration, standardization, or check records presented for brass ring and assemblies did not include detailed results (Section 6.1.5.1). The records presented did not include measurements of critical dimensions.

Intervals and written procedures were not presented for compression or loading devices (T236) (Section 6.1.2).

Observation

Current calibration, standardization, or check records for flash cups (T79) were presented; however, the records indicated that a previous interval was missed (Section 6.1.5). Records were not presented from 2012.

CLOSURE

The findings upon which this report is based were discussed with the laboratory personnel during the course of the on-site assessment. At the conclusion of the assessment, a preliminary report summarizing these comments was presented to the laboratory staff, and all departures from applicable standard test methods and specifications were discussed in detail.

It is recommended that this report be compared with the report of the preceding assessment that was made in this laboratory in October 2011.

AASHTO MATERIALS REFERENCE LABORATORY

Mike Wagner
Assessor

Ryan LaQuay
Assessor

Sample ID: 9700041406251544 Test Number: 1 Sample Date: 06/25/2014

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: dmccullo	McCullough, Donald	0004

Central Lab Technician: plawrenc

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
Lawrence, Phillip R.	0020	91	Central Bituminous Liquid Lab

Test Category: CASB (Category Description): Asphalt Binder

Central Lab Test ID: 00099

(Test Description)	(AASHTO)	(ASTM)	(Other)
Distillation of Cutback	T78		

Evaluation Type: ○ Verbal ● Performance

Mentor: ☐

Remarks1:
Remarks2:
Remarks3:

Evaluation Results: ● Satisfactory ○ Unsatisfactory

Drip Rate Calculations for AASHTO T78 Evaluation

Evaluator: Donald McCullough

Evaluatee: Phillip Lawrence

Date: 25-Jun-2014

Drip Count
< 1 minute: 10

Drip Rate (Per Minute) Calculations			
up to 500° F		500°F to 600°F	
Time in seconds & < 1 min.	Drip Rate Per Minute 50-70	Time in seconds	Drip Rate Per Minute 20-70
12.12	50	13.02	46
9.43	64	12.51	48
9.08	66	11.61	52
8.95	67	13.09	46
9.34	64	11.72	51
9.74	62	13.93	43
10.45	57	14.12	42
10.48	57	15.01	40
9.99	60	15.30	39
10.20	59	15.30	39
11.15	54	15.63	38
11.20	54	16.11	37
11.67	51	16.77	36
11.49	52	16.00	38
10.94	55	17.14	35
9.42	64	17.20	35
10.07	60	15.90	38
10.02	60	16.77	36
11.17	54	18.12	33
11.47	52	17.31	35
10.20	59	17.76	34
10.88	55	16.51	36
11.16	54	17.37	35
		16.67	36
		18.06	33
		19.15	31
		19.00	32

OKLAHOMA DEPARTMENT OF TRANSPORTATION
200 N. E. 21st Street
Oklahoma City, OK 73105-3204

June 16, 2014

METHOD FOR REVIEWING TECHNICIAN COMPETENCY

The Technical Support Branch is responsible for evaluating technician competency. Technicians are required to demonstrate each AASHTO, ASTM, or OHD-L procedure for which the technician has been trained. When approved by the Materials & Research Engineer, the laboratory supervisor will be responsible for evaluating technician competency for specific AASHTO, ASTM and OHD-L procedures. Current AMRL or CCRL worksheets should be used as a guide for evaluations when available. Competency evaluations shall be administered at least once every 12 months to technicians with less than 3 years of experience for the applicable procedure. The competency evaluation interval may be increased to 24 months for technicians with 3 or more years of experience for the applicable procedure. If a technician does not routinely perform a procedure, the laboratory supervisor may determine that it is not necessary to evaluate the competency of that technician to perform the procedure during a regular schedule; however, the technician's competency shall be evaluated prior to performing the procedure.

1. For each technician, a competency evaluation record shall be prepared by the Technical Support Staff or an approved laboratory supervisor. The record shall include the procedure demonstrated, date (MM/DD/YY) of demonstration, name of the evaluator, Pass/Fail results, and any comments.

2. If an unsatisfactory evaluation for a procedure is observed, the Technical Support Branch or approved laboratory supervisor shall review all detected deviations from the procedure with the technician. The technician shall review the procedure and detected deviations. The technician will then notify the laboratory supervisor they are ready for re-evaluation. The Technical Support Branch or approved laboratory supervisor shall observe the technician demonstrate the procedure and record the results as indicated above.

3. The Quality System Manager shall maintain records of competency evaluations. A report of completed and due competency evaluations will be provided to the laboratory supervisor.

Koehler
INSTRUMENT COMPANY, INC.

1595 Sycamore Avenue
Bohemia, NY 11716
631-589-3800 * FAX: 631-589-3815
www.koehlerinstrument.com

PAYABLE IN U.S. FUNDS
DRAWN ON A U.S. BANK

ORDER RECEIPT

Order ID: 142256
Order Date: 04/23/2014
Printed: 04/23/2014
Page: 1
DUNS: 00 - 136 - 1773
FEDERAL I.D. # 11-1672633

Sold To
OKLAHOMA D.O.T. MATERIALS DIV/BITUMINOUS BRANCH OKLAHOMA CITY, OK 73105 US 200 NE 21ST STREET

Ship To
OKLAHOMA D.O.T. MATERIALS DIV/BITUMINOUS BRANCH OKLAHOMA CITY, OK 73105 US 200 NE 21ST STREET

CUSTOMER ID	CUSTOMER PO	PAYMENT TERMS
45443	VBL/TAMMY DAVIS/CC	CREDIT CARD FREIGHT PREPAID

SALES REP	SHIPPING METHOD	F.O.B	SHIP DATE
Alex Nucera	UPS GROUND	ORIGIN	TBD

QUANTITY					UNIT	EXTENDED
ORD	SHP	BCK	PART ID	DESCRIPTION	PRICE	PRICE
1.00	0.00	1.00	K42000	POWERTROL HEATER, 115V UNIT INCLUDES THE FOLLOWING: (1) K420-0-8 REFRACTORY (2) K42010 DOVETAIL CLAMP (1) INSTRUCTION MANUAL ---------- SERIAL NUMBER(S):	$624.00	$624.00

ORDER SPECIFICATIONS

Total (Excluding freight/taxes if applicable): $624.00

THANK YOU FOR YOUR ORDER. YOU WILL RECEIVE YOUR ORDER ACKNOWLEGEMENT SEPARATELY.

Order Acknowledged contingent upon account in good standing at time of shipment.
ACKNOWLEDGED PRICES ARE EXCLUSIVE OF ANY APPLICABLE TAXES UNLESS CALLED OUT IN THE ORDER.

RECEIVED
Marcella Donovan 4-30-14
Tammy Davis

649R-6-(C)

Humboldt Mfg Co.
875 Tollgate Rd,
Elgin,IL 60123
USA
Tollfree: 1.800.544.7220
Telephone: 1.708.456.6300
Fax: 1.708.456.0137
Website: www.humboldtmfg.com
Federal Tax ID: 36-1245250

FL 2377
/
Equipment #

Invoice

159328

Invoice Date: 05/28/2014
Due Date: 05/28/2014
Payment Terms: Credit Card
Customer Ref. No: Tammy
Customer Number: C218031

Bill To:
Oklahoma DOT * OK City
200 N E 21st St,
Oklahoma City,OK 73105
USA

Ship To:
Oklahoma DOT * Ok City
200 NE 21st St,
Oklahoma City,OK 73105
USA

Contact Person: Tammy Davis

Ship Via:
Tracking #: 1Z6146970373573762

Item Code	Description	Qty	Price	Total
H-1990	Open Cup Flash Tester, Tag, Electric, 115V 50/60Hz	1	$1,872.00	$1,872.00

RECEIVED
M Donovan

649R-6-(e)

5.28.14 1ctn 8#
charge data for $1884.00 ap code 052920

Based On Sales Orders 142912. Based On Deliveries 152925.

Sub Total	$1,872.00
Shipping & Handling	$12.00
Total	$1,884.00
Applied Amt	$1,884.00
Balance Due	**$0.00**

Sample ID: 9700041406131605 | Test Number: 1 | Sample Date: 06/13/2014

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: dmccullo	McCullough, Donald	0004

Central Lab Technician: plawrenc

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
Lawrence, Phillip R.	0020	91	Central Bituminous Liquid Lab

Test Category: CASB — (Category Description): Asphalt Binder

Central Lab Test ID: 00112

(Test Description)	(AASHTO)	(ASTM)	(Other)
Specific Gravity (Cutback Asphalt)	T295	D3142	

Evaluation Type: ○ Verbal ● Performance

Mentor: ☑

Remarks1:

Remarks2:

Remarks3:

Evaluation Results: ● Satisfactory ○ Unsatisfactory

Oklahoma Department of Transportation

Procedure Evaluation for Philip Lawrence

AASHTO	ASTM	Test	Initial Training	12 Month Evaluation	Evaluated By	Date	Results
Asphalt Binder							
T295		Specific Gravity or API Gravity of Liquid Asphalts by Hydrometer Method		X	Donald McCullough	06/13/2014	Satisfactory

Comments

Signature
Donald McCullough

Date Evaluation Completed
06/13/2014

Entered Date
06/16/2014

OKLAHOMA DEPARTMENT OF TRANSPORTATION
200 N. E. 21st Street
Oklahoma City, OK 73105-3204

June 16, 2014

METHOD FOR REVIEWING TECHNICIAN COMPETENCY

The Technical Support Branch is responsible for evaluating technician competency. Technicians are required to demonstrate each AASHTO, ASTM, or OHD-L procedure for which the technician has been trained. When approved by the Materials & Research Engineer, the laboratory supervisor will be responsible for evaluating technician competency for specific AASHTO, ASTM and OHD-L procedures. Current AMRL or CCRL worksheets should be used as a guide for evaluations when available. Competency evaluations shall be administered at least once every 12 months to technicians with less than 3 years of experience for the applicable procedure. The competency evaluation interval may be increased to 24 months for technicians with 3 or more years of experience for the applicable procedure. If a technician does not routinely perform a procedure, the laboratory supervisor may determine that it is not necessary to evaluate the competency of that technician to perform the procedure during a regular schedule; however, the technician's competency shall be evaluated prior to performing the procedure.

1. For each technician, a competency evaluation record shall be prepared by the Technical Support Staff or an approved laboratory supervisor. The record shall include the procedure demonstrated, date (MM/DD/YY) of demonstration, name of the evaluator, Pass/Fail results, and any comments.

2. If an unsatisfactory evaluation for a procedure is observed, the Technical Support Branch or approved laboratory supervisor shall review all detected deviations from the procedure with the technician. The technician shall review the procedure and detected deviations. The technician will then notify the laboratory supervisor they are ready for re-evaluation. The Technical Support Branch or approved laboratory supervisor shall observe the technician demonstrate the procedure and record the results as indicated above.

3. The Quality System Manager shall maintain records of competency evaluations. A report of completed and due competency evaluations will be provided to the laboratory supervisor.

Sample ID: 9700041407171334 | Test Number: 1 | Sample Date: 07/17/2014

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: dmccullo	McCullough, Donald	0004

Central Lab Technician: sgeorge

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
George, Silas	3059	95	Central Geotechnical Lab

	(Category Description)
Test Category: CSOI	Soil

Central Lab Test ID: 00155

(Test Description)	(AASHTO)	(ASTM)	(Other)
Coarse Particle Correction	T224		

Evaluation Type: ○ Verbal ● Performance

Mentor: ☐

Remarks1:

Remarks2:

Remarks3:

Evaluation Results: ● Satisfactory ○ Unsatisfactory

Sample ID: 9700041310290825 | Test Number: 1 | Sample Date: 10/29/2013

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: dmccullo	McCullough, Donald	0004

Central Lab Technician: jsmith

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
Smith, Jerry D.	0036	93	Central Bituminous Mixture Lab

	(Category Description)
Test Category: CAGG	Aggregate

Central Lab Test ID: 00084

(Test Description)	(AASHTO)	(ASTM)	(Other)
Sand Equivalent (Aggregate)	T176		

Evaluation Type:
- ○ Verbal
- ● Performance

Mentor: ☑

Remarks1:
Remarks2:
Remarks3:

Evaluation Results:
- ● Satisfactory
- ○ Unsatisfactory

Sample ID: 9700041405130840 Test Number: 5 Sample Date: 05/13/2014

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: dmccullo	McCullough, Donald	0004

Central Lab Technician: sgeorge

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
George, Silas	3059	95	Central Geotechnical Lab

	(Category Description)
Test Category: CAGG	Aggregate

Central Lab Test ID: 00091

(Test Description)	(AASHTO)	(ASTM)	(Other)
Aggregate Durability Index	T210	D3744	

Evaluation Type: ○ Verbal ● Performance

Mentor: ☐

Remarks1:
Remarks2:
Remarks3:

Evaluation Results: ● Satisfactory ○ Unsatisfactory

Sample ID: 9729351406261100 | Test Number: 1 | Sample Date: 06/26/2014

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: cdonovan	Donovan, Chuck	2002

Central Lab Technician: gmassey

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
Massey, Garrett W.	3486	94	Central Structural Materials Lab

	(Category Description)
Test Category: CAGG	Aggregate

Central Lab Test ID: 00104

(Test Description)	(AASHTO)	(ASTM)	(Other)
Specific Gravity and Absorption (Coarse)	T85	C127	

Evaluation Type:
- ○ Verbal
- ● Performance

Mentor: ☐

Remarks1: Passed Performance.
Remarks2:
Remarks3:

Evaluation Results:
- ● Satisfactory
- ○ Unsatisfactory

Oklahoma Department of Transportation

EQUIPMENT CALIBRATION PROCEDURE S132

Direct Shear Device

Reference AASHTO T236

Purpose

This procedure provides instructions for determining the deformation of the testing device when subject to consolidation loads.

Inspection Equipment Required

1. Copper or hard steel calibration disk or block.

Procedure:

1. Position and adjust the normal displacement indicator to measure consolidation or swell from the "calibration disk" reading.
2. Record the zero or "no load" reading.
3. Apply increments of normal force up to the equipment limitations and record both the applied normal force and the normal displacement indicator reading.
4. Remove the applied normal force in reverse sequence of the applied force and again record the normal displacement indicator readings and normal force.
5. Calculate the average of the two recorded deformation values corresponding to each value of applied normal loading sequences (loading and unloading).
6. Plot the average deformation of the device as a function of the applied load.
7. Remove the calibration disk if the shear device will be used to test a specimen.

