

VERIFICATION PROCEDURE : VP - 42

Equipment Verified: **GROOVING TOOL**

Standard References : **AASHTO T 89**

Purpose

This method provides instructions for the verification of critical dimensions of the Liquid Limit Grooving Tool.

Inspection Equipment Required

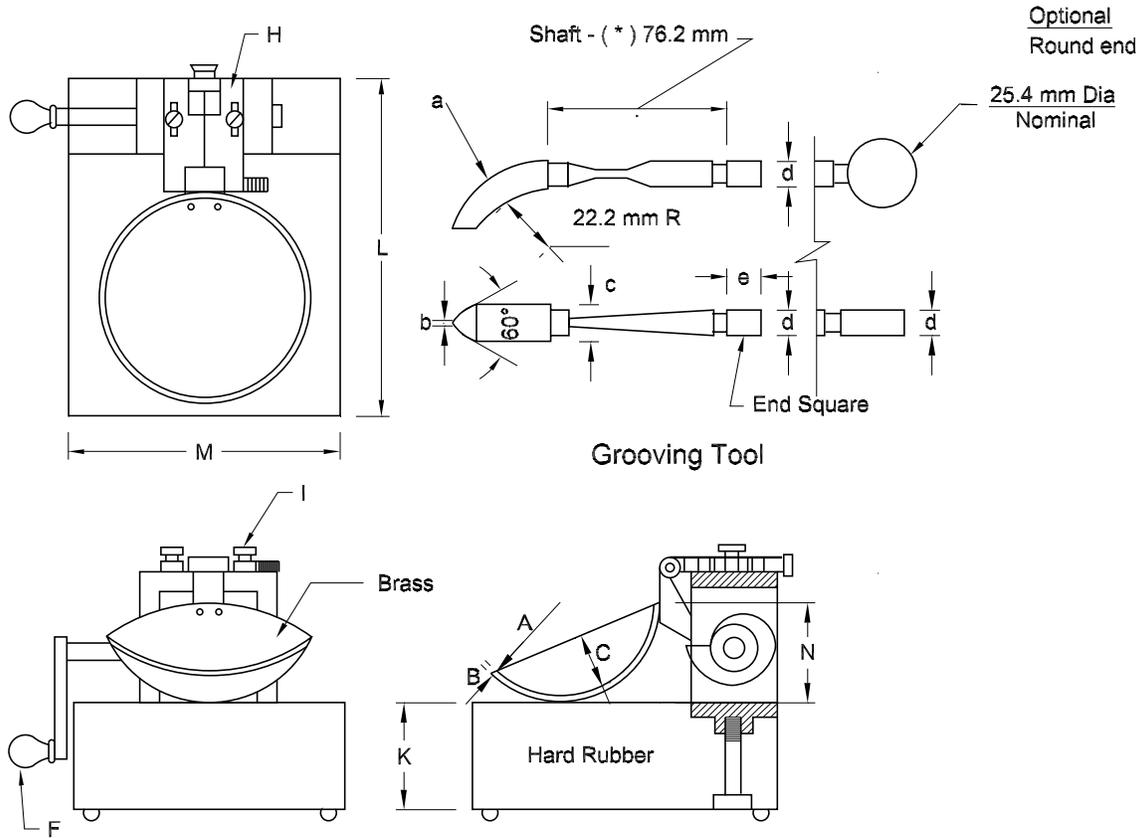
1. Caliper readable to 0.01 mm.
2. Worksheet VP-42 (attached)

Tolerance

Equipment shall meet the dimensional tolerances specified in the applicable test method as extracted and shown on the attached worksheet.

Procedure

1. Using the caliper, measure and record the critical dimensions as indicated on the worksheet. Record the dimensions as indicated.



Worksheet for VP-42

Equipment Verified: GROOVING TOOL

Standard References : AASHTO T 89

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC - 12 Months **Region -** Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

TABLE OF MEASUREMENTS

	GROOVING TOOL			
	CURVED END			GAGE
DIMENSION	a	b	c	d
DESCRIPTION	Thick.	Cut. Edge	Width	Depth
METRIC, mm	10.0	2.0	13.5	10.0
TOLERANCE, mm	0.1	0.1 *	0.1	0.2
** ENGLISH, inch	.394	.079	.531	.3937
TOLERANCE, inch	.004	.004	.004	.008

* An additional wear tolerance of +0.1 mm shall be allowed for deminsion "b" for used grooving tools

** English units are approximate conversions

The **Metric** units are the required dimensions

MEASURED	mm				
DIFFERENCE	mm				

Equipment Used to Verify:

1.) Caliper # _____

Equipment found to be: Satisfactory _____ satisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE :VP - 43**Equipment Verified: LIQUID LIMIT DEVICE****Standard References : AASHTO T 89, Fig 1, Section 4.1****Purpose**

This method provides instructions for checking critical dimensions and calibration of the liquid limit device used in the above test procedure.