DM

Revision: 06Jun2014

Oklahoma Department of Transportation

EQUIPMENT CALIBRATION RECORD S132

Direct Shear Device

Reference AASHTO T236

Verification Frequency: 12 months

Previous Verification Date: unknown

Next Due Date: 26-Jun-2015

Verification Equipment Used: Hard Steel Calibration Block

Loading (Increasing)	Normal Force (Kg)	0	1	2	3	5	10	20	30	40	50
	Normal Displacement	0.0000	-0.0029	-0.0040	-0.0047	-0.0056	-0.0067	-0.0080	-0.0088	-0.0097	-0.0104
Unloading (Decreasing)	Normal Force Kg)	0	1	2	3	5	10	20	30	40	50
	Normal Displacement	-0.0001	-0.0033	-0.0047	-0.0055	-0.0064	-0.0075	-0.0087	-0.0095	-0.0102	-0.0104
Loading & Unloading	Average Displacement	0.00005	0.0031	0.00435	0.0051	0.006	0.0071	0.00835	0.00915	0.00995	0.0104

Zero (No Load Displacement)	0.0000

Inspected by: Donald McCullough

Date: 26-Jun-2014

DM

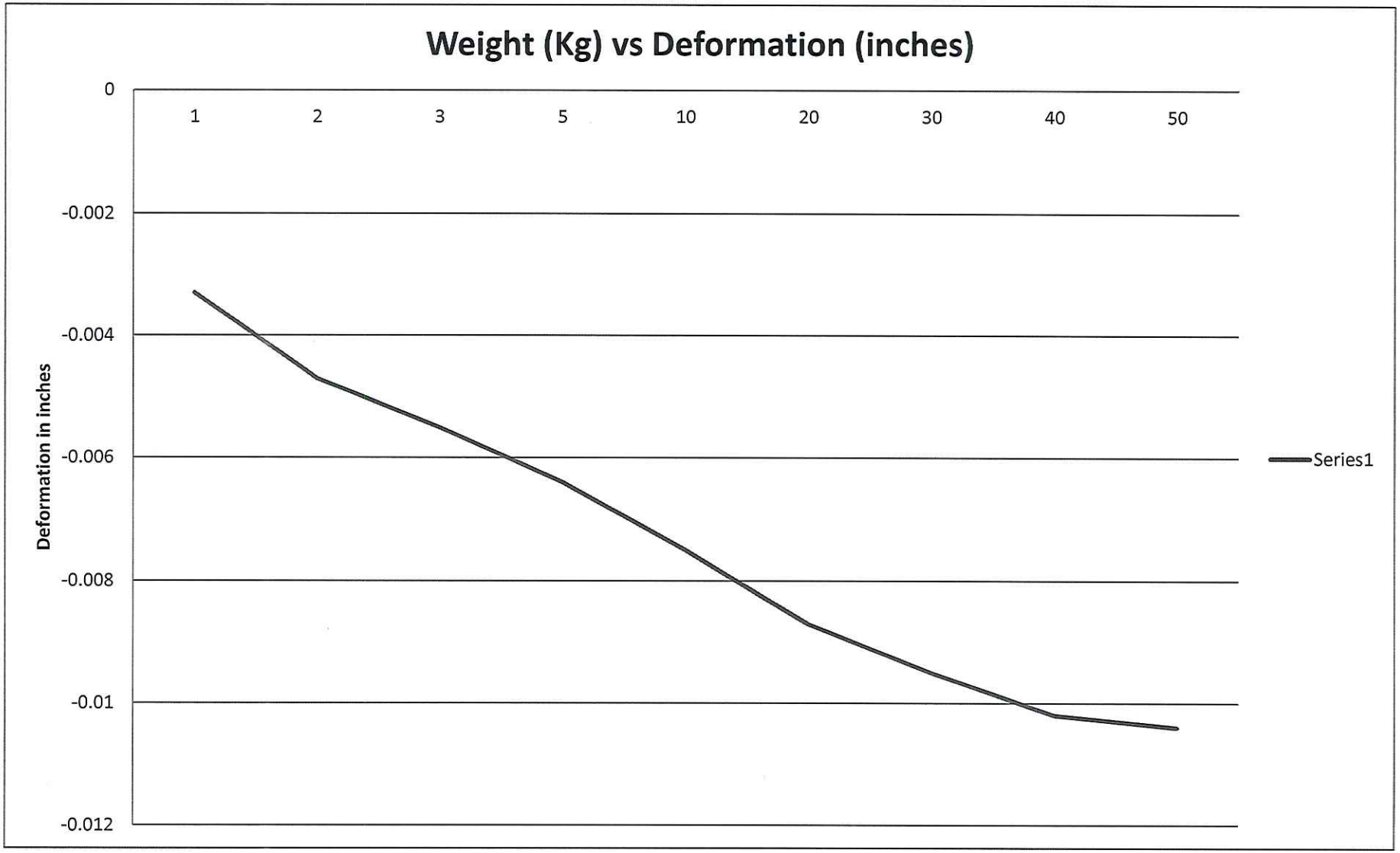
Oklahoma Department of Transportation

EQUIPMENT CALIBRATION RECORD S132

Direct Shear Device

Reference AASHTO T236

Revision: 06Jun2014



Revision June 18, 2014

Oklahoma Department of Transportation
Geotechnical Lab
Equipment Calibration, Standardization and Check Information

Item	Interval	Requirement	Procedure	
Balances and Scales	12 Months	Check/ Calibrate	Outside contractor	S102
Loading Devices	12 Months	Check/ Calibrate	Outside contractor	S103
Consolidation Devices	Prior to use	Check	In-House procedure	S104
Ovens	12 Months	Check/Standardize	In-House procedure	S108
Vacuum Systems	12 Months	Check	In-House procedure	S109
Manual Hammers, Mechanical Compactor & Proctor Molds	12 Months	Check	In-House procedure	S111
Sieves	12 Months	Check	In-House procedure	S112
Liquid Limit Devices	12 Months	Check	In-House procedure	S113
Grooving Tools	12 Months	Check	In-House procedure	S114
Hydrometers	24 Months	Check	In-House procedure	S115
Straight Edges	12 Months	Check	In-House procedure	S116
CBR Weights, Molds and Penetration Piston	12 Months	Check	In-House procedure	S117
Timers	6 Months	Check/Standardize	In-House procedure	S121
Stirring Apparatus	12 Months	Check	In-House procedure	S122
Revolving drum Processors	6 Months	Check	In-House procedure	S124
Constant Temperature Bath	12 Months	Check/Standardize	In-House procedure	S125
Sedimentation Cylinders	12 mo. Visual 36 mo. Measure	Check	In-House procedure	S126
Sample Splitter	12 Months	Check	In-House procedure	S127
Dial Gauges	12 Months	Check	In-House procedure	S129
Slake Durability	12 Months	Check	In-House procedure	S130
Digital Caliper	12 Months	Check	In-House procedure	S131
Direct Shear	12 Months	Check/Standardize	In-House procedure	S132

BL

Oklahoma Department of Transportation

Revision Jan 16, 2014

EQUIPMENT CALIBRATION PROCEDURE S-103

Loading Devices

Reference AASHTO T193, T208, T236, T294, T296, T297 (ASTM E4, E74)

Purpose

This procedure requires a 'Calibration and Load Verification Certificate' for the loading devices.

Inspection Equipment Required

NONE

Tolerance

The loading device shall meet the dimensional tolerances specified in the test method listed above.

Procedure:

Every 12 months check the Certificate and Calibration load curve data for compression device.

Section1: Check Status of certificate containing information below.

1. Address and name of company issuing certificate.
2. Service, test or adjustments.
3. Calibration Apparatus used and traceable identification of such, e.g.:
    a. Cell Code.
    b. Serial number.
    c. Capacity.
    d. Calibration Lab number.
    e. Calibration Date.
    f. Class A Lower Limit.
4. Calibration Instrument used and its traceable identification, e.g.:
    a. Calibration instruments
    b. Serial number.
    c. NBS Calibration Date.
    d. NBS LAB number.
    e. Manufacturer.
5. Optional: Graph of applied load vs. Deflection with data used to generate such

Section 2: Data to record on the 'Equipment Verification Record'

1. Type.
2. Manufacturer.
3. Model.
4. Serial Number, ODOT number.
5. Capacity.
6. Date of calibration or service.
7. Next calibration date.
8. Technician (from certification).
9. Status

Oklahoma Department of Transportation

EQUIPMENT VERIFICATION RECORD S103
Loading Devices
Reference AASHTO T 193, T 208, T 236, T 294, T 296, T297 (ASTM E4 & E74)

Verification Frequency: 12 month
Previous Verification Date: 27-Mar-2013
Next Due Date: 24-Apr-2015
Verification Equipment Used: Refer to calibration certificate in report
Verification Procedure: See Loading Device Verification Procedure
Calibration and Load Verification Company Calibration Solutions or Accurate Labs

Type	Manufacturer	Model	Serial No.	Capacity	Date of Calibration	Next Calibration	Technician	Status
Proving Ring	ELE	KG.50	MAT617	110 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Proving Ring	ELE	KG.50	MAT616	110 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Proving Ring	Wykeham-Farrance	200KG	13975	500 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Proving Ring	Hogen Togler	Unknown	2-17-86	2000 lbs.	25-Apr-2014	25-Apr-2015	Juan Gonzalez	OK
Proving Ring	Hogen Togler	G3865	5D-6-98	500 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Proving Ring	Wykeham-Farrance	200KG	14840	500 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Proving Ring	Wykeham-Farrance	1200LB	14438	1500 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Proving Ring	Wykeham-Farrance	50KG	14853A	112 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Proving Ring	Wykeham-Farrance	50KG	14853B	112 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Kneading Compactor	Cox and Sons	CS1000	4990	1000.0 psi	25-Apr-2014	25-Apr-2015	Juan Gonzalez	OK
Proving Ring	Hogen Togler	Unknown	5D-1-03	500 lbs.	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Pressure Gauge	Karol Warner	Test Gauge	PS-1	100.0 psi	7-Mar-2012	N/A	Behzad Regimand	RFS 3-13
Absolute Manometer	Gilson	9210	3099	1000 mm Hg	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Pressure Gauge	Mano	LEO 1	15839	300 Bar	24-Apr-2014	24-Apr-2015	Juan Gonzalez	OK
Pressure Gauge	Mano	LEO 1	20599	1000 Bar	15-May-2014	15-May-2015	Larry Perry	OK

Inspected By: Donald McCullough

Date: 25-Apr-2014

Certificate of Calibration

CALIBRATION SOLUTIONS LLC

16320 S. Lennox Ct.
Olathe, KS 66062.

3801 Doris Lane
Round Rock, TX 78664

Certificate Number	T.O-52-71	**Date**	4/24/2014	**Due Date**	4/24/2015	
Customer	Oklahoma Dept. of Transportation					
Address	**Street**	200 N.E 21ST Street				
	City	Oklahoma City	**State**	OK	**Zip**	73105
Service Location	**Street**	200 N.E 21ST Street				
	City	Oklahoma City	**State**	OK	**Zip**	73105

Calibration Standards

2-RH1/00148 Extech Thermohygrometer s/n CP54617 Cal Date: 1-20-14 Due Date: 1-20-15 Vendor: InnoCal NIST# 547476

2-2K Strainsense Load Cell s/n:121212 Cal date:1-27-2014 Cal Due:1-28-2016:Range 2200Lbs Vendor NSTL SJT.01/110123

Frequency	12 Months		
Manufacturer	Wykeham-Farrance	**Type**	Proving Ring
Model Number	Unknown	**Serial Number**	14840
Indication Type	DIGITAL	**Tolerance**	+/-1% of Applied Load
Asset Number	FL1723	**Temperature**	74F
Number of Ranges	1	**Humidity**	55%

	As Found	**As Left**	**Calibration Performed by:**
Within Tolerance	PASS	PASS	PATRICK YORIO

Proving Ring

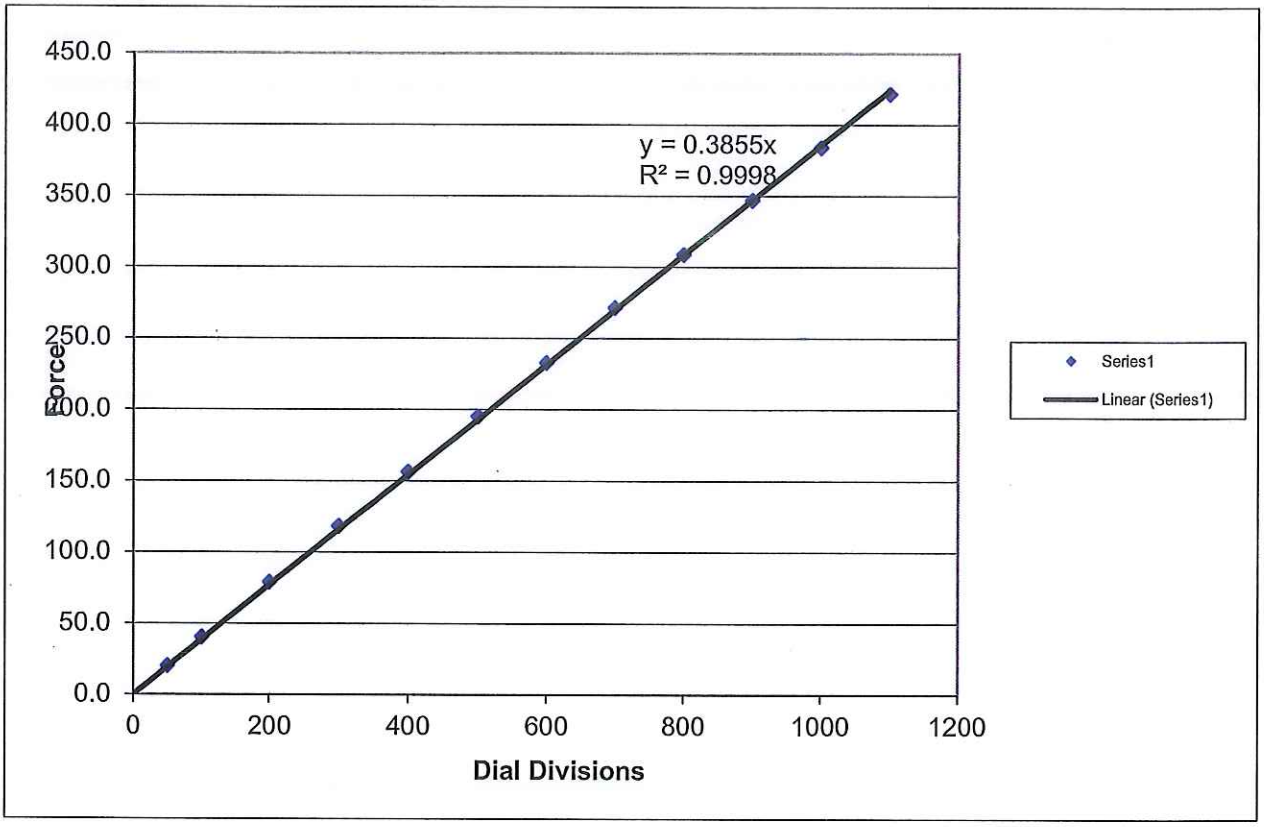
Reference: ASTM E-4

Capacity	440 Lbs	Instrument Resolution	
Resolution	0.0001	Serial No.	14840
Intrument Range	1100	Avg. Pounds Per Div	0.385

Load Intervals (Div)	Verification Reading #1	Verification Reading #2	Verification Reading #3	Average Reading
0	0	0	0	0.00
50	19.8	20.1	20.1	20.00
100	39.8	40.2	40.2	40.07
200	78.6	78.8	78.9	78.77
300	117.8	118.2	118.3	118.10
400	155.9	156.2	156.3	156.13
500	194.7	195.0	195.1	194.93
600	232.5	232.6	232.6	232.57
700	270.8	271.3	271.3	271.13
800	308.4	308.5	308.5	308.47
900	346.4	346.6	346.7	346.57
1000	383.8	383.6	383.8	383.73
1100	421.3	421.5	421.5	421.43

Certificate of Calibration

Certificate Number	T.O-52-71



The above system (Instrument, Load Cell, Integral Software and Output Device(s), and accessories has been calibrated in accordance with ASTM E4 - Standard Practices for Force Verification of Testing machines using apparatus and standards calibrated in accordance to ASTM E74 - Standard practice for Calibration of Force-Measuring Instruments for Verifying the Load Indication of Testing Machines which are traceable to NIST (National Institute of Standards and Technology). The information provided on this form complies with the data gathering and reporting requirements of ISO/IEC Guide 17025 and ANSI/NCSL Z540-1.

The UUT % uncertainty includes the uncertainty of the Calibration standards used combined with the uncertainty of the measurement process using the RSS method with a K factor of 2 for an approximate 95% level of confidence. The uncertainty for this measurement is < 0.25% of the test load applied unless otherwise stated. The calibration process meets or exceeds a ratio of 4:1.

Technical Manager BEHZAD REGIMAND Date 5/24/2014

Signature

DM

08AUG2014

Oklahoma Department of Transportation
EQUIPMENT CALIBRATION RECORD S132
Direct Shear Device
Reference AASHTO T236

Verification Frequency: 12 months

Previous Verification Date: N/A

Next Due Date: 26-Jun-2015

	Nominal Mass (kg)	Mass (g)	Cumulative Normal Load		Normal Stress (2.5" box)		Normal Stress (2.5" box)	
			On Hanger (N)	On 10:1 Lever Arm (N)	On Hanger (kPa)	On 10:1 Lever Arm (kPa)	On Hanger (psf)	On 10:1 Lever Arm (psf)
Hanger +Top Cap +Stone +Grid		5204.6	51.04	51.04	12.75	12.75	266.2	266.2
1A	1	999.6	60.84	149.1	15.20	37.23	317.4	777.5
1B	1	999.9	70.65	247.1	17.64	61.72	368.5	1289.0
1C	1	1000.3	80.46	345.2	20.09	86.22	419.7	1800.7
2	2	2000.6	100.08	541.4	24.99	135.22	522.0	2824.0
5	5	5000.8	149.12	1031.8	37.24	257.70	777.8	5382.1
10A	10	10,001.0	247.19	2012.6	61.74	502.65	1289.4	10,497.8
10B	10	10,001.0	345.27	2993.3	86.23	747.60	1801.0	15,613.6
10C	10	10,001.2	443.35	3974.1	110.73	992.55	2312.6	20,729.5
10D	10	10,001.0	541.42	4954.9	135.22	1237.50	2824.1	25,845.3
					Area of Box (m^2)	0.00400394		

Shear Box Measurements (millimeters)		
	Bottom Half	Top Half
Length 1	63.24	63.26
Length 2	63.26	N/A
Length 3	63.29	63.36
Average	63.2633	63.3100
Width 1	63.26	63.26
Width 2	63.30	63.28
Width 3	63.26	63.24
Average	63.2733	63.2600

Surface Area (mm^2): 4003.9364

Inspected by: Donald McCullough

Date: 8-Aug-2014

Oklahoma Department of Transportation
Geotechnical Lab
Equipment Calibration, Standardization and Check Information

Item	Interval	Requirement	Procedure	
Balances and Scales	12 Months	Check/ Calibrate	**Outside contractor**	S102
Loading Devices	12 Months	Check/ Calibrate	**Outside contractor**	S103
Proving Rings	12 Months	Check/ Calibrate	**Outside contractor**	S103
Consolidation Devices	Prior to use	Check	In-House procedure	S104
Ovens	12 Months	Check/Standardize	In-House procedure	S108
Vacuum Systems	12 Months	Check	In-House procedure	S109
Manual Hammers, Mechanical Compactor & Proctor Molds	12 Months	Check	In-House procedure	S111
Sieves	12 Months	Check	In-House procedure	S112
Liquid Limit Devices	12 Months	Check	In-House procedure	S113
Grooving Tools	12 Months	Check	In-House procedure	S114
Hydrometers	24 Months	Check	In-House procedure	S115
Straight Edges	12 Months	Check	In-House procedure	S116
CBR Weights, Molds and Penetration Piston	12 Months	Check	In-House procedure	S117
Timers	6 Months	Check/Standardize	In-House procedure	S121
Stirring Apparatus	12 Months	Check	In-House procedure	S122
Revolving drum Processors	6 Months	Check	In-House procedure	S124
Constant Temperature Bath	12 Months	Check/Standardize	In-House procedure	S125
Sedimentation Cylinders	12 mo. Visual 36 mo. Measure	Check	In-House procedure	S126
Sample Splitter	12 Months	Check	In-House procedure	S127
Dial Gauges (indicators)	12 Months	Check	In-House procedure	S129
Slake Durability	12 Months	Check	In-House procedure	S130
Digital Caliper	12 Months	Check	In-House procedure	S131
Direct Shear Device Deformation	12 Months	Check/Standardize	In-House procedure	S132
Direct Shear Device Weights and Box Dimensions	12 Months	Check/Standardize	In-House procedure	S133
Aggregate Washer	12 months	Check	In-House procedure	P401

Oklahoma Department of Transportation

EQUIPMENT CALIBRATION PROCEDURE S133

Direct Shear Device Weights and Box Dimensions

Reference AASHTO T236

Purpose

This procedure provides instructions for standardizing the dead weights and measuring the shear box area.

Inspection Equipment Required

1. Caliper (readable to 0.01 mm)
2. Balance (readable to 0.1 g)

Procedure:

Dead Weights:

1. Using a balance capable of measuring up to a minimum of ten kilograms (10 kg),
    a. Check the level of the balance and adjust if necessary.
    b. Place one weight on the balance.
    c. Record the identification of the weight and the mass to the nearest 0.1 gram in the space provided.
    d. Remove the weight from the balance.
2. Repeat Step 1, of the dead weights section, until all nine (9) weights have been verified.

Shear Box:

1. At multiple locations, measure the length of the bottom half of the box (at the mating surface with the top half) to the nearest 0.01 mm in the space provided.
2. At multiple locations, measure the width of the top half of the box (at the mating surface with the bottom half) to the nearest 0.01 mm in the space provided.
3. Using the average length and average width of both the top and bottom, calculate the area of the box at the mating surface. Use formula, length times width equals area (L X W = A), and record to nearest 0.1 mm in the space provided.

DM

Revised:08AUG2014

Oklahoma Department of Transportation
EQUIPMENT CALIBRATION RECORD S133
Direct Shear Device Weights and Box Dimensions
Reference AASHTO T236

Verification Frequency: 12 months

Previous Verification Date: N/A

Next Due Date: 26-Jun-2015

Verification Equipment:

Caliper: 04396583
Balance: LBT0068

	Nominal Mass (kg)	Mass (g)	Cumulative Normal Load		Normal Stress (2.5" box)		Normal Stress (2.5" box)	
			On Hanger (N)	On 10:1 Lever Arm (N)	On Hanger (kPa)	On 10:1 Lever Arm (kPa)	On Hanger (psf)	On 10:1 Lever Arm (psf)
Hanger +Top Cap +Stone +Grid		5204.6	51.04	51.04	12.75	12.75	266.2	266.2
1A	1	999.6	60.84	149.1	15.20	37.23	317.4	777.5
1B	1	999.9	70.65	247.1	17.64	61.72	368.5	1289.0
1C	1	1000.3	80.46	345.2	20.09	86.22	419.7	1800.7
2	2	2000.6	100.08	541.4	24.99	135.22	522.0	2824.0
5	5	5000.8	149.12	1031.8	37.24	257.70	777.8	5382.1
10A	10	10,001.0	247.19	2012.6	61.74	502.65	1289.4	10,497.8
10B	10	10,001.0	345.27	2993.3	86.23	747.60	1801.0	15,613.6
10C	10	10,001.2	443.35	3974.1	110.73	992.55	2312.6	20,729.5
10D	10	10,001.0	541.42	4954.9	135.22	1237.50	2824.1	25,845.3

Area of Box (m^2) 0.00400394

Shear Box Measurements (millimeters)		
	Bottom Half	Top Half
Length 1	63.24	63.26
Length 2	63.26	N/A
Length 3	63.29	63.36
Average	63.2633	63.3100
Width 1	63.26	63.26
Width 2	63.30	63.28
Width 3	63.26	63.24
Average	63.2733	63.2600

Surface Area (mm^2): 4003.9364

Inspected by: _____ Date: 8-Aug-2014

CANNON Instrument Co.
2139 High Tech Road
State College PA 16803-1733
UNITED STATES

Phone:814-353-8000
Fax:814-353-8007

CANNON INSTRUMENT COMPANY

IN-HOUSE REPAIR REPORT

Call: 5598

Case: 2,035

Date:
Time:

Technician Name:	Daniel L. Yoder				
Date Receive	5/22/2014	Date Repaired:	7/3/2014	Date Shipped:	
Contact Name:	Tammy Davis			Product Model:	ACO-7 Cleveland Open
Company:	Oklahoma D.O.T/Materials Division				
Address:	Oklahoma D.O.T/Materials Division 200 NE 21st Street Oklahoma City OK 73105-3204			Purchase Date:	
Phone:		Ext:		RA #:	
Reason for Repair:	ACO-7 Cleveland Ope				
Misc Charges:					
Description of Work Repairs:	*Temp off by about 5 deg.F above 390. Calibrated temp. to 605F. Rate is 11 deg.\min. Repaired flame sup lid. and thermal fuse shorted to the frame*				

Quantity	Part #	Description	Material	Labor	Miscellaneous
1.00 EA	89.0054	ACO-7 Cleveland Open Cup Flash Point Tester	No	No	No
Job:	SRV0055980001				

Job Operation Component

Seq. No.	Operation	Actual Hours	Actual Unit Price	Ext.Price
10	REPAIR In house Customer Repair	4.00	600.00	0.00

Temp off by about 5 deg.F above 390. Calibrated temp. to 605F. Rate is 11 deg.\min. Repaired flame sup lid. and thermal fuse shorted to the frame.

SCTicket:001:00

Oklahoma DOT Unexpired Central Lab Technician Qualifications by Test
Authorized Evaluations in the Past Year
Includes All Tests in the Inventory

U = Routinely Used
A = Accredited

FLAGS
"V" = No Documented Evaluations

Test Description	Specifications AASHTO		ASTM	OTHER
Softening Point	T53	U A	D36	

Technician Name	Eval. Date	Expr. Date	Sample ID	Tst. Nbr.	Eval. Type
Lawrence, Phillip R.	10/22/2013	10/22/2014	9700091310221337	17	Verbal

Test Description	Specifications AASHTO		ASTM	OTHER
Solubility	T44	U A	D2042	

Technician Name	Eval. Date	Expr. Date	Sample ID	Tst. Nbr.	Eval. Type
Lawrence, Phillip R.	10/22/2013	10/22/2014	9700091310221337	19	Verbal

Test Description	Specifications AASHTO		ASTM	OTHER
Specific Gravity (Cutback Asphalt)	T295	U A	D3142	

Technician Name	Eval. Date	Expr. Date	Sample ID	Tst. Nbr.	Eval. Type
Lawrence, Phillip R.	10/22/2013	10/22/2014	9700091310221337	18	Verbal

Test Description	Specifications AASHTO		ASTM	OTHER
Specific Gravity (Semi-Solid Asphalt)	T228	U A	D70	

Technician Name	Eval. Date	Expr. Date	Sample ID	Tst. Nbr.	Eval. Type
Lawrence, Phillip R.	10/22/2013	10/22/2014	9700091310221337	21	Verbal

Test Description	Specifications AASHTO		ASTM	OTHER
Spot Test	T102	U		

Technician Name	Eval. Date	Expr. Date	Sample ID	Tst. Nbr.	Eval. Type
Lawrence, Phillip R.	10/23/2013	10/23/2014	9700091310231130	2	Verbal

Test Description	Specifications AASHTO		ASTM	OTHER
Viscosity by Viscometer	T202	U A	D2171	

Technician Name	Eval. Date	Expr. Date	Sample ID	Tst. Nbr.	Eval. Type
Lawrence, Phillip R.	10/22/2013	10/22/2014	9700091310221337	22	Verbal

Oklahoma DOT Central Lab Technician Qualifications by Technician

Most Recent Authorized Evaluations

NOTE: Technicans in Lab 96 (IA), 97 (Admin.), and 98 (Research) are excluded. Kenneth Hobson and Kenny Seward are excluded.

FLAGS

"X" = Over 1 Year Old

"Y" = Will be 1 Year Old Within the Next 30 Days

Technician

Name: **Lawrence, Phillip R.** User ID: **plawrenc** Cert. No.: **0020**

CLab Test Category: ***Asphalt Binder***

	Test Description	Test ID	Eval. Date	Eval. Type	Sample ID	Tst. Nbr.
	Aging by PAV	00123	10/22/2013	Verbal	9700091310221337	2
D1298 X	Density, Specific Gravity (Hydrometer)	00186	11/30/2012	Verbal	9700041211301310	26
	Distillation of Cutback	00099	10/22/2013	Verbal	9700091310221337	15
	Ductility	00097	10/22/2013	Verbal	9700091310221337	4
	Dynamic Shear Rheometer (DSR)	00117	10/22/2013	Verbal	9700091310221337	7
	Elastic Recovery (Binder)	00061	10/22/2013	Verbal	9700091310221337	8
	Fabric: Asphalt Retention	00205	10/23/2013	Verbal	9700091310231130	4
	Flash and Fire Points	00094	10/22/2013	Verbal	9700091310221337	3
	Flash Point (Tag Open-Cup)	00100	10/23/2013	Verbal	9700091310231130	5
	Flexural Creep Stiffness (BBR)	00116	10/22/2013	Verbal	9700091310221337	25
	Float Test	00096	10/22/2013	Verbal	9700091310221337	24
	Grading	00124	10/22/2013	Verbal	9700091310221337	5
	Kinematic Viscosity	00087	10/22/2013	Verbal	9700091310221337	20
	MCSR	00064	10/22/2013	Verbal	9700091310221337	6
	Penetration	00095	10/22/2013	Verbal	9700091310221337	23
	Rolling Thin Film Oven	00107	10/22/2013	Verbal	9700091310221337	1
	Rotational Viscometer	00118	10/22/2013	Verbal	9700091310221337	16
	Separ. Of Polym. From Polym. Mod. AC	00175	10/23/2013	Verbal	9700091310231130	3
	Softening Point	00098	10/22/2013	Verbal	9700091310221337	17
	Solubility	00093	10/22/2013	Verbal	9700091310221337	19
T295	Specific Gravity (Cutback Asphalt)	00112	10/22/2013	Verbal	9700091310221337	18
	Specific Gravity (Semi-Solid Asphalt)	00092	10/22/2013	Verbal	9700091310221337	21
	Spot Test	00131	10/23/2013	Verbal	9700091310231130	2
	Viscosity by Viscometer	00088	10/22/2013	Verbal	9700091310221337	22