Inspection Equipment Required

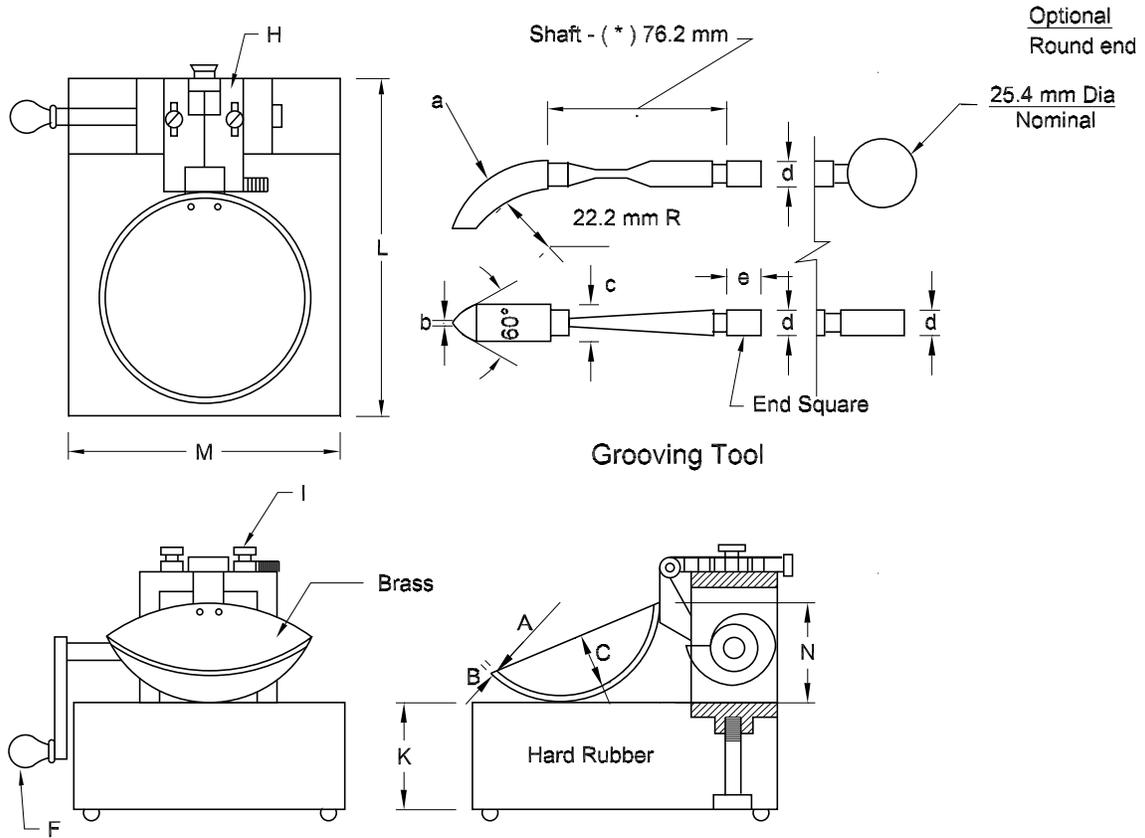
1. Calipers readable to 0.01 mm.
2. Height gauge 10 mm \pm 0.2 mm (Square end of the grooving tool may be used).
3. Worksheet VP-43 (attached)

Tolerance

Equipment shall meet the dimensional tolerances specified in the applicable test method as extracted and shown on the worksheet.

Procedure

1. Measure the dimensions described in AASHTO T 89 with caliper and record results on the work sheet.
2. Check for wobble on the rise of the cup as an indication of wear on the pin.
3. Check for wear as described in AASHTO T 89, section 4.1 and record observations on the worksheet.



Worksheet for VP-43

Equipment Verified: LIQUID LIMIT DEVICE

Standard References : AASHTO T 89, Fig 1, Section 4.1

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 12 Months **Region** Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

DIMENSION	CUP ASSEMBLY				BASE		
	A	B	C	N	K	L	M
DESCRIPTION	RADIUS OF CUP	THICK- NESS OF CUP	DEPTH OF CUP	CUP @ CAM FOLLOWER TO BASE	THICK- NESS	LENGTH	WIDTH

SPECIFICATIONS

METRIC,	mm	54	20	27	47	50	150	125
TOLERANCE,	mm	2	0.1	1	1.5	5	5	5
ENGLISH,	inch	2.13	.079	1.065	1.850	1.97	5.90	4.92
TOLERANCE,	inch	.04	.004	.04	0.4	.2	.2	.2

MEASURED	mm							
DIFFERENCE	mm							

Equipment Used To Verify:

1.) Caliper # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE :VP - 44

Equipment Verified: **5.5 lb MANUAL RAMMER T 99**
10.0 lb MANUAL RAMMER T 180

Standard References : **AASHTO T 99, T 180, WSDOT T 606**

Purpose

This procedure provides instructions for the verification of the weight and critical dimensions of the manual rammer.

Inspection Equipment Required

1. Balance, capacity 5 kg (10 lb), readable to 1 g (0.01 lb).
2. Tape measure, readable to 0.20 mm (1/16 inch).
3. Calipers, readable to 0.025 mm (0.001 inch).

Tolerance

Manual Rammers shall meet all applicable tolerance described in AASHTO T 99, ~~and~~ AASHTO T 180 and WSDOT T 606.

Procedure

1. Measure and record the diameter of the rammer face determined by taking two readings 90 degrees apart using the calipers.
2. Measure and record the drop height by pulling the handle out and measuring the distance from the bottom edge of the tube to the rammer face using the tape measure inserted inside the tube.
3. Record the weight of the rammer:
 - a. Remove the rammer handle knob;
 - b. Slide the rammer out of the tube;
 - c. Replace the knob and nuts into the rammer;
 - d. Weigh the rammer; and
 - e. Adjust the weight if necessary by removing the rammer head from the handle shaft and adding or removing shot.
4. Measure and record the diameter of the vent holes near the end of the rammer.

Worksheet for VP-44

Equipment Verified:

MANUAL RAMMER

Standard References:

AASHTO T 180

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months - Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Dimension	Required	Tolerance	Measurement	
Rammer Face Diameter	50.80 mm (2.000 in)	50.42 – 51.05 mm (1.985 - 2.010 in)		
Rammer Weight	4.536 kg (10.00 lb)	4.527 - 4.545 kg (9.98 - 10.02 lb)		
Drop Height	457 mm (18.00 in)	455 - 459 mm (17.94 - 18.06 in)		
Diameter of Vent Holes	≥ 9.5 mm (≥ 0.375 in)			
Vent Hole Location from End	~19 mm (~0.75 in)			
Is the rammer face flat?				