CLab Test Category: ***Emulsified Asphalt***

Test Description	Test ID	Eval. Date	Eval. Type	Sample ID	Tst. Nbr.
Particle Charge	00071	10/22/2013	Verbal	9700091310221337	12
Residue by Evaporation	00073	10/22/2013	Verbal	9700091310221337	11
Saybolt Viscosity at 25 deg. C (77 deg. F)	00074	10/22/2013	Verbal	9700091310221337	13
Saybolt Viscosity at 50 deg. C (122 deg. F)	00075	10/22/2013	Verbal	9700091310221337	14
Settlement and Storage Stability	00076	10/22/2013	Verbal	9700091310221337	9
Sieve Test	00077	10/22/2013	Verbal	9700091310221337	10

Oklahoma DOT Central Laboratory Test List

Count of All Tests: 219

U = Routinely Used
A = Accredited

Asphalt Binder

Count of Tests: 26

Central Lab Test (CLT)	CLT I.D.	Specifications AASHTO		ASTM		OTHER	
Aging by PAV	00123	R28	U A				
Density, Specific Gravity (Hydrometer)	00186			D1298	U		
Distillation of Cutback	00099	T78	U A				
Ductility	00097	T51	U A	D113			
Dynamic Shear Rheometer (DSR)	00117	T315	U A				
Elastic Recovery (Binder)	00061			D6084	U A		
Fabric: Asphalt Retention	00205			D6140	U		
Flash and Fire Points	00094	T48	U A	D92			
Flash Point (Tag Open-Cup)	00100	T79	U A				
Flexural Creep Stiffness (BBR)	00116	T313	U A				
Float Test	00096	T50	U A	D139			
Grading	00124	R29	U A				
Kinematic Viscosity	00087	T201	U A	D2170			
MCSR	00064	TP70		D7405	U A		
Penetration	00095	T49	U A	D5			
Rolling Thin Film Oven	00107	T240	U A	D2872			
Rotational Viscometer	00118	T316	U A	D4402			
Sampling	00141	T40		D140		OHDL5	U
Separ. Of Polym. From Polym. Mod. AC	00175			D5976	U	OHDL41	
Softening Point	00098	T53	U A	D36			
Solubility	00093	T44	U A	D2042			
Specific Gravity (Cutback Asphalt)	00112	T295	U A	D3142			
Specific Gravity (Semi-Solid Asphalt)	00092	T228	U A	D70			
Spot Test	00131	T102	U				
Viscosity by Viscometer	00088	T202	U A	D2171			
Water in Bituminous Mat. (Distillation)	00235			D95-05			

Emulsified Asphalt

Count of Tests: 7

Central Lab Test (CLT)	CLT I.D.	Specifications AASHTO		ASTM	OTHER	
Elastic Recovery (Emulsified)	00187				OHDL42	U
Particle Charge	00071	T59	U A			
Residue by Evaporation	00073	T59	U A			
Saybolt Viscosity at 25 deg. C (77 deg. F)	00074	T59	U A			
Saybolt Viscosity at 50 deg. C (122 deg. F)	00075	T59	U A			
Settlement and Storage Stability	00076	T59	U A			
Sieve Test	00077	T59	U A			

BL

Oklahoma Department of Transportation

Revision Aug 16, 2013

EQUIPMENT VERIFICATION RECORD B205-M
Ductility Molds
(Reference ASTM T-D113-07; AASHTO T300, T301)

Verification Frequency: 60 months

Previous Verification Date: 28 AUG 2012 **Next Due Date:** 19 AUG 2014

Verification Equipment Used: Digital Caliper ID#: 4396583 (Readable to 0.01 mm)

Verification Procedure: See Ductility Apparatus Verification Procedure

Mold ID #: A

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	112.6 mm
B - Total length of briquette	74.5mm to 75.5mm	74.9 mm
C – Distance between clips	29.7mm to 30.3mm	29.9 mm
D - Shoulder	6.8mm to 7.2mm	7.0 mm
E - Radius	15.75mm to 16.25mm	15.91 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.1 mm
I – Hole diameter	6.5mm to 6.7mm	6.7 mm
J - Thickness	9.9mm to 10.1mm	10.0 mm

Mold ID #: B

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	113.0 mm
B - Total length of briquette	74.5mm to 75.5mm	74.6 mm
C – Distance between clips	29.7mm to 30.3mm	29.9 mm
D - Shoulder	6.8mm to 7.2mm	7.2 mm
E - Radius	15.75mm to 16.25mm	15.80 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.1 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.0 mm
I – Hole diameter	6.5mm to 6.7mm	6.6 mm
J - Thickness	9.9mm to 10.1mm	10.0 mm

Mold ID #: C REMOVE FROM SERVICE

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: D

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	113.4 mm
B - Total length of briquette	74.5mm to 75.5mm	75.1 mm
C – Distance between clips	29.7mm to 30.3mm	29.9 mm
D - Shoulder	6.8mm to 7.2mm	7.1 mm
E - Radius	15.75mm to 16.25mm	16.01 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.1 mm
I – Hole diameter	6.5mm to 6.7mm	6.6. mm
J - Thickness	9.9mm to 10.1mm	9.9 mm

Mold ID #: G

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	113.2 mm
B - Total length of briquette	74.5mm to 75.5mm	75.1 mm
C – Distance between clips	29.7mm to 30.3mm	29.9 mm
D - Shoulder	6.8mm to 7.2mm	6.9 mm
E - Radius	15.75mm to 16.25mm	16.00 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.0 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.1 mm
I – Hole diameter	6.5mm to 6.7mm	6.6 mm
J - Thickness	9.9mm to 10.1mm	10.0 mm

Mold ID #: H

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	113.3 mm
B - Total length of briquette	74.5mm to 75.5mm	75.2 mm
C – Distance between clips	29.7mm to 30.3mm	29.9 mm
D - Shoulder	6.8mm to 7.2mm	7.0 mm
E - Radius	15.75mm to 16.25mm	16.15 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	42.9 mm
I – Hole diameter	6.5mm to 6.7mm	6.7 mm
J - Thickness	9.9mm to 10.1mm	9.9 mm

Mold ID #: E

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	113.5 mm
B - Total length of briquette	74.5mm to 75.5mm	75.2 mm
C – Distance between clips	29.7mm to 30.3mm	30.0 mm
D - Shoulder	6.8mm to 7.2mm	7.1 mm
E - Radius	15.75mm to 16.25mm	16.10 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.0 mm
I – Hole diameter	6.5mm to 6.7mm	6.6 mm
J - Thickness	9.9mm to 10.1mm	9.9 mm

Mold ID #: F

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	112.9 mm
B - Total length of briquette	74.5mm to 75.5mm	75.0 mm
C – Distance between clips	29.7mm to 30.3mm	30.0 mm
D - Shoulder	6.8mm to 7.2mm	7.0 mm
E - Radius	15.75mm to 16.25mm	16.00 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.0 mm
I – Hole diameter	6.5mm to 6.7mm	6.6 mm
J - Thickness	9.9mm to 10.1mm	9.9 mm

Mold ID #: I

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	113.1 mm
B - Total length of briquette	74.5mm to 75.5mm	74.6 mm
C – Distance between clips	29.7mm to 30.3mm	30.0 mm
D - Shoulder	6.8mm to 7.2mm	7.0 mm
E - Radius	15.75mm to 16.25mm	15.75 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.1 mm
I – Hole diameter	6.5mm to 6.7mm	6.7 mm
J - Thickness	9.9mm to 10.1mm	10.0 mm

Mold ID #: J REMOVE FROM SERVICE

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: L

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	112.5 mm
B - Total length of briquette	74.5mm to 75.5mm	74.92 mm
C – Distance between clips	29.7mm to 30.3mm	30.0 mm
D - Shoulder	6.8mm to 7.2mm	7.0 mm
E - Radius	15.75mm to 16.25mm	15.96 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.0 mm
I – Hole diameter	6.5mm to 6.7mm	6.7 mm
J - Thickness	9.9mm to 10.1mm	10.0 mm

Mold ID #: K

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	112.6 mm
B - Total length of briquette	74.5mm to 75.5mm	75.0 mm
C – Distance between clips	29.7mm to 30.3mm	29.9 mm
D - Shoulder	6.8mm to 7.2mm	7.0 mm
E - Radius	15.75mm to 16.25mm	16.09 mm
F – Width at minimum cross section	9.9mm to 10.1mm	10.0 mm
G – Width at mouth of clip	19.8mm to 20.2mm	20.1 mm
H – Distance between centers of radius	42.9mm to 43.1mm	43.0 mm
I – Hole diameter	6.5mm to 6.7mm	6.8 mm
J - Thickness	9.9mm to 10.1mm	10.0 mm

Inspected by: Lori Bush Date: 19 AUG 2013

Sample ID: 9700041408211103 | Test Number: 1 | Sample Date: 08/21/2014

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: dmccullo	McCullough, Donald	0004

Central Lab Technician: dstottle

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
Stottlemyre, Daniel R.	0037	95	Central Geotechnical Lab

Test Category: CSOI — (Category Description): Soil

Central Lab Test ID: 00047

(Test Description)	(AASHTO)	(ASTM)	(Other)
California Bearing Ratio	T193	D1883	

Evaluation Type: ○ Verbal ● Performance

Mentor: ☐

Remarks1:
Remarks2:
Remarks3:

Evaluation Results: ● Satisfactory ○ Unsatisfactory

Oklahoma Department of Transportation

EQUIPMENT VERIFICATION RECORD B205-M
Ductility Molds
(Reference ASTM T-D113-07; AASHTO T300, T301)

Verification Frequency: 12 months

Previous Verification Date: _____ **Next Due Date:** _____

Verification Equipment Used: Digital Caliper ID#: 4396583 (Readable to 0.01 mm)

Verification Procedure: See Ductility Apparatus Verification Procedure

Mold ID #: A

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: B

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: C

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: D

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: E

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: F

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: G

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: H

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: I

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: J

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: L

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Mold ID #: K

Dimension	Distance (mm)	Actual Measurement
A - Distance between centers	111.5mm to 113.5 mm	
B - Total length of briquette	74.5mm to 75.5mm	
C – Distance between clips	29.7mm to 30.3mm	
D - Shoulder	6.8mm to 7.2mm	
E - Radius	15.75mm to 16.25mm	
F – Width at minimum cross section	9.9mm to 10.1mm	
G – Width at mouth of clip	19.8mm to 20.2mm	
H – Distance between centers of radius	42.9mm to 43.1mm	
I – Hole diameter	6.5mm to 6.7mm	
J - Thickness	9.9mm to 10.1mm	

Inspected by: _____ Date: _____

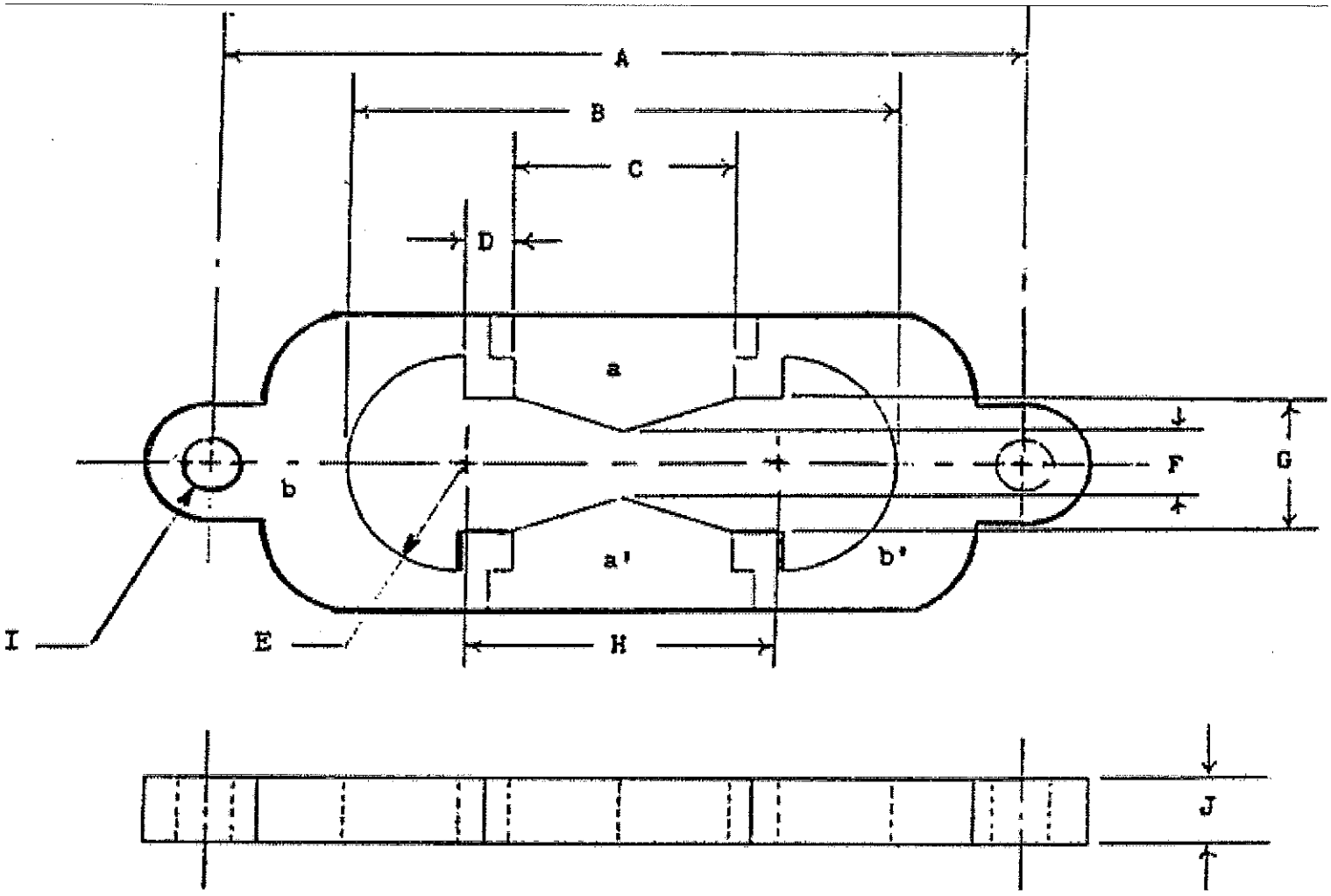
Use the following formulas for Radius (E) and Distance between centers of radius (H) calculation. All the assigned letters in formula are from the drawings.

H = the Height of the arc

$$Radius = \frac{H}{2} + \frac{W^2}{8H}$$

W = the Width of the base of an arc

Distance H = B – 2E



A—Distance between centers, 111.5 to 113.5 mm.
B—Total length of briquette, 74.5 to 75.5 mm.
C—Distance between clips, 29.7 to 30.3 mm.
D—Shoulder, 6.8 to 7.2 mm.
E—Radius, 15.75 to 16.25 mm.
F—Width at minimum cross section, 9.9 to 10.1 mm.
G—Width at mouth of clip, 19.8 to 20.2 mm.
H—Distance between centers of radii, 42.9 to 43.1 mm.
I—Hole diameter, 6.5 to 6.7 mm.
J—Thickness, 9.9 to 10.1 mm.