Equipment Used To Verify:

- 1.) Micrometer # _____
- 2.) 8000 gram scale # _____
- 3.) Ruler # _____
- 4.) Verified Straight Edge # _____
- 5.) Feeler Gauge # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-44

Equipment Verified: MANUAL RAMMER

Standard References: AASHTO T 99/WSDOT T 606

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 12 Months - Regions Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Dimension	Required	Tolerance	Measurement	
Rammer Face Diameter	50.80 mm (2.000 in)	50.55 – 51.05 mm (1.990 - 2.010 in)		
Rammer Weight	2.495 kg (5.50 lb)	2.486 - 2.504 kg (5.48 - 5.52 lb)		
Drop Height	305 mm (12.00 in)	303 - 307 mm (11.94 - 12.06 in)		
Diameter of Vent Holes	≥ 9.5 mm (≥ 0.375 in)			
Vent Hole Location from End	≈19 mm (≈0.75 in)			
Is the rammer face flat?				

Equipment Used To Verify:

- 1.) Micrometer # _____
- 2.) 8000 gram scale # _____
- 3.) Ruler # _____
- 4.) Verified Straight Edge # _____
- 5.) Feeler Gauge # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP - 45

Equipment Verified: MECHANICAL COMPACTOR

Standard References : AASHTO T 99, T 180, ASTM 2168

Purpose

This method provides instructions for checking critical dimensions of the mechanical compactor used in the above test procedures.

Inspection Equipment Required

1. Balance, capacity 5 kg (10 lb) readable to 1 g (0.01 lb)
2. Tape Measure, readable to 0.20 mm (1/16 inch).
3. Calipers, readable to 0.025 mm (0.001 inch).
4. Soil Sample for calibration

Tolerance

Mechanical compactors shall meet all applicable tolerances described in AASHTO T 99 and AASHTO T 180

Procedure

1. Measure the specified parameters indicated in the above test procedure for the mechanical compactor.
2. The mechanical compactor shall be calibrated by ASTM D 2168.
 - a) Inspect the mechanical compactor for wear and malfunction
 - b) Operate for a minimum of 25 drops, allowing the rammer to fall on the soil

- c) Obtain approximately 50 pounds of required material for calibration. Allow the sample to air dry, sieve and retain material passing the #4 sieve.
- d) Prepare two samples, one using the mechanical compactor and one using the manual rammer and determine the optimum moisture and maximum density for each sample.
- e) Determine the percent difference in the maximum density.
- f) If the two samples are within 2 percent, the mechanical compactor is within specifications. If not, prepare two additional samples using the soil prepared in step c, and repeat steps d and e. If the average of the three samples are within 2 percent, the mechanical compactor is within specification. If not adjust the rammer mass and repeat steps c through e. Repeat until the average difference in maximum density between the mechanical compactor and manual rammer is within 2 percent.

NOTE

If a larger than permitted change in rammer mass is necessary, improper operation of the mechanical compactor is indicated. inspect and adjust to discover the problem and eliminate the cause of the malfunction and repeat the calibration.

Do not make makeshift modifications that could affect the operation of the mechanical compactor. If results indicate that the mass needs to be reduced, carefully recheck all the equipment and the calibrations. If removal of mass is still indicated the drop height should be adjusted. Do not add more than 10 percent to the original mass. If more than 10 percent is required, the mechanical compactor should be rebuilt or repaired.

Do not use the mechanical compactor if the indicated mass change is still larger than allowed.

Worksheet for VP-45

Equipment Verified:

MECHANICAL COMPACTOR

Standard References:

AASHTO T 99, T 180 and ASTM D2168-90

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 12 Months - Regions - Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Dimension	Required	Tolerance	Measurement	
Rammer Face Diameter	50.80 mm (2.000 in)	50.55 - 51.05 mm (1.990 - 2.010 in)		
Drop Height	305 mm (12.00 in)	303 - 307 mm (11.94 - 12.06 in)		
Is the rammer face flat?				
Is the rammer weight not more than 10% greater than the original weight?	5.5 lbf	5.5 – 6.05 lbf		

CALIBRATION ACCORDING TO ASTM D-2168

Manual Rammer				Mechanical Compactor			
	c_1	c_2	D		c'_1	c'_2	D'
1.				1.			
2.				2.			
3.				3.			
4.				4.			
5.				5.			
			$D_{avg} =$ $v_1 =$				$D'_{avg} =$ $v_2 =$

Equipment Used To Verify:

- 1.) Micrometer # _____
- 2.) Lead Deformation Apparatus Assembly
- 3.) Feeler Gauge
- 4.) 8000 Gram Balance # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-46

Equipment Verified: STRAIGHTEDGE

Standard References: AASHTO T 99 and T 180 **Equipment ID:** _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 6 Months - Regions Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Dimension	Required.	Measured	
Length of straightedge	> 10 in (> 254 mm)		
Base plate standardizing straightedge	4 in maximum		
Plane of longitudinal edge	0.01 in 10 in 0.250 mm in 250 mm	Yes _____	No _____
One beveled edge?		Yes _____	No _____

Equipment Used To Verify:

- 1.) Straightedge, Verified # _____
- 2.) Feeler gage: 0.25 mm (0.01 inch) # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 47

Equipment Verified: **Pycnometers, Specific Gravity, Soils**

Standard References: **AASHTO T 100**

Purpose:

This procedure provides instructions for calibrating the pycnometers used for determining the specific gravity of soils in conformance with the above method.

Inspection Equipment Required

1. Balance, readable to 0.01 gram.
2. Verified thermometer, readable to 1C (2F).
3. Verification form, VP 47.

Tolerance

Water temperatures shall be determined to the nearest degree Celsius. Calibration computations shall be determined in conformance with AASHTO T 100, Table 1.

Procedure

1. Determine the mass of the pycnometer and the mass of the pycnometer filled with water at room temperature as described in Section 7.2 of the referenced test method.
2. For the individual pycnometers, prepare a calibration table, as outlined in Section 7.2 for each degree celsius, from 18C through 28C.

Worksheet for VP- 47

Equipment Verified: PYCNOMETERS (VOUMETRIC FLASK) FOR
SPECIFIC GRAVITY SOILS

Standard References: **AASHTO T 100**

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 3 Months - Regions Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

- a. Volumetric Flasks are 250 ml @ 20 C and 500 ml @ 20 C.
- b. Weigh and record the mass of each Volumetric Flask when dry and clean.
- c. Fill the Volumetric Flask to the fill line w/distilled water.
- d. Place in water bath and bring to 20 C temperature.
- e. Adjust to fill line of flask after equilibrium has been reached.
- f. Remove, Dry outside, weigh and record the mass.
- g. Repeat d thru f at each temperature from 18 C to 30 C and record.

Flask No.	1	2	3	4	5	6	7	8	9	10	11
f. @ 18C											
f. @ 19C											
f. @ 20C											
f. @ 21C											
f. @ 22C											
f. @ 23C											
f. @ 24C											
f. @ 25C											
f. @ 26C											
f. @ 27C											
f. @ 28C											
f. @ 29C											
f. @ 30C											

Equipment Used To Verify:

Balance, readable to 0.01 gram. ID #: _____

Verified thermometer, readable to 1C (2F). ID #. _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 48**Equipment Verified: EXPANSION PRESSURE DEVICE****Standard References: AASHTO T 190, W 611****Purpose:**

This method provides for instructions for direct calibration of the expansion pressure devices used in this test procedure.

Inspection Equipment Required

1. Expansion Pressure Device
2. Lever-type calibration device

Tolerance

Measured readings should be within ± 0.0001 inches.

Procedure

1. Lower the turntable all the way down and place the calibration base symmetrically on the turntable with the planes of the two frames as nearly at right angles to each other as possible.
2. Hold the base of the calibration device with one hand and with the other hand slowly rotate the turntable up until the top of the ball bearing touches the spring steel bar of the expansion pressure device while the lever of the calibration device is horizontal.
3. Hang the weight assembly on the lever at the first notch nearest to the bearing) and note the reading of the dial indicator.
4. If the readings are not within tolerance, make fine adjustments by turning the screw.

5. If the readings are not linear, adjust the position of the shims. To adjust the position of the shims, loosen the two large nuts on top of the beam. Move the shim as required.
 - a) If the readings are higher, move the shims toward the center.
 - b) If the readings are lower, move the shims toward the tie rod away from the center.
6. Reposition the top of the beam and tighten the nuts.
7. Shim adjustment and zero adjustment of the dial indicator may have to be repeated a few times to obtain the calibration readings within ± 0.0001 inches.

Worksheet for VP-48

Equipment Verified:

Expansion Pressure Device

Standard References:

AASHTO T-190 and Washington Test Method 611

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Dimension	Tolerance (in)	Measure
Notch 1	0.0020 - 0.0022	
Notch 2	0.0041 - 0.0043	
Notch 3	0.0062 - 0.0064	
Notch 4	0.0083 - 0.0085	

Equipment Used To Verify:

1.) Lever-Type Calibration Device # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 49

Equipment Verified : METAL FOLLOWER AND STANDARD SPECIMEN

Standard References: AASHTO T 190

Purpose:

This method provides for instructions on checking the dimensions on the Metal Follower and Standard Metal Specimen used in this test procedure.

Inspection Equipment Required

Caliper, readable to 0.025 mm (0.001 inch)

Tolerance

Dimensions for all required accessories shall meet all specifications described in AASHTO T 190.

Procedure

1. Measure and record the outside diameter of the bottom of the follower to the nearest 0.025 mm (0.001 inch). Rotate the follower 90 degrees, measure and record the outside diameter.
2. Turn the follower over and repeat Step 1.
3. Measure and record the height of the follower to the nearest 1 mm (1/16 inch). Rotate the follower 90 degrees, measure and record the height.
4. Repeat Steps 1 through 3 for the Standard Specimen.

Worksheet for VP-49

Equipment Verified:

Metal Follower and Standard Metal Specimen

Standard References:

AASHTO T-190

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 12 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Item	Dimension	Tolerance	Measurements			
Follower	Outside Diam.	100.33 ± 0.13 mm (3.95 ± 0.005 in)				
	Height	127 mm (5 in)				
Specimen	Outside Diam.	101.60 mm (4 in)				
	Height	152.20 mm (6 in)				

Equipment Used To Verify:

1.) Caliper # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 50

Equipment Verified: **TAMPING HAMMER**

Standard References: **W 606**

Purpose:

This procedure provides instructions for the verification of the weight and critical dimensions of the manual rammer.

Inspection Equipment Required

1. Balance, capacity 5 kg (10 lb), readable to 1 g (0.01 lb).
2. Tape measure, readable to 0.20 mm (1/16 inch).
3. Calipers, readable to 0.025 mm (0.001 inch).

Tolerance

Tamping Hammer shall meet all applicable tolerance described in AASHTO T 99

Procedure

1. Measure and record the diameter of the rammer face determined by taking two readings 90 degrees apart using the calipers.
2. Measure and record the drop height by pulling the handle out and measuring the distance from the bottom edge of the tube to the rammer face using the tape measure inserted inside the tube.
3. Record the weight of the rammer:
 - a. Remove the rammer handle knob;
 - b. Slide the rammer out of the tube;
 - c. Replace the knob and nuts into the rammer;
 - d. Weigh the rammer; and
 - e. Adjust the weight if necessary by removing the rammer head from the handle shaft and adding or removing shot.
4. Measure and record the diameter of the vent holes near the end of the rammer.

Worksheet for VP-50

Equipment Verified:

TAMPING HAMMER

Standard References:

WSDOT T 606

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months - Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Dimension	Required	Tolerance	Measurement	
Rammer Face Diameter	50.80 mm (2.000 in)	50.42 - 50.93 mm (1.985 - 2.005 in)		
Rammer Weight	2.495 kg (5.50 lb)	2.486 - 2.504 kg (5.48 - 5.52 lb)		
Drop Height	305 mm (12.00 in)	303 - 307 mm (11.94 - 12.06 in)		
Diameter of Vent Holes	≥ 9.5 mm (≥ 0.375 in)			
Vent Hole Location from End	~19 mm (~0.75 in)			
Is the rammer face flat?				