CANNON INSTRUMENT COMPANY

RETURN MATERIAL AUTHORIZATION REQUEST

This form must be completed and returned to CANNON Instrument Company *before* any equipment may be returned for service, repair or replacement. A separate form is required for each requested RMA#; all equipment included under the RMA# must be listed below.

RETURN MATERIAL AUTHORIZATION NUMBER

Fax completed form to **(814) 353-8007 attention** K Felix. Following approval, a Return Material Authorization Number (RMA#) will be issued to you. After receipt of your RMA#, ship equipment (prepaid) to:

CANNON Instrument Company
2139 High Tech Road
State College, PA 16803
Attn: Returns

Type of Equipment: Flash Point Tester

Model: AC 07 SN # 26372

Serial #: SN # 26372

Reason for return:

Temperature rate out of spec.

DISCLOSURE OF POTENTIAL HAZARDOUS SUBSTANCE EXPOSURE

OSHA Hazard Communication Standard 29CFR1910.1200 mandates that we inform and protect our employees from potential exposure to hazardous, biological, or radioactive chemicals. Please indicate below if equipment for return has been exposed to any such contaminants:

☑ This equipment has not been exposed to hazardous, biological, or radioactive chemicals and is safe to handle without special precautions.

☐ This equipment has been exposed to hazardous, biological, or radioactive chemicals **AND** has been properly decontaminated in accordance applicable regulatory requirements.

NOTICE: Any equipment that may have been potentially exposed to any hazardous substance(s) as defined by OSHA must be properly decontaminated prior to return. CANNON Instrument Company will not accept returns of potentially contaminated equipment.

If equipment to be returned was exposed to any hazardous substance(s) as defined by OSHA, you must attach the following to this Return Material Authorization Request:

- A letter signed by an authorized company representative certifying that the equipment has been properly decontaminated in accordance with applicable regulatory requirements

CANNON INSTRUMENT COMPANY

- A copy of the required Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for each identified hazardous substance(s).

ACKNOWLEDGEMENT

CANNON Instrument Company reserves the right to refuse any returned equipment that has not been issued a Return Material Authorization Number. Any returns without a Return Material Authorization Number will be not be serviced and will be returned to the sender at their expense.

Customers will held liable for any harm or injury to CANNON employees and will be responsible for all damages due to injury to CANNON employees resulting from exposure to hazardous, biological, or radioactive materials present in returned equipment.

The undersigned certifies that the equipment listed on this form has not been exposed to hazardous, biological, or radioactive chemicals OR, in the event of exposure to such chemicals, has been properly decontaminated in accordance with applicable regulatory requirements and is deemed safe to handle.

Date: 5-20-14

Print Name: Marcella Donovan

Title: Matls. Spec. 5

Company: ODOT

Address: 200 N.E. 21st St.

OKLAHOMA CITY, OK 73105-3204

Phone Number: 405-522-4922

Email Address: mdonovan@odot.org

Signature: Marcella Donovan

RMA# Issue after completed form received 21458

Humboldt Mfg Co.
875 Tollgate Rd,
Elgin,IL 60123
USA
Tollfree: 1.800.544.7220
Telephone: 1.708.456.6300
Fax: 1.708.456.0137
Website: www.humboldtmfg.com
Federal Tax ID: 36-1245250

Remit To:
Humboldt Mfg. Co.
Dept No: 8050,
PO Box 87618,
Chicago, IL 60680-0618

Invoice

154020

Invoice Date: 03/25/2014
Due Date: 03/25/2014
Payment Terms: Credit Card
Customer Ref. No: Tammy
Customer Number: C218031

Bill To:
Oklahoma DOT * OK City
200 N E 21st St,
Oklahoma City,OK 73105
USA

Ship To:
Oklahoma DOT * Ok City
Marcella
200 NE 21st St,
Oklahoma City,OK 73105
USA

Contact Person: Tammy Davis

Ship Via: UPS GROUND
Tracking #: 1Z6146970375657383

Item Code	Description	Qty	Price	Total
H-1280	Penetration Needle for Bituminous Material, 40-45mm	7	$74.00	$518.00

Based On Sales Orders 140503.
ap: 060741
date:3-25-14
amount: 530.00 Based On Deliveries 147608.

Sub Total	$518.00
Shipping & Handling	$12.00
Total	$530.00
Applied Amt	$530.00
Balance Due	**$0.00**

BL

Oklahoma Department of Transportation

Revision Aug 21, 2013

EQUIPMENT VERIFICATION RECORD B220
Penetration Apparatus and Accessories
(Reference AASHTO T- 49)

Verification Frequency: 12 months

Previous Verification Date: NEW NEEDLES **Next Due Date:** AUG 26, 2014

Verification Equipment Used: Balance (0.0 g) ID # LBT6295
Thermometer ID # Fluke LAT-228
Caliper ID# 4396583
Stopwatch ID # 111733214
Magnifying eyepiece ID # Bausch & Lome
Feeler Gauge ID# 173MAT;
Gauge blocks set: 0.130; 0.250; 0.750; 1.000; 1.250; 1.500"

Verification Procedure: See Penetration Apparatus and Accessories Verification Procedure

Dimension, Mass and other criteria:

Spindle 47.5g±0.05g	Mass 50g Block 50g ± 0.05g	Mass 100g Block 100g±0.05g	5 s Switch Time (s)	10.0 mm Block Dial Reading (mm)	25.5 mm Block Dial Reading (mm)
n/a	n/a	n/a	n/a	n/a	n/a

NEW NEEDLE(S)					
ID	Diameter 1.00 -1.02mm	MASS (g) 2.50g±0.05g	STRAIGHT	BURR (none)	
A-2148	1.01	2.50	Yes	None	
A-2229	1.01	2.51	Yes	None	
A-2204	1.01	2.51	Yes	None	
A-2192	1.01	2.51	Yes	None	
A-1549	1.01	2.50	Yes	None	
A-2180	1.01	2.50	Yes	None	
A-2167	1.01	2.50	Yes	None	

Check base for flatness? ____n/a_____

Base checked with level?_____n/a_____

Does handheld level agrees with equipment leveling indicator? _____ n/a _____

Check 0.1mm deflection on dial indicator? _____ n/a _____

25°C WATER BATH				
A 100mm min.	B 50mm min.	C 10 liters min.	E thermometer 25 ± 0.1°C	F Digital readout °C
n/a	n/a	n/a	n/a	n/a

Where:
A=Top of perforated shelf to surface of water
B=Perforated shelf to bottom of bath
E=Calibrated thermometer temperature at 25°C
F=Digital readout at test temperature of 25°C

4°C WATER BATH			
A 100mm min.	B 50mm min.	C 10 liters min.	E thermometer 4 ± 0.1°C
n/a	n/a	n/a	n/a

Where:
A=Top of perforated shelf to surface of water
B=Perforated shelf to bottom of bath
D=Immersion depth of calibrated thermometer
E=Calibrated thermometer temperature at 4°C
F=Digital readout at test temperature of 4°C

Inspected by: _____ Date: APRIL 15, 2014

verified new needle only.

Humboldt Mfg Co.
875 Tollgate Rd,
Elgin,IL 60123
USA
Tollfree: 1.800.544.7220
Telephone: 1.708.456.6300
Fax: 1.708.456.0137
Website: www.humboldtmfg.com
Federal Tax ID: 36-1245250

Remit To:
Humboldt Mfg. Co.
Dept No: 8050,
PO Box 87618,
Chicago, IL 60680-0618

Invoice

154020

Invoice Date: 03/25/2014
Due Date: 03/25/2014
Payment Terms: Credit Card
Customer Ref. No: Tammy
Customer Number: C218031

Bill To:
Oklahoma DOT * OK City
200 N E 21st St,
Oklahoma City,OK 73105
USA

Ship To:
Oklahoma DOT * Ok City
Marcella
200 NE 21st St,
Oklahoma City,OK 73105
USA

Contact Person: Tammy Davis

Ship Via: UPS GROUND
Tracking #: 1Z6146970375657383

Item Code	Description	Qty	Price	Total
H-1280	Penetration Needle for Bituminous Material, 40-45mm	7	$74.00	$518.00

Based On Sales Orders 140503.
ap: 060741
date:3-25-14
amount: 530.00 Based On Deliveries 147608.

Sub Total	$518.00
Shipping & Handling	$12.00
Total	$530.00
Applied Amt	$530.00
Balance Due	**$0.00**

Response to Testing Nonconformity

AASHTO Materials Reference Laboratory Assessment No. 649R

11 April 2014

Unconfined Compressive Strength of Soil (AASHTO T208-2010 / ASTM D2166-2013)

> "The load was not applied to produce an axial strain rate of 0.5 to 2 percent per minute. The rate of axial strain varied between 0.3 to 0.8 percent per minute."

Testing was performed using a Wykeham-Farrance load frame (model no. 10021), with a 110-lbf capacity load ring. The rate of feed for the loading platform is set by a clutch position and changeable gears (see Figure 1). The rate of feed for each setting is tabulated in Table 1. This is a scan of the current table, but I believe it simply reproduces a table supplied by the manufacturer.

Figure 1. Clutch and gear rate adjustment

Table 1. Current (as-found) rate of feed for WF load frame

Rate of Feed Inches Per Minute						
Driver		30	60	36	54	45
Driven		60	30	54	36	45
Gear	A	0.01496	0.05984	0.01969	0.04488	0.02992
Change	B	0.00299	0.01181	0.00394	0.00886	0.00591
Position	C	0.00059	0.00236	0.00079	0.00177	0.00118
	D	0.00012	0.00047	0.00016	0.00035	0.00024
	E	0.00002	0.00009	0.00003	0.00004	0.00005

Testing was performed on compacted specimen (Harvard Miniature size, 2.8" x 1.3" nominal) of lean clay, at standard optimum moisture content. The rate of feed was set to 0.01969 in./min which corresponds to about 0.7%/min. Note that this is the rate of feed, not the rate of strain. During testing, the rate of strain started low, about 0.3%/min. As the compressive stress reached the peak, the rate of strain increased dramatically, up to about 0.8%.

AASHTO T208-10 and ASTM D2166-13 only specify that the strain rate should be between 0.5 and 2.0%. There is no requirement of how constant the strain rate should be. The issue here is that at some point during the test, the strain rate was outside the allowable range.

To identify and correct the cause of the nonconformity, two components need to be examined:

- Verify that the rate of feed is accurate and constant, and whether a proper rate was chosen
- Estimate the effect of load ring compressibility on strain rate, and whether a stiffer ring or load cell should be used.

The rate of feed was verified in general compliance with ASTM E 2658-11, and found to be about 4% faster than the as-found values, see Table 2. Only gear A was verified, because it is the only one used. The rate was also essentially constant over the range of verification; see Figure 2 (though this is not within the scope of E 2658).

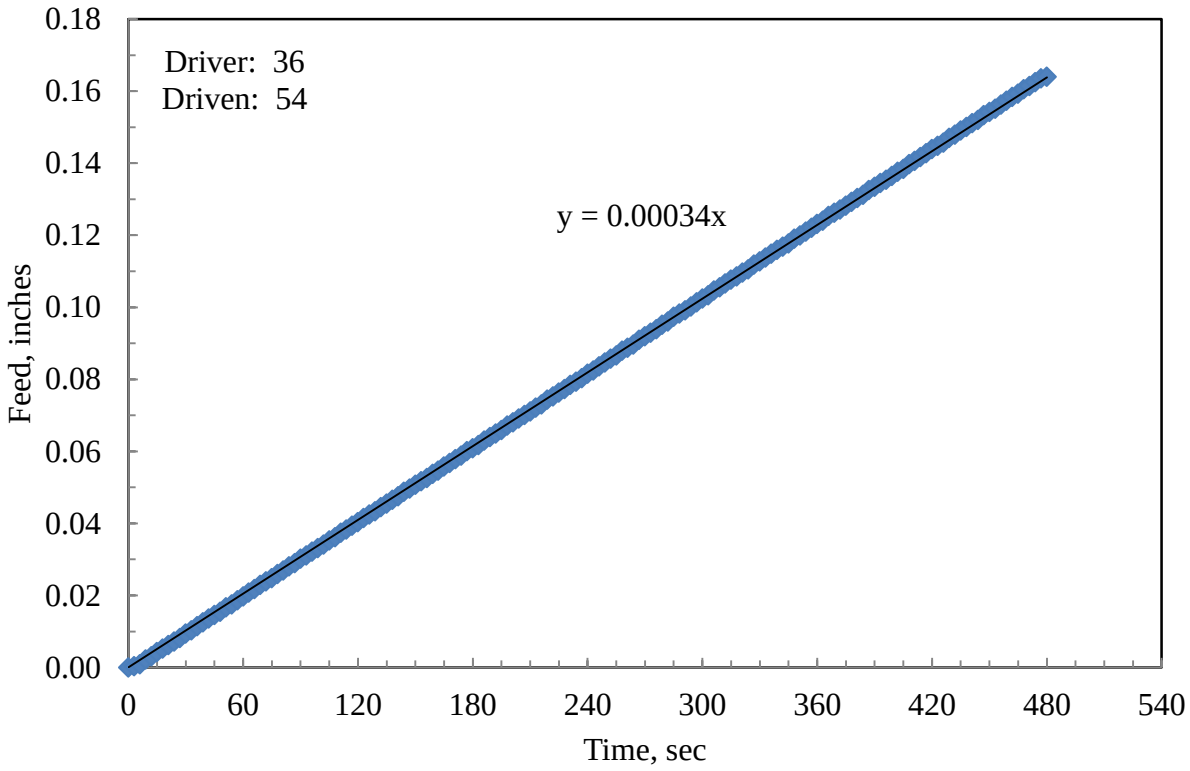


Figure 2. Typical verification run

Table 2. Rate of feed verification

Gear A	Driver	30	36	45	54	60
	Driven	60	54	45	36	30
Speed Setting, As-Found, in./min		0.01496	0.01969	0.02992	0.04488	0.05984
Verification Run #1, in./min		0.01557	0.02071	0.03103	0.04669	0.06207
Verification Run #2, in./min		0.01561	0.02073	0.03104	0.04662	0.06206
#1 Error, %		4.055	5.199	3.712	4.033	3.725
#2 Error, %		4.318	5.295	3.751	3.872	3.710
Repeatability, %		-0.2625	-0.0968	-0.0393	0.1614	0.0145
Speed Setting, As-Adjusted, in./min		0.01559	0.02072	0.03104	0.04665	0.06206

The nonconformity is therefore not due to problems with the rate of feed.

Compressibility of the load ring is known from experience to affect the rate of strain:

> "Mechanical sensors, like load (proving) rings … may also have undesirable side effects (for example, the compressibility of a load ring causing pronounced variation in the strain rate during loading and strain softening)."
>
> – Germaine, J. T. and Ladd, C. C, "Triaxial Testing of Saturated Cohesive Soils," *Advanced Triaxial Testing of Soil and Rock, ASTM STP 977*, Robert T. Donaghe, Ronald C. Chaney, and Marshall L. Silver, Eds., American Society for Testing and Materials, Philadelphia, 1988, p. 430.