Equipment Used To Verify:

- 1.) Micrometer # _____
- 2.) 8000 gram scale # _____
- 3.) Ruler # _____
- 4.) Verified Straight Edge # _____
- 5.) Feeler Gauge # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 51

Equipment Verified: **SAMPLE PREPARATION & CURING CONDITIONS**
(Moist Room, Moist Cabinet & Water Storage Tank)

Standard References: **AASHTO M 201, T 106, T 22**

Purpose:

This procedure provides instructions on verifying compliance of the moist room, moist cabinet and water curing tanks to ensure conformance with the referenced standards.

Inspection Equipment Required

1. Verified thermometer, readable to 1C (0.5F), having a range of 20 to 27.5 C (68 to 81.5F)
2. Verified Humidity Sensing device

Tolerance

1. Temperature in moist cabinets and rooms shall be $23 \pm 1.7C$ ($73.4 \pm 3F$).
2. Humidity in moist cabinets and rooms shall be not less than 95 percent.
3. Water temperature of water storage (curing) tanks shall be $23 \pm 2C$ (69.8-77)

Procedure

1. Record the reading(s) indicated on the recording thermometer(s) for the moist room, moist cabinet and water curing tanks.
2. Place the certified thermometer as close to the recording sensor as possible, keep the door to the moist room or cabinet closed for a minimum of 5 minutes before taking a reading. If a discrepancy more than 1.0C exists, adjust the recording thermometer to within 0.5C.
3. If the water storage tank is not in a temperature-controlled room, it must have a temperature-recording device. That device will be verified by placing the certified thermometer as close to the recording sensor as possible. If a discrepancy more than 1.0C exists, adjust the recording thermometer to within 0.5C.

4. Measure and record the humidity in the moist room and moist cabinet.
5. Observe that there is free-lime present in the bottom of the sample curing tanks. Stir the water in the tank if the saturated water is less than 24 months old, otherwise clean and refill the tank with water containing 3 g/L of calcium hydroxide.
6. If actual temperature is not $23 \pm 2\text{C}$ (69.8-77F) or the humidity is less than 95 percent, make adjustments as necessary.

Worksheet for VP-51

Equipment Verified: Moist Cabinets, Moist Rooms & Water Storage Tanks

Standard References: AASHTO M 201, T 106, T 22

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification:

6 months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

1. Recording Thermometer Readings:

Moist Cabinet _____
Moist Room _____
Water Storage Tank _____

2. Certified Thermometer Readings:

Moist Cabinet _____
Moist Room _____
Water Storage Tank _____

Adjustments to the recording thermometer warranted? _____

3. Humidity Readings:

Moist Cabinet _____
Moist Room _____

Adjustments to the humidifier warranted? _____

4. Free lime present in water storage tank? _____

Age of solution? _____

Stirred or cleaned and refilled? _____

Equipment Used To Verify:

1.) Thermometer # _____

2.) Humidity Sensing Instrument # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 52**Equipment Verified: STANDARD SAND****Standard References: ASTM C778****Purpose:**

This procedure provides instructions for checking a shipment of Standard Sand using the procedure outlined in ASTM C778

INSPECTION EQUIPMENT REQUIRED:

1. Sieves, 8" U.S. No. 16, U.S. No.20, U.S. No.30, U.S. No.40, U.S. No.50,& U.S. No.100
2. Sample Splitter meeting the requirements of ASTM C778.
3. Shaking equipment meeting ASTM C126
4. Standard testing equipment for performing AASHTO T106
5. Standard testing equipment for performing AASHTO T137

TOLERANCE:

1. See ASTM C778, Table 1 for specifications

PROCEDURE:

1. Sample per ASTM C778, Table 2
2. Reduce the sample as per ASTM C778, Section 6
3. Perform a sieve analysis as per ASTM C778, Section 7
4. If Contamination is suspected, perform a test for Air-Entraining Potential as per ASTM C778, Section 8
5. If the sand fails to meet one or more of the specifications, resample as per ASTM C778, Section 9.

Worksheet for VP-52

Equipment Verified:

STANDARD SAND

Standard References:

ASTM C 778

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC Each Shipment

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

1. Gradation:

Initial Weight Sieve Size	Grams Retained	Percent Retained	Percent Passing	Specifications	
				20-30 Sand	Graded Sand
U.S. No. 16				100	100
U.S. No. 20				85-100	
U.S. No. 30				0-5	96-100
U.S. No. 40					65-75
U.S. No. 50					20-30
U.S. No. 100					0-4
Pan					

2. Air Entraining Potential (Only if Contamination is suspected)

a. 20-30 Sand; (AASHTO T137)

Air Content of Washed Batch W1:		_____
Air Content of Washed Batch W2:		_____
Average Washed		_____
Air Content of As Received Batch U1:		_____
Air Content of As Received Batch U2:		_____
Averaged As Received		_____
Difference		_____
Specification		2.0% Maximum

b. Graded Sand; (AASHTO T106 & T85)



	Mass in Water	Mass SSD	Mass Dry	Specific Gravity SSD
W1				
W2				
W3				
Average				
U1				
U2				
U3				
Average				

Apparent air content of Washed Sample: _____
 Apparent air content of As Received Sample: _____
 Difference: _____
 Specification 1.5% Maximum

Equipment Uded To Verify:

- 1.) Shaker # _____
- 2.) Balance # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-53**Equipment Verified: BEARING BLOCKS****Standard References: AASHTO T 22 and AASHTO T 106****Purpose:**

This procedure provides instructions for checking the diameter, planeness, and the spherical seating of the bearing blocks for determining the compressive strength of concrete cylinders or mortar grout cubes

Inspection Equipment Required

1. Calipers capable of reading to 0.001 in
2. Verified Straightedge
3. Feeler gauges : 0.013 mm (0.0005 in) for new blocks
0.025mm (0.001 in) for blocks in-service

Tolerance

See worksheets for tolerances

Procedure

1. Measure the diameter of the upper and lower blocks.
2. Check bearing surface by attempting to insert a thickness gauge between the straightedge and the block surface .
3. Rotate the straight edge, 90 degrees in the plane of the surface and repeat the check.
4. Check that the upper block seat is spherical and moves freely.
5. Record as acceptable blocks which meet the,planeness, diameter, and spherical criteria above. Remove from service and remachine or replace blocks that exceed the allowable values.