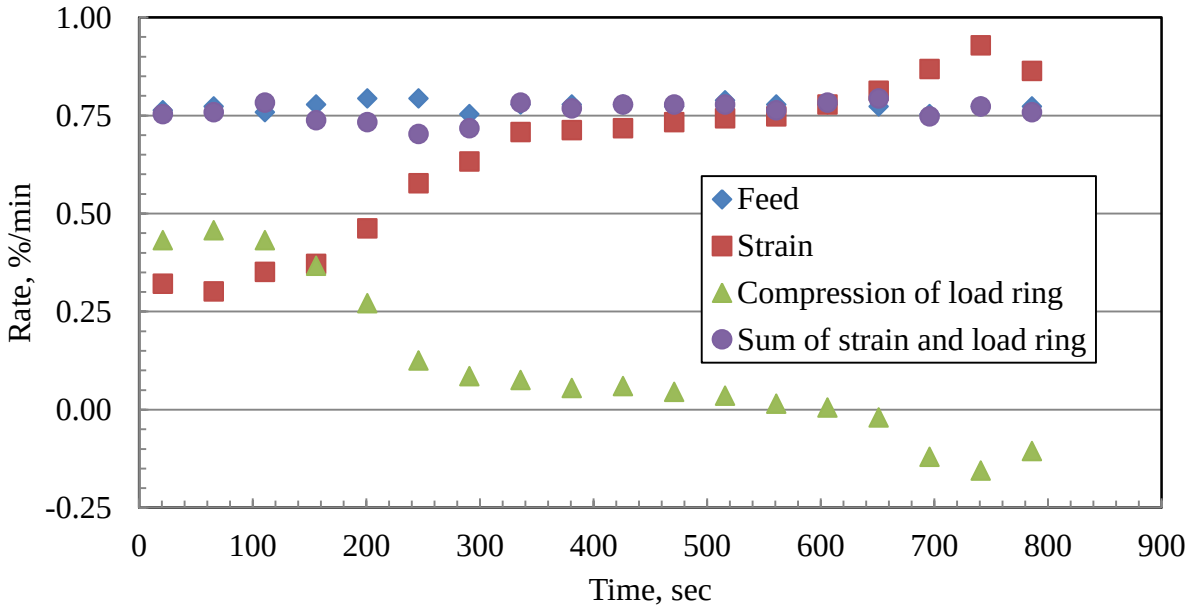


Figure 3. Comparison of rate of feed, rate of strain, and rate of compression of load ring from a typical unconfined compression test

The feed and strain are related by:

$$feed = compression\ of\ specimen + compression\ of\ load\ ring$$

Using a stiffer load ring would result in the less compression of the load ring at a given load, and rate of strain closer to the rate of feed. However, using a stiffer load ring would result in a peak load low in the useable range of the ring, which is not best practice. Another alternative would be to use a load cell, which requires less deformation at a given load. This may be a longer term solution.

The test results shown in Figure 3 are for a specimen similar to the one use in the demonstration. It can be seen that at the beginning of loading, the rate of strain is nearly 0.5% below the rate of feed. As the load approaches the peak, the load essentially levels off, and the rate of strain is close to the rate of feed. As the compressive load drops off after the peak, the load ring is expanding, and rate of strain is larger than the rate of feed.

The cause of the nonconformity was selection of rate of feed that did not sufficiently take into account the variability caused by load ring compression.

The proposed short-term remedy is to restrict the rate of feed to a range of 1.1 to 1.7 percent per minute, to allow sufficient range for the variation of rate of strain. The long-term remedy is to convert to the use of load cells, which would introduce less variability in the strain rate.

Response to Testing Nonconformity

AASHTO Materials Reference Laboratory Assessment No. 649R

11 April 2014

(a) Technician Training and Evaluation

> "The competency evaluation records presented for Dan Stottlemyre indicated that evaluations had not been performed for test method T224 (Section 5.5.3).
>
> Records of competency evaluation activities for Dan Stottlemyre indicated that the evaluations had not been performed in the 12-month interval specified by the laboratory's quality manual for the following methods (Section 5.5.3): D1883, T176, T193, and T210. Records indicated that the evaluations were last performed in 2011.
>
> The competency evaluation records presented for Chris Clarke indicated that evaluations had not been performed for test method D2488 (Section 5.5.3).
>
> The competency evaluation records presented for Shelly Maddox indicated that evaluations had not been performed for test method D2487 (Section 5.5.3)."

Recent changes to ODOT's Quality System Manual to comply with changes in AASHTO R18, in addition to changes in personnel, required more detailed and time-consuming evaluations. It was recognized early on that it might not be possible for Quality Assurance Branch personnel to complete all current evaluations before the AMRL Laboratory Assessment, but it was suggested that the appropriate laboratory supervisor or branch manager could evaluate and certify technicians. This is not the preferred policy, but is allowable. However, there was confusion in the Geotechnical Branch over this. Additionally, ASTM D 2487 and D 2488 are new to ODOT's certified list, and it wasn't realized until the last minute that they would be demonstrated.

Though Stottlemyre and Maddox were observed by the lab supervisor and branch manager to perform their tests satisfactorily (notwithstanding the nonconformity by Stottlemyre on the CBR), they were not formally certified.

Clarke, the branch manager, recognized there was a problem with the lack of certification on these tests, but believed it was too late to do anything about it, though they could be performed satisfactorily.

Stottlemyre and Maddox should have been evaluated and certified by the lab supervisor or branch manager. Clarke should have sought evaluation and certification on D 2488 by Quality Assurance personnel in a timely manner.

The preferred procedure is for Quality Assurance Branch personnel to perform evaluation and certification. As the backlog is worked out, this should become the norm. The Geotechnical Branch Manager and lab supervisor are preparing a prioritized schedule for training, evaluation and certification.

Oklahoma Department of Transportation

Equipment Verification Record B206

Ring and Ball Apparatus

Reference AASHTO T53, ASTM D36-06

Verification Frequency: 12 months

Previous Verification Date: MAR 29-2013

Next Due Date: APRIL 14, 2015

Verification Equipment Used: Caliper ID# 4396583
Balance ID# LBT0295

Verification Precedure: See equipment verification procedure B206

Shouldered Ring ID# 3 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	19.8	Pass
C	18.8 ± 0.3 mm	18.6	Pass
D	15.9 ± 0.3 mm	15.8	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	1.9	Pass
G	6.4 ± 0.4 mm	6.3	Pass
H	3.6 ± 0.3 mm	3.6	Pass
I	2.8 ± 0.3 mm	2.8	Pass

Shouldered Ring ID# 4 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	19.8	Pass
C	18.8 ± 0.3 mm	19.0	Pass
D	15.9 ± 0.3 mm	15.9	Pass
E	4.4 ± 0.3 mm	4.3	Pass
F	2.0 ± 0.3 mm	1.8	Pass
G	6.4 ± 0.4 mm	6.3	Pass
H	3.6 ± 0.3 mm	3.6	Pass
I	2.8 ± 0.3 mm	2.7	Pass

Shouldered Ring ID# 5 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	19.8	Pass
C	18.8 ± 0.3 mm	19.1	Pass
D	15.9 ± 0.3 mm	15.9	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	1.8	Pass
G	6.4 ± 0.4 mm	6.3	Pass
H	3.6 ± 0.3 mm	3.6	Pass
I	2.8 ± 0.3 mm	2.9	Pass

Shouldered Ring ID# 7 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	20.0	Pass
C	18.8 ± 0.3 mm	19.0	Pass
D	15.9 ± 0.3 mm	16.0	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	2.1	Pass
G	6.4 ± 0.4 mm	6.4	Pass
H	3.6 ± 0.3 mm	3.6	Pass
I	2.8 ± 0.3 mm	2.9	Pass

Oklahoma Department of Transportation

Shouldered Ring ID# 8 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.1	Pass
B	19.8 ± 0.3 mm	20.0	Pass
C	18.8 ± 0.3 mm	19.0	Pass
D	15.9 ± 0.3 mm	16.0	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	1.9	Pass
G	6.4 ± 0.4 mm	6.4	Pass
H	3.6 ± 0.3 mm	3.9	Pass
I	2.8 ± 0.3 mm	2.9	Pass

Shouldered Ring ID# 11 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	20.0	Pass
C	18.8 ± 0.3 mm	19.0	Pass
D	15.9 ± 0.3 mm	16.0	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	2.0	Pass
G	6.4 ± 0.4 mm	6.4	Pass
H	3.6 ± 0.3 mm	3.6	Pass
I	2.8 ± 0.3 mm	2.9	Pass

Shouldered Ring ID# 12 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	19.7	Pass
C	18.8 ± 0.3 mm	18.7	Pass
D	15.9 ± 0.3 mm	15.8	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	1.9	Pass
G	6.4 ± 0.4 mm	6.3	Pass
H	3.6 ± 0.3 mm	3.6	Pass
I	2.8 ± 0.3 mm	2.8	Pass

Shouldered Ring ID# 14 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	20.0	Pass
C	18.8 ± 0.3 mm	19.0	Pass
D	15.9 ± 0.3 mm	16.0	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	2.0	Pass
G	6.4 ± 0.4 mm	6.3	Pass
H	3.6 ± 0.3 mm	3.4	Pass
I	2.8 ± 0.3 mm	3.0	Pass

Shouldered Ring ID# 22 see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm	23.0	Pass
B	19.8 ± 0.3 mm	20.0	Pass
C	18.8 ± 0.3 mm	19.0	Pass
D	15.9 ± 0.3 mm	15.9	Pass
E	4.4 ± 0.3 mm	4.4	Pass
F	2.0 ± 0.3 mm	1.9	Pass
G	6.4 ± 0.4 mm	6.4	Pass
H	3.6 ± 0.3 mm	3.6	Pass
I	2.8 ± 0.3 mm	2.9	Pass

Shouldered Ring ID# see figure 1 (a)

Location	Requirement	Measured	Pass / Fail
A	23.0 ± 0.3 mm		
B	19.8 ± 0.3 mm		
C	18.8 ± 0.3 mm		
D	15.9 ± 0.3 mm		
E	4.4 ± 0.3 mm		
F	2.0 ± 0.3 mm		
G	6.4 ± 0.4 mm		
H	3.6 ± 0.3 mm		
I	2.8 ± 0.3 mm		

Inspected by: _____

Date: April 14, 2014

BL

Revision April 8, 2014

Oklahoma Department of Transportation

Equipment Verification Record B206

Ring and Ball Apparatus

Reference AASHTO T53, ASTM D36-06

Verification Frequency: 12 months

Previous Verification Date: MAR 29, 2013

Next Due Date: APR 14, 2015

Verification Equipment Used: Caliper ID# 4396583
Balance ID# LBT0295

Verification Precedure: See equipment verification procedure B206

Ring Holder ID# 1 — see figure 1 (b)

Location	Requirement	Measured	Pass / Fail
A	18.55 to 19.15 mm	19.09	Pass
Distance from bottom of shouldered ring to top of bottom plate	25 mm - 25.5 mm	25.3	Pass

Ring Holder ID# 2 — see figure 1 (b)

Location	Requirement	Measured	Pass / Fail
A	18.55 to 19.15 mm	19.13	Pass
Distance from bottom of shouldered ring to top of bottom plate	25 mm - 25.5 mm	25.1	Pass

Ring Holder ID# 3 — see figure 1 (b)

Location	Requirement	Measured	Pass / Fail
A	18.55 to 19.15 mm	19.14	Pass
Distance from bottom of shouldered ring to top of bottom plate	25 mm - 25.5 mm	25.4	Pass

Ring Holder ID# 4 — see figure 1 (b)

Location	Requirement	Measured	Pass / Fail
A	18.55 to 19.15 mm	19.05	Pass
Distance from bottom of shouldered ring to top of bottom plate	25 mm - 25.5 mm	25.3	Pass

Ring Holder ID# 5 — see figure 1 (b)

Location	Requirement	Measured	Pass / Fail
A	18.55 to 19.15 mm	19.03	Pass
Distance from bottom of shouldered ring to top of bottom plate	25 mm - 25.5 mm	25.1	Pass

Ring Holder ID# 6 — see figure 1 (b)

Location	Requirement	Measured	Pass / Fail
A	18.55 to 19.15 mm	19.03	Pass
Distance from bottom of shouldered ring to top of bottom plate	25 mm - 25.5 mm	25.2	Pass

Inspected by: _____

Date: APR 14, 2014

BL

Revision April 8, 2014

Oklahoma Department of Transportation

Equipment Verification Record B206

Ring and Ball Apparatus

Reference AASHTO T53, ASTM D36-06

Verification Frequency: 12 months

Previous Verification Date: MAR 29, 2013

Next Due Date: APR 14, 2015

Verification Equipment Used: Caliper ID# 4396583

Balance ID# LBT0295

Verification Precedure: See equipment verification procedure B206

Ball Guide # 1 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.35	Pass
B	9.7 to 9.75 mm	9.70	Pass

Ball Guide # 2 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.29	Pass
B	9.7 to 9.75 mm	9.70	Pass

Ball Guide # 3 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.31	Pass
B	9.7 to 9.75 mm	9.72	Pass

Ball Guide # 7 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.21	Pass
B	9.7 to 9.75 mm	9.70	Pass

Ball Guide # 6 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.18	Pass
B	9.7 to 9.75 mm	9.72	Pass

Ball Guide # 8 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.25	Pass
B	9.7 to 9.75 mm	9.70	Pass

Ball Guide # 12 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.15	Pass
B	9.7 to 9.75 mm	9.72	Pass

Ball Guide # 15 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.18	Pass
B	9.7 to 9.75 mm	9.71	Pass

Ball Guide # 16 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.17	Pass
B	9.7 to 9.75 mm	9.72	Pass

Ball Guide # 19 see figure 1 (c)

Location	Requirement	Measured	Pass / Fail
A	22.75 to 23.35 mm	23.14	Pass
B	9.7 to 9.75 mm	9.71	Pass

Inspected by: 

Date: APR 14, 2014

Oklahoma Department of Transportation

Equipment Verification Record B206

Ring and Ball Apparatus

Reference AASHTO T53, ASTM D36-06

Verification Frequency: 12 months

Previous Verification Date: MAR 29, 2013 **Next Due Date:** 11-Apr-2015

Verification equipment: Caliper ID# 4396583
Balance ID# LBT0295
Straightedge ID#

Verification Precedure: See equipment verification procedure B206

Steel Balls

Ball	Diameter (9.5 mm to 9.7 mm)	Weight (3.50 ± 0.05 g)	Pass / Fail
1	9.5	3.45	Pass
2	9.5	3.46	Pass
3	9.5	3.45	Pass
4	9.5	3.45	Pass
5	9.5	3.45	Pass
6	9.5	3.46	Pass
7	9.5	3.46	Pass
8	9.5	3.46	Pass
9	9.5	3.46	Pass
10	9.5	3.45	Pass
11	9.5	3.46	Pass
12	9.5	3.47	Pass
13	9.5	3.46	Pass
14	9.5	3.47	Pass
15	9.5	3.45	Pass
16	9.5	3.45	Pass
17	9.5	3.45	Pass
18	9.5	3.47	Pass
19	9.5	3.47	Pass
20	9.5	3.46	Pass