Worksheet for VP- 53

Equipment Verified: Bearing Blocks for Concrete Cylinders

Standard References: AASHTO T-22

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC – 12 Months **Regions -** Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Bottom Bearing Block:

Plain within 0.001 inch in any 6 inches of block _____

Thickness - minimum 1 inch, see T-22 for exceptions _____

Horizontal dimension 3% greater than diameter of specimens _____

Provision for centering specimens on lower block if used _____

Top Spherically Seated Block:

Plain within 0.001 inch in any 6 inches of block _____

Size of spherical face _____

Max. 6.5 inch dia. for 4 inch cylinders

Max. 10 inch dia. for 6 inch cylinders

Concentric Rings - required if block is 0.5 inch larger than cylinder _____

Horizontal dimension 3% greater than diameter of specimens _____

Spherical block held close in the spherical seat _____

Free to move 4° minimum in any direction _____

Ball and socket cleaned and lubricated periodically _____

Lubricant a petroleum type oil - not a pressure grease _____

Diameter of: bearing face _____ Radius of: bearing face _____
sphere _____ sphere _____

Radius of bearing face equal to or greater than the radius of sphere _____

Diameter of the sphere at least 75% of diameter of specimen _____

If radius of sphere is less than radius of largest specimen tested: _____

Is thickness of face at edge as great as difference in radii _____

Center of sphere at center of bearing face _____

Is spherical portion & socket free form deformation

Equipment Used To Verify:

1.) Caliper: # _____ 2.) Ruler: # _____

3.) Straightedge: # _____ 4.) Feeler Gauge: # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP- 53a

Equipment Verified: **Bearing Blocks for Grout Cube**

Standard References: **AASHTO T-106**

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC – 12 Months

Regions - Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

General Requirements for Upper and Lower Blocks

In-service bearing blocks plane within 0.001 inch. (NEW blocks plane within 0.0005 inch) _____
Rockwell hardness not less than 60 HRC. _____

Specific Requirements for Lower Bearing Block:

Bearing face diameter between 71.6mm (2.82 in.) and 73.7mm (2.9 in.). _____
(Slightly greater than the diagonal of the face of the specimen to facilitate accurate centering.) _____

Specific Requirements for Top Spherically Seated Bearing Block:

Spherically seated face properly lubricated and free to move in any direction. _____
Bearing face diameter between 71.6mm (2.82 in.) and 79.5mm (3.13 in.). _____

Equipment Used To Verify:

1.) Caliper:	# _____	2.) Ruler:	# _____
3.) Straightedge:	# _____	4.) Feeler Gauge:	# _____

Equipment found to be: **Satisfactory** _____ **Unsatisfactory** _____

Action Taken: **Replaced** _____ **None** _____ **Other** _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-54**Equipment Verified: BOND EXTENSION EQUIPMENT****Standard References: W 412****Purpose**

This procedure provides instructions for verifying the extension rate and temperature of the equipment used to perform the joint sealer bond test.

Inspection Equipment Required

1. Ruler, readable to 1 mm.
2. Timer, readable to 0.1 second
3. Thermometer, calibrated and readable to $17.8C \pm 1.1C$ ($0F \pm 2F$)
4. Caliper, readable to 0.025 mm (0.01 in)
5. Brass Thermometer well
6. Rate Verification Form, VP-54.

Tolerance

The equipment shall meet the tolerances specified in the test method listed above:

1. The specimen shall be extended 12.7 mm (0.50 in) at the rate of 3.2 mm (1/8 in) per hour.
2. Temperature of the environmental conditioning chest shall be $18 \pm 2C$, ($0F \pm 5F$)

Procedure

(Extension Device Verification)

1. Bring the test specimen holding devices together for a starting point.
2. Trial run extension equipment to verify that it will extend past 12.7 mm (0.50 in)
3. Reset extension device to closed position. Start extension device and timer.
4. Run extension device for three hours. During this period record the extension readings at one, two and three hours.
5. Reset extension device to closed position. Run it for three hours. During this period record the compression readings at one, two and three hours.
6. Record data on verification form VP-54.

(Chamber Temperature verification)

1. Operate environmental chamber until temperature is stable (within 2C when temperature is checked at 18 C at 1/2 hour intervals. Temperature will be determined with thermometer and brass well inside the chamber.
2. Adjust temperature control until designated test temperature is achieved. Record control setting
3. Continue to operate and observe at 1/2 hour intervals for 3 hours to confirm that stable temperature is maintained
4. Record data on verification form VP-54.

Worksheet for VP-54

Equipment Verified: **BOND EXTENSION EQUIPMENT**

Standard References: **W 412**

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: **OCS - 12 Months**

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Initial Testing

Temperature: Temperature of test cabinet _____ -18 ± 2C
Rate:

	Distance	Distance Diff	Time	Time Diff	Rate	Temp
Start	_____		_____			
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
Average		_____			_____	

Retest in Reverse

Temperature: _____ Temperature of test cabinet _____ -18 ± 2C
 Rate: _____

	Distance	Distance Diff	Time	Time Diff	Rate	Temp
Start	_____		_____			
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	_____	_____
Average		_____			_____	

Equipment Used To Verify:

- 1.) Ruler, readable to 1 mm. # _____
2. Timer, readable to 0.1 second # _____
3. Thermometer, # _____
4. Caliper, # _____
5. Brass Thermometer well # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 55**Equipment Verified: LENGTH COMPARATOR****Standard References: AASHTO T 107****Purpose:**

This procedure provides instructions for checking the critical dimensions of the length comparator to meet the requirements of the referenced standard

INSPECTION EQUIPMENT REQUIRED:

1. Calipers capable of measuring 300 mm (12 in) and readable to 0.025 mm (0.001 in).
2. CCRL standard bar to check dial micrometer.

TOLERANCE:

1. The reference bar shall be 11 5/8 in. + 1/16 in.
2. The dial micrometer shall read in 0.0001 inch units, accurate within 0.0001 inch in any 0.0010 inch segment.

PROCEDURE:

1. Measure and record the length of the reference bar with the caliper.
2. Place the reference bar in the comparator. Read and record the length on the dial micrometer
3. Measure and record the length of CCRL standard bar with the caliper.
4. Place the CCRL standard bar in the length comparator and read and record the Dial indicator reading.
5. Compare results of the two bars

VERIFICATION PROCEDURE : VP- 56**Equipment Verified:** AUTOCLAVE**Standard References:** AASHTO T 107**Purpose:**

This method provides instruction for checking the temperature, pressure, and rate of pressure increase and decrease.

INSPECTION EQUIPMENT REQUIRED:

1. Verified thermometer with a working range of 20 to 216C (68 to 420F) readable to 1C (0.05F)
2. Timer
3. Calibrated Pressure Gauge.

TOLERANCE:

The autoclave shall meet the requirements of AASHTO T 107 section 4.5 and 6.0

PROCEDURE:

1. Prepare to operate the autoclave per section 10.1 of AASHTO T 107 with calibrated thermometer and calibrated pressure gauge
2. Measure and record the time and pressure when the heat is turned on and again when the pressure reaches 295 psi.
3. Maintain 295 psi + 10 psi for 3 hours.
4. Measure and record the time and pressure when the heat is turned off until 10 psi is reached
5. Check temperature and pressure against calibrated equipment.

VERIFICATION PROCEDURE : VP- 57

Equipment Verified: AUTOCLAVE BAR MOLDS

Standard References: AASHTO M 210

Purpose:

This procedure provides instructions for checking the critical dimensions of Autoclave Bar Molds used in AASHTO T 107.

INSPECTION EQUIPMENT REQUIRED: .

Calipers, readable to 0.025 mm (0.001 in) and capable of measuring the critical dimensions called out in AASHTO M 210.

TOLERANCE: .

The height, width and length dimensions as well as the gauge and dimensional tolerances shall be as specified in AASHTO M 210

PROCEDURE:

1. Measure and record the A (lateral: width & breadth) dimension.
2. Measure and record the length dimension
3. Measure and record the stainless steel gage stud dimension.

VERIFICATION PROCEDURE: VP- 58**Equipment Verified: GYRATORY COMPACTOR****Standard References: AASHTO T 312, AASHTO TP 71****Purpose**

This procedure identifies the equipment needed to calibrate the Superpave Gyratory Compactor (SGC) in accordance with the manufacturer's calibration manual. Calibration needs to be performed every 6 months in the E&EP Materials Laboratory and yearly in the region and field laboratories. A calibration must be performed any time the SGC or testing facility is moved.

Inspection Equipment Required

All measuring equipment, devices, or spacers used to calibrate the SGC must be verified on an annual basis.

1. Hydraulic oil filter kit; Pine Instruments Part No AFGBA10 (Pine SGC AFGB1A Only).
2. Verified Load Cell.
3. Verified Standard Height Block.
4. Verified Timer, readable to 0.1 seconds.
5. Verified straight edge.
6. Verified feeler Gauge, 0.001 inch (0.025 mm).
7. Verified Dynamic Internal Angle Measuring Device w/HMS (Hot Mix Simulator) with manual.
8. Manufacturer's Calibration Manual for SGC.

Tolerance

Measurements determined shall conform to the requirements defined in AASHTO T 312 and AASHTO TP 71.

Procedure

1. Verify and calibrate the ram pressure using the verified load cell and the manufacturer's calibration procedure. Prior to initially verifying the ram pressure, the hydraulic system shall be serviced by filtering the entire volume of the fluid reservoir according to the manufacturer's procedure (Pine AFG1A only; Manual Sec 5.3, Pg V-8). The verification and calibration process shall be repeated until measurements are obtained that are within the allowable tolerance of 600 KPa \pm 18 KPa per the manufacturer's instructions. Record the calibrated and measured load cell pressure on the work sheet.
2. Verify and calibrate the height LVDT using the standard height block and the manufacturer's calibration procedure. This process shall be repeated until the measured results are within the allowable tolerances.
3. Using a verified timer, count the number of rotations in one minute. Repeat this process two times. Average the results and compare them to the allowable tolerance of 30.0 gyrations/min. \pm 0.5 gyrations/min. Make necessary calibration adjustments per manufacturer's instructions. This process shall be repeated until the measured results are within the allowable tolerances.
4. Using a verified straight edge and feeler gauge, ensure that the ram head is flat by taking two observations at right angles to each other by attempting to insert the feeler gauge between the ram head and the straight edge. Record the results on the work sheet.
5. Using a verified caliper, measure the diameter of the ram head in two locations at right angles to each other (Troxler Model 4140 and Pine AFGC125X only). Record the measurements on the work sheet. Average the two readings and compare it to the allowable tolerances.
6. Verify Dwell Setting:
Troxler – dwell set at 0
Interlaken – dwell set at 0
Pine (AFGC125X) – dwell set at 0
Portable Pine (AFGB1A) – dwell set at 2
Pine (AFG1A) – dwell set at 0

7. Measure the internal angle of gyration per the Dynamic Internal Angle Measuring Device w/HMS procedure. If necessary, make adjustments according to the compactor manufacturer instructions and measure the angle again. This process shall be repeated until two consecutive measurements are obtained that are within the allowable tolerance of $1.16^{\circ} \pm 0.02^{\circ}$. A printout of the internal angle calibration should be attached to the SGC worksheet. The post calibration external angle of compaction may be recorded and monitored for informational purposes only.