Oklahoma Department of Transportation

Pouring Plate (If requirement is met, place a check mark in Brass, Flat, Smooth column corresponding to Pouring plate #)

Plate #	Brass	Flat	Smooth	(P)ass / (F)ail
example:	√	√	√	Pass
1	√	√	√	Pass
2	√	√	√	Pass
3	√	√	√	Pass
4	√	√	√	Pass
5	√	√	√	Pass
6	√	√	√	Pass
7	√	√	√	Pass
8	√	√	√	Pass

Inspected by: _____ Date: APR 14, 2014

BL

Revision April 8, 2014

Oklahoma Department of Transportation

Equipment Verification Record B206

Ring and Ball Apparatus

Reference AASHTO T53, ASTM D36-06

Verification Frequency: 12 months

Previous Verification Date: MAR 29, 2013

Next Due Date: APR 14, 2015

Verification Equipment: Caliper ID# 4396582
Balance ID# LBT0294

Verification Precedure: See equipment verification procedure B205

Glass Vessel ID# : 1

	Requirement	Measured	Pass / Fail
Inside diameter	85 mm minimum	94.0	Pass
Height*	120 mm minimum	121.2	Pass
Distance from the lower suface of the bottom plate to the bottom of the bath	16 ± 3 mm	17.5	Pass
Distance from thermometric device to each ball-centering guide	less than 12.7 mm	3	Pass

*Measure from the bottom of the flare to the bottom of glass vessel

Glass Vessel ID# : 2

	Requirement	Measured	Pass / Fail
Inside diameter	85 mm minimum	92.3	Pass
Height*	120 mm minimum	121.4	Pass
Distance from the lower suface of the bottom plate to the bottom of the bath	16 ± 3 mm	17.5	Pass
Distance from thermometric device to each ball-centering guide	less than 12.7 mm	3	Pass

*Measure from the bottom of the flare to the bottom of glass vessel

Glass Vessel ID# : 3

	Requirement	Measured	Pass / Fail
Inside diameter	85 mm minimum	92.4	Pass
Height*	120 mm minimum	121.8	Pass
Distance from the lower suface of the bottom plate to the bottom of the bath	16 ± 3 mm	17.3	Pass
Distance from thermometric device to each ball-centering guide	less than 12.7 mm	3	Pass

*Measure from the bottom of the flare to the bottom of glass vessel

Glass Vessel ID# : 4

	Requirement	Measured	Pass / Fail
Inside diameter	85 mm minimum	92.2	Pass
Height*	120 mm minimum	121.3	Pass
Distance from the lower suface of the bottom plate to the bottom of the bath	16 ± 3 mm	17.2	Pass
Distance from thermometric device to each ball-centering guide	less than 12.7 mm	3	Pass

*Measure from the bottom of the flare to the bottom of glass vessel

Oklahoma Department of Transportation

Glass Vessel ID# : 5

	Requirement	Measured	Pass / Fail
Inside diameter	85 mm minimum	92.1	Pass
Height*	120 mm minimum	121.4	Pass
Distance from the lower suface of the bottom plate to the bottom of the bath	16 ± 3 mm	17.4	Pass
Distance from thermometric device to each ball-centering guide	less than 12.7 mm	3	Pass

*Measure from the bottom of the flare to the bottom of glass vessel

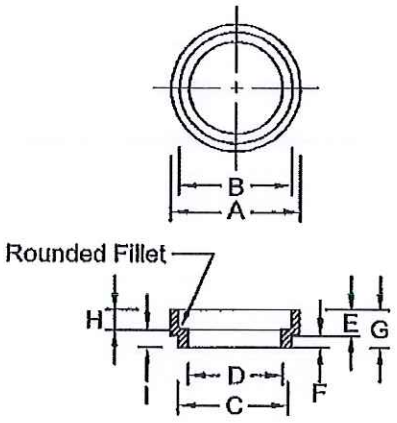
Glass Vessel ID# : 6

	Requirement	Measured	Pass / Fail
Inside diameter	85 mm minimum	92.3	Pass
Height*	120 mm minimum	121.2	Pass
Distance from the lower suface of the bottom plate to the bottom of the bath	16 ± 3 mm	17.52	Pass
Distance from thermometric device to each ball-centering guide	less than 12.7 mm	3	Pass

*Measure from the bottom of the flare to the bottom of glass vessel

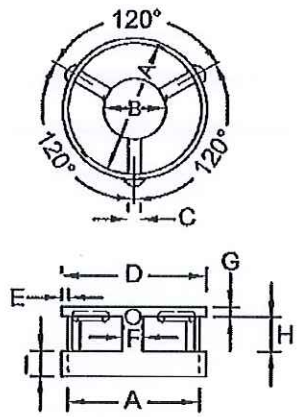
Inspected by: _____

Date: April 14, 2014



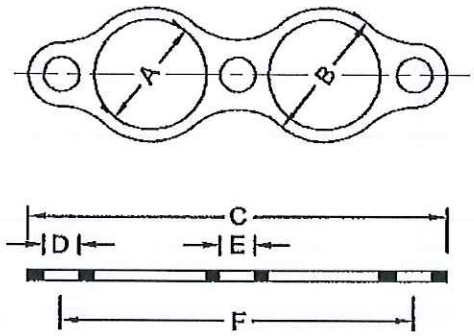
(a) Shouldered Ring

A	23.0 ± 0.3 mm	(0.91 ± 0.01 in.)
B	19.8 ± 0.3 mm	(0.78 ± 0.01 in.)
C	18.8 ± 0.3 mm	(0.74 ± 0.01 in.)
D	15.9 ± 0.3 mm	(0.63 ± 0.01 in.)
E	4.4 ± 0.3 mm	(0.17 ± 0.01 in.)
F	2.0 ± 0.3 mm	(0.08 ± 0.01 in.)
G	6.4 ± 0.4 mm	(0.25 ± 0.02 in.)
H	3.6 ± 0.3 mm	(0.14 ± 0.01 in.)
I	2.8 ± 0.3 mm	(0.11 ± 0.01 in.)



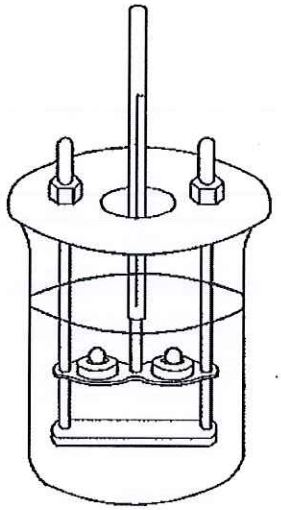
(c) Ball-Centering Guide

A	23.1 mm (see Note 3)	(0.91 in. (see Note 3))
B	9.7 mm (see Note 4)	(0.38 in. (see Note 4))
C	1.5 ± 0.5 mm	(0.06 ± 0.02 in.)
D	24.6 ± 0.3 mm	(0.97 ± 0.01 in.)
E	0.8 ± 0.5 mm	(0.03 ± 0.02 in.)
F	3.0 ± 0.5 mm	(0.12 ± 0.02 in.)
G	1.5 ± 0.3 mm	(0.06 ± 0.01 in.)
H	4.8 ± 0.3 mm	(0.19 ± 0.01 in.)
I	4.3 ± 0.3 mm	(0.17 ± 0.01 in.)



(b) Ring Holder (see Note 2)

A	19.0 mm (see Note 1)	(0.75 in. (see Note 1))
B	23.9 ± 0.5 mm	(0.94 ± 0.02 in.)
C	76.2 ± 0.5 mm	(3.00 ± 0.02 in.)
D	5.6 ± 0.5 mm	(0.22 ± 0.02 in.)
E	5.6 ± 0.5 mm	(0.22 ± 0.02 in.)
F	66.5 ± 0.5 mm	(2.62 ± 0.02 in.)



(d) Two-Ring Assembly

Notes:

1. This diameter is to be slightly larger (approximately 0.05 mm (0.002 in.)) than dimension "C" of Figure 1(a) to permit insertion of the ring. In the final assembly, the thermometer bulb shall be within 12.7 mm (0.50 in.) of, but not touching, the ball-centering guide.
2. The shape of the ring holder in Figure 1(b) is not critical with respect to the test results; therefore, any shape is acceptable provided it is suitable to support the test apparatus.
3. This diameter is to be slightly larger (approximately 0.05 mm (0.002 in.)) than dimension "A" of Figure 1(a) to slide over the ring.
4. This diameter is to be slightly larger (approximately 0.05 mm (0.002 in.)) than 9.7 mm (0.38 in.) to allow placing and centering of the steel ball.

Figure 1—Shouldered Ring, Ring Holder, Ball-Centering Guide, and Assembly of Apparatus Showing Two Rings

BL

Revision March 31, 2014

Oklahoma Department of Transportation

EQUIPMENT VERIFICATION RECORD B113

Superpave Gyratory Compactor (SGC)

Reference AASHTO T312

Verification Frequency: 12 months on molds and plates

Previous Verification Date: Feb 1, 2014

Molds and plates Next Due Date: MAR 21, 2015

Calibration Equipment Used: Caliper ID# 4396583
Three point internal bore gauge serial# 000859, 002099
Master ring 5.7187" (Class Z)

Calibration and Verification Precedure: See Equipment Verification Procedure B113

Location of verification: ODOT, Division 9, Asphalt Mix Laboratory
Owner: ODOT, Division 9, Asphalt Mix Laboratory

Note: Wear area is located at the top of this mold

Mold 1943	Requirement	50 mm from top of mold				100 mm from top of mold				50 mm from bottom of mold				New mold
Position	0°, 90°, 180°	1A	1B	1C	Pass / Fail	2A	2B	2C	Pass / Fail	3A	3B	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.2 mm	150.1089	150.1089	150.1013	Pass	150.1140	150.1318	150.1064	Pass	149.9946	149.9972	149.9845	Pass	No
Mold O.D.	None	165.6588	165.6588	165.6588	n/a	165.6512	165.6512	165.6512	n/a	165.6791	165.6791	165.6791	n/a	
Mold Thickness	7.5 mm minimum	15.5499	15.5499	15.5575	Pass	15.5372	15.5194	15.5448	Pass	15.6845	15.6819	15.6946	Pass	
End Plate	Requirement	Measure A	Pass / Fail	Measure B	Pass / Fail									
Top Plate O.D.	149.50 - 149.75 mm	149.5704	Pass	149.5603	Pass									
Bottom Plate O.D.	149.50 - 149.75 mm	149.5806	Pass	149.5704	Pass									

Note: Wear area is located at the top of this mold

Mold 1953	Requirement	50 mm from top of mold				100 mm from top of mold				50 mm from bottom of mold				New mold
Position	0°, 90°, 180°	1A	1B	1C	Pass / Fail	2A	2B	2C	Pass / Fail	3A	3B	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.2 mm	149.9489	149.9464	149.9489	Pass	149.9040	149.9489	149.9464	Pass	149.9387	149.9413	149.9387	Pass	No
Mold O.D.	None	165.6588	165.6512	165.6791	n/a	165.6588	165.6513	165.6790	n/a	165.6588	165.6513	165.6790	n/a	
Mold Thickness	7.5 mm minimum	15.7099	15.7048	15.7302	Pass	15.7548	15.7024	15.7326	Pass	15.7201	15.7100	15.7403	Pass	
End Plate	Requirement	Measure A	Pass / Fail	Measure B	Pass / Fail									
Top Plate O.D.	149.50 - 149.75 mm	149.6111	Pass	149.6111	Pass									
Bottom Plate O.D.	149.50 - 149.75 mm	149.5806	Pass	149.5781	Pass									

Note: Wear area is located at the bottom of this mold

Mold 238	Requirement	50 mm from top of mold				100 mm from bottom of mold				50 mm from bottom of mold				New mold
Position	0°, 90°, 180°	1A	1B	1C	Pass / Fail	2A	2B	2C	Pass / Fail	3A	3B	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.2 mm	149.9692	149.9413	149.9667	Pass	149.9718	149.9692	149.9718	Pass	149.9743	149.9743	149.9740	Pass	No
Mold O.D.	None	165.1991	165.2499	165.2499	n/a	165.2499	165.1991	165.2499	n/a	165.1991	165.2498	165.2499	n/a	
Mold Thickness	7.5 mm minimum	15.2299	15.3086	15.2832	Pass	15.2781	15.2299	15.2781	Pass	15.2248	15.2755	15.2759	Pass	
End Plate	Requirement	Measure A	Pass / Fail	Measure B	Pass / Fail									
Bottom Plate O.D.	149.50 - 149.75 mm	149.7406	Pass	149.7432	Pass									

I.D. = Inner diameter
O.D. = Outer diameter

BL

Oklahoma Department of Transportation

Revision March 31, 2014

Note: Wear area is located at the bottom of this mold

Mold 2060	Requirement	50 mm from top of mold				100 mm from bottom of mold				50 mm from bottom of mold				New mold
Position	0°, 90°, 180°	1A	1B	1C	Pass / Fail	2A	2B	2C	Pass / Fail	3A	3B	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.2 mm	149.9413	149.9438	149.9438	Pass	149.9362	149.9413	149.9337	Pass	149.9260	149.9260	149.9311	Pass	No
Mold O.D.	None	165.6309	165.6512	165.6512	n/a	165.6309	165.6512	165.6512	n/a	165.6309	165.6512	165.6512	n/a	
Mold Thickness	7.5 mm minimum	15.6896	15.7074	15.7074	Pass	15.6947	15.7099	15.7175	Pass	15.7049	15.7252	15.7201	Pass	
End Plate	Requirement	Measure A	Pass / Fail	Measure B	Pass / Fail									
Bottom Plate O.D.	149.50 - 149.75 mm	149.7406	Pass	149.7508	Pass									

Note: Wear area is located at the botoom of this mold

Mold 2075	Requirement	50 mm from top of mold				100 mm from bottom of mold				50 mm from bottom of mold				New mold
Position	0°, 90°, 180°	1A	1B	1C	Pass / Fail	2A	2B	2C	Pass / Fail	3A	3B	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.2 mm	150.0149	150.0200	150.0175	Pass	150.0200	150.0226	150.0149	Pass	149.9692	149.9667	149.9743	Pass	No
Mold O.D.	None	165.3896	165.5191	165.4200	n/a	165.3896	165.5191	165.4200	n/a	165.3896	165.5191	165.4200	n/a	
Mold Thickness	7.5 mm minimum	15.3747	15.4991	15.4025	Pass	15.3696	15.4965	15.4051	Pass	15.4204	15.5524	15.4457	Pass	
End Plate	Requirement	Measure A	Pass / Fail	Measure B	Pass / Fail									
Bottom Plate O.D.	149.50 - 149.75 mm	149.7508	Pass	149.7381	Pass									

Information note:

Item	Manufacturer	Model #	Range	Certificate#	Verification Date
Digital Caliper	Mitutoyo	CD-8"PS	8"	n/a	24-May-13
Three point internal bore gauge *	Mitutoyo	HTD-6"R	6"	n/a	n/a
Master ring	FlexBar	2D08	5.7187"	575102	22-Jan-13