8. If available through any particular brand and model of SGC, obtain a printout of the calibration from the SGC internal computer and attach it to the worksheet.

Worksheet for VP-58

Equipment Verified: **Gyratory Compactor**

Standard References: **AASHTO T 312**

Equipment ID: _____ **Equipment Type:** _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 6 Months, Regions Yearly, or After Each Move

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Dimension	Required.	Tolerance	Measurements
Frequency	30.0 rev./min.	30.0 ± 0.5/1 min.	
Internal Angle	1.16 degrees	1.16 ± 0.02 degrees	
Height	Manufacturer's measured height	± 0.05 mm	
Ram Pressure	600 kPa	600 ± 18 kPa	

RAM HEAD PLATE

Dimension	Required	Tolerance	Measurements	Average
Outside Dia.	149.50-149.75mm	149.50-149.75mm		
Surface	Flat	Flat		

Dwell Setting _____

Equipment Used To Verify:

- 1.) Straight Edge # _____ 2.) Caliper # _____ 3.) DAV w/HMS # _____
 4.) Feeler Gauge # _____ 5.) Load Cell # _____ 6.) Timer # _____
 7.) Standard Height Block # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 59

Equipment Verified : **GYRATORY COMPACTOR STANDARD BLOCK**

Standard References : **AASHTO T 312**

Purpose :

This procedure identifies the equipment needed to calibrate the gyratory compactor in accordance with the manufacturer's manual.

Inspection Equipment Required

1. Caliper, readable to 0.01 mm .

Tolerance

Measurements shall conform to the requirements defined in AASHTO T 312.

Procedure

1. Measure and record the block height at 90° intervals around its perimeter.
2. Average the 4 measurements
3. Determine if they are within the required tolerance.

Worksheet for VP-59

Equipment Verified: **Gyratory Compactor Standard Block**

Standard References: **AASHTO T312**

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: **OSC - 6 Months** **Regions - Yearly**

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Dimension	A Required	Tolerance	B 1 st	C 2 nd	D 3 rd	E 4 th	F Average	Differenc e A-F
Height		Note 1						

Note 1: Measurements determined shall conform to the requirements defined in AASHTO T 312.

Equipment Used To Verify:

1.) Caliper # _____

Equipment found to be: **Satisfactory**_____ **Unsatisfactory**_____

Action Taken: **Replaced**_____ **None**_____ **Other**_____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 60**Equipment Verified : PRESSURE AGING VESSEL****Standard References : AASHTO R 28****Purpose :**

This procedure identifies the equipment and provides instruction for the calibration of the Pressure Aging Vessel (PAV).

Inspection Equipment Required

1. Verified Resistance Thermal Detector (RTD)
2. Verified Pressure Gauge
3. Verified Level
4. Verified Timer readable to 0.1 seconds.

Tolerance

The tolerances should be as stated in AASHTO R 28.

Procedure

1. Place the TFO pan holder filled with a dummy sample into the oven. Using a verified level, determine that the TFO pans and holder are level.
2. Assemble the PAV per the referenced procedure.
3. Remove the 1/4 inch plug on top of the PAV cover.
4. Thread a calibrated RTD into the 1/4 inch hole and run the wire under the cover to the oven.
5. Perform the following verifications while the test is running:
 - (A) Using a verified timer, measure the time it takes to bring the PAV to the desired temperature. Record this time on the work sheet.

- (B) Beginning at one hour elapsed time after the start of the test, take three measurements with the RTD at hourly intervals. Record the temperatures at each hour on the work sheet. Average the measurement and determine if the average is within the allowable tolerance.
 - (C) Using a verified timer measure the amount of time that the test is running. Record this measurement on the work sheet.
 - (D) Using a verified timer, measure the amount of time it takes for the PAV to depressurize. Record this measurement on the work sheet.
6. Remove the RTD and place the calibrated pressure gage into the 1/4 inch hole.
7. Perform the following verifications while the test is running:
- (A) Using a verified timer, measure the time it takes to bring the PAV to the desired temperature. Record this time on the work sheet.
 - (B) Beginning at one hour elapsed time after the start of the test, take three measurements with the verified pressure gauge at hourly intervals. Record the pressures at each hour on the work sheet. Average the measurement and determine if the average is within the allowable tolerance.
 - (C) Using a verified timer measure the amount of time that the test is running. Record this measurement on the work sheet.
 - (D) Using a verified timer, measure the amount of time it takes for the PAV to depressurize. Record this measurement on the work sheet.
8. Average the measurements obtained in steps 5 and 7. Determine if the averages are within the allowable tolerances.

Worksheet for VP-60 (EXTERNAL)

Equipment Verified:

PRESSURE AGING VESSEL

Standard References:

AASHTO R 28

Equipment ID# _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 6 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

	1 st	2 nd	3 rd	Average	Tolerance	Acceptable Y/N
Time to initial pressure			XX		Within 2 Hours	
Operating temperature					± 0.5 C of set temperature	
Total Test Time			XX		20 Hours ± 10 minutes	
Depressurizing Time			XX		9 ± 1 minute	
Pressure reading					2.1 ± 0.1 MPa (304.5 ± 14.5 PSI)	

TFO Pans Level: Y _____ N _____

Holder Level: Y _____ N _____

Timer used: _____

Date Calibrated: _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 61**Equipment Verified :** THIN FILM OVEN PANS**Standard References :** AASHTO T 179**Purpose :**

This method provides instruction for the verification of the thin film oven pans used in the Pressure Aging Vessel.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm
2. Ruler, readable to 1 mm.
3. Verified Straight edge.
4. Feeler gauge, 0.01 mm.
5. Worksheet for VP-61

Tolerance

The tolerances should be as stated in AASHTO T 179.

Procedure

1. Measure the inside diameter of the TFO pans in two places at right angles to each other. Record the measurement on the work sheet.
2. Average the two measurements and compare