I.D. = Inner diameter

O.D. = Outer diameter

*= Verify with master ring before use

Inspected by: _____

Date: MAR 21, 2014

BL

Revision March 31, 2014

Oklahoma Department of Transportation

EQUIPMENT VERIFICATION RECORD B113
Superpave Gyratory Compactor (SGC)
Reference AASHTO T312

Verification Frequency: 12 months on molds and plates

Previous Verification Date: MAR 21, 2014

Molds and plates Next Due Date: MAR, 21, 2015

Calibration Equipment Used: Caliper ID# 4396583
Three point internal bore gauge serial# 000859, 002099
Master ring 5.7187" (Class Z)

Calibration and Verification Precedure: See Equipment Verification Procedure B113

Location of verification: ODOT, Division 9, Asphalt Mix Laboratory
Owner: ODOT, Division 9, Asphalt Mix Laboratory

Note: Wear area is located at the top of these molds: #1943, #1953,

Mold 1943	Requirement	50 mm from top of mold						100 mm from top of mold						50 mm from bottom of mold						New mold
Position	0°, 90°, 180°	1A	Pass / Fail	1B	Pass / Fail	1C	Pass / Fail	2A	Pass / Fail	2B	Pass / Fail	2C	Pass / Fail	3A	Pass / Fail	3B	Pass / Fail	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.20mm	150.1089	Pass	150.1089	Pass	150.1013	Pass	150.1140	Pass	150.1318	Pass	150.1064	Pass	149.9946	Pass	149.9972	Pass	149.9845	Pass	No
Mold O.D.	n/a	165.6588	n/a	165.6588	n/a	165.6588	n/a	165.6512	n/a	165.6512	n/a	165.6512	n/a	165.6791	n/a	165.6791	n/a	165.6791	n/a	
Mold Thickness	7.5 mm minimum	15.5499	Pass	15.5499	Pass	15.5575	Pass	15.5372	Pass	15.5194	Pass	15.5448	Pass	15.6845	Pass	15.6819	Pass	15.6946	Pass	
End Plate	**Requirement**	**Measure A**	**Pass / Fail**	**Measure B**	**Pass / Fail**															
Top Plate O.D.	149.50 - 149.75 mm	149.5552	Pass	149.5425	Pass															
Bottom Plate O.D.	149.50 - 149.75 mm	149.5425	Pass	149.5298	Pass															

Mold 1953	Requirement	50 mm from top of mold						100 mm from top of mold						50 mm from bottom of mold						New mold
Position	0°, 90°, 180°	1A	Pass / Fail	1B	Pass / Fail	1C	Pass / Fail	2A	Pass / Fail	2B	Pass / Fail	2C	Pass / Fail	3A	Pass / Fail	3B	Pass / Fail	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.20 mm	149.9489	Pass	149.9464	Pass	149.9489	Pass	149.9040	Pass	149.9489	Pass	149.9464	Pass	149.9387	Pass	149.9413	Pass	149.9387	Pass	No
Mold O.D.	n/a	165.6588	n/a	165.6512	n/a	165.6791	n/a	165.6588	n/a	165.6513	n/a	165.6790	n/a	165.6588	n/a	165.6513	n/a	165.6790	n/a	
Mold Thickness	7.5 mm minimum	15.7099	Pass	15.7048	Pass	15.7302	Pass	15.7548	Pass	15.7024	Pass	15.7326	Pass	15.7201	Pass	15.7100	Pass	15.7403	Pass	
End Plate	**Requirement**	**Measure A**	**Pass / Fail**	**Measure B**	**Pass / Fail**															
Top Plate O.D.	149.50 - 149.75 mm	149.5806	Pass	149.5679	Pass															
Bottom Plate O.D.	149.50 - 149.75 mm	149.6060	Pass	149.5933	Pass															

Note: Wear area is located at the bottom of these molds: #238, #2060, #2075,

Mold 238	Requirement	50 mm from top of mold						100 mm from bottom of mold						50 mm from bottom of mold						New mold
Position	0°, 90°, 180°	1A	Pass / Fail	1B	Pass / Fail	1C	Pass / Fail	2A	Pass / Fail	2B	Pass / Fail	2C	Pass / Fail	3A	Pass / Fail	3B	Pass / Fail	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.20 mm	149.9692	Pass	149.9413	Pass	149.9667	Pass	149.9718	Pass	149.9692	Pass	149.9718	Pass	149.9743	Pass	149.9743	Pass	149.9740	Pass	No
Mold O.D.	n/a	165.1991	n/a	165.2499	n/a	165.2499	n/a	165.2499	n/a	165.1991	n/a	165.2499	n/a	165.1991	n/a	165.2498	n/a	165.2499	n/a	
Mold Thickness	7.5 mm minimum	15.2299	Pass	15.3086	Pass	15.2832	Pass	15.2781	Pass	15.2299	Pass	15.2781	Pass	15.2248	Pass	15.2755	Pass	15.2759	Pass	
End Plate	**Requirement**	**Measure A**	**Pass / Fail**	**Measure B**	**Pass / Fail**															
Bottom Plate O.D.	149.50 - 149.75 mm	149.7432	Pass	149.7279	Pass															

Mold 2060	Requirement	50 mm from top of mold						100 mm from bottom of mold						50 mm from bottom of mold						New mold
Position	0°, 90°, 180°	1A	Pass / Fail	1B	Pass / Fail	1C	Pass / Fail	2A	Pass / Fail	2B	Pass / Fail	2C	Pass / Fail	3A	Pass / Fail	3B	Pass / Fail	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.20 mm	149.9413	Pass	149.9438	Pass	149.9438	Pass	149.9362	Pass	149.9413	Pass	149.9337	Pass	149.9260	Pass	149.9260	Pass	149.9311	Pass	No
Mold O.D.	n/a	165.6309	n/a	165.6512	n/a	165.6512	n/a	165.6309	n/a	165.6512	n/a	165.6512	n/a	165.6309	n/a	165.6512	n/a	165.6512	n/a	
Mold Thickness	7.5 mm minimum	15.6896	Pass	15.7074	Pass	15.7074	Pass	15.6947	Pass	15.7099	Pass	15.7175	Pass	15.7049	Pass	15.7252	Pass	15.7201	Pass	
End Plate	**Requirement**	**Measure A**	**Pass / Fail**	**Measure B**	**Pass / Fail**															
Bottom Plate O.D.	149.50 - 149.75 mm	149.7457	Pass	149.7330	Pass															

Mold 2075	Requirement	50 mm from top of mold						100 mm from bottom of mold						50 mm from bottom of mold						New mold
Position	0°, 90°, 180°	1A	Pass / Fail	1B	Pass / Fail	1C	Pass / Fail	2A	Pass / Fail	2B	Pass / Fail	2C	Pass / Fail	3A	Pass / Fail	3B	Pass / Fail	3C	Pass / Fail	Yes or No
Mold I.D.	149.90 - 150.20 mm	150.0149	Pass	150.0200	Pass	150.0175	Pass	150.0200	Pass	150.0226	Pass	150.0149	Pass	149.9692	Pass	149.9667	Pass	149.9743	Pass	No
Mold O.D.	n/a	165.3896	n/a	165.5191	n/a	165.4200	n/a	165.3896	n/a	165.5191	n/a	165.4200	n/a	165.3896	n/a	165.5191	n/a	165.4200	n/a	
Mold Thickness	7.5 mm minimum	15.3747	Pass	15.4991	Pass	15.4025	Pass	15.3696	Pass	15.4965	Pass	15.4051	Pass	15.4204	Pass	15.5524	Pass	15.4457	Pass	
End Plate	**Requirement**	**Measure A**	**Pass / Fail**	**Measure B**	**Pass / Fail**															
Bottom Plate O.D.	149.50 - 149.75 mm	149.7457	Pass	149.7330	Pass															

Verification Equipment information

Item	Manufacturer	Model #	Range	Certificate#	Verification
Digital Caliper	Mitutoyo	CD-8"PS	8"	n/a	5-May-14
Three point internal bore gauge	Mitutoyo	HTD-6"R	6"	n/a	Master ring
Master ring	FlexBar	2D08	5.7187"	575102	22-Jan-13

Remark: Re-inspected all the end plates in accordance with AASHTO T312

Inspected by: _____

Date: MAY 9, 2014

AASHTO Accreditation Program (AAP)
Proficiency Sample Corrective Action Report

Name/Location of Laboratory:	Sample Material:
Oklahoma Department of Transportation /Materials Lab 200 N.E. 21st Street Oklahoma City, OK 73105	Soil Classification & Compaction
Laboratory PSP Number: 035	**Sample Numbers: 167/168**

Please use this form when investigating poor ratings on proficiency sample testing. Results which are beyond 2 standard deviations of the grand average are considered to be poor results (ratings of 0, 1, and 2). Investigate the root cause of the problem and describe the corrective action taken to resolve the problem in the areas provided. Please retain a copy of this document for your own records. You do not need to submit this form to the AMRL or CCRL for review, but if you would like feedback on your findings, it is permissible to request it.

Test Method: AASHTO T88 ASTM D422 **Rating:** 0.002 mm, 1,0; 0.001 mm, 1,1

Root Cause Analysis (A step-by-step method that leads to the discovery of the problem's first or root cause.)

We encountered the same problem in the previous round of proficiency sample testing, and it was found it was due to using the Iowa air-jet for dispersion. However, test results from all dispersion methods were combined in that round. The current round (167/168) did inquire about dispersion method, but did not distinguish between methods in the final statistics.

After obtaining statistics on air-dispersion (though they did not distinguish between Winterkorn cup and Iowa air-jet), we found that we were still out of range. When dispersed by mechanical stirring apparatus (malt mixer), results matched statistics very well.

Corrective Action (Action taken to eliminate the cause of a detected nonconformity.)

The Iowa air jet has been removed from use in routine hydrometer testing. It may be used when specifically requested, though it will be documented that results may not be comparable with T88/D422.

Sample ID: 9700041409121428 | Test Number: 1 | Sample Date: 09/12/2014

C97001

Oklahoma Department of Transportation
Central Lab Technician Evaluation

	(Evaluator Name)	(Cert. #)
Evaluator: dmccullo	McCullough, Donald	0004

Central Lab Technician: dstottle

(Technician Name)	(Cert. #)	(Lab ID)	(Lab Name)
Stottlemyre, Daniel R.	0037	95	Central Geotechnical Lab

	(Category Description)
Test Category: CSOI	Soil

Central Lab Test ID: 00155

(Test Description)	(AASHTO)	(ASTM)	(Other)
Coarse Particle Correction	T224		

Evaluation Type: ○ Verbal ● Performance

Mentor: ☐

Remarks1:
Remarks2:
Remarks3:

Evaluation Results: ● Satisfactory ○ Unsatisfactory

OKLAHOMA DEPARTMENT OF TRANSPORTATION

200 Northeast 21st Street

Oklahoma City, OK 73105-3204

July 25, 2011

METHOD FOR REVIEWING TECHNICIAN COMPETENCY

All technicians shall be reviewed for competency to perform the AASHTO, ASTM, and/or OHD test procedures for which he/she has been trained at least once every 12 months. Technician Competency may be reviewed by either test demonstration or oral evaluation. A technician who has not previously had a competency review for the test shall be reviewed by test demonstration only. If a technician does not routinely perform a test procedure, it may not be necessary to review the competency to perform that test, however the technician's competency shall be reviewed prior to performing the test.

1. For test demonstrations, the Technical Support Branch shall observe the technician demonstrating the procedure and document the results. For oral evaluation, the Technical Support Branch shall ask the technician a series of questions pertaining to the test and document the results. The oral evaluation shall be extensive. Current AMRL or CCRL worksheets should be used as a guide for questions, when available.

2. For each technician, the Technical Support Branch shall record the test reviewed, record the date (MM/DD/YY), record the results (S for satisfactory or U for unsatisfactory), note (CE for Competency Evaluation or CD for Competency Demonstration under comments and remarks, sign the entry, and record the due date for next review (MM/DD/YY) on the Technician Training and Competency Review Record.

3. If an unsatisfactory result is recorded for a specific test, the Technical support Branch shall review all observed deviations from the standard AASHTO or ASTM procedure with the technician. The technician shall review the test procedure and performance and notify the laboratory supervisor or senior technician that they are ready for re-evaluation. The Technical Support Branch shall observe the technician **demonstrate** the test procedure and record the results as indicated above.

4. The Quality System Manager shall maintain a file of the completed record forms. One copy of the form shall be given to the laboratory supervisor or senior technician monthly, if new entries are recorded. The training record files may be kept by the Engineering/Branch Manager at his option.

Oklahoma Department of Transportation

EQUIPMENT VERIFICATION RECORD C200

Various Equipment for Calibration / Verification
Reference AASHTO R18

The following equipment will be sent out annually for calibration or verification to a certified laboratory traceable to NIST standards. Confirm certification dates and next due dates

Description	Location	Certification or Verification Date	Manufacturer	Model	ID	Certification is Current (Y/N)	Certification or Verification Due Date
Digital Temperature Humidity Gauge	Cement room		Extech	445715	713	Yes	4/7/2015
Stop Watch	QA	3/23/2011	Thomas Scientific	Unknown	96102752	Yes	4/7/2015
Barnant Type K (Braided Lead)	Chem Lab	10/19/2007	Unknown	Unknown	Unknown	Yes	4/7/2015
Barnant Type K (Wire Lead)	Chem Lab	11/1/2006	Unknown	Unknown	Unknown	Yes	4/7/2015
Thermister	Liquid Lab	7/9/2013	Thermister	45525K	DSRCAL 6	Yes	7/9/2014
Thermister	Liquid Lab	7/9/2013	Thermister	45525K	DSRCAL 7	Yes	7/9/2014
PRT Probe	QA	7/10/2013	Fluke	5616	32981	Yes	7/10/2014
Thermometer Readout	QA	7/10/2013	Fluke	1521	A86053	Yes	7/10/2014
0-40 torr Vacuum Gauge	Asphalt Lab	7/23/2013	Busch	CR-2	AD-1 (0003015G)	Yes	7/23/2014
0-40 torr Vacuum Gauge	Asphalt Lab	7/23/2013	Busch	CR-2	AD-2 (0003040G)	Yes	7/23/2014
Master Pressure Gauge	QA	8/19/2013	Omega Eng.	Test Gauge	Q-8608	Yes	8/19/2014
Stop Watch	QA	8/21/2013	Fisher Scientific	Decimal 500	111733714	Yes	8/21/2014
Perma-Cal test gauge (325 nozzle)	Chem Lab	12/8/2013	PERMA-CAL	101FTM02B21	020613001-01-001	Yes	12/6/2014
Digital Multimeter	Liquid Lab	12/17/2013	Fluke	87	68330602	Yes	12/17/2014
Gage Blocks	QA	12/18/2013	Various	Various	06297	Yes	12/18/2014
Straight Edge	QA	12/18/2013	Unknown	Unknown	MATSE-1	Yes	12/18/2014

Donald McCullough 08 APR 2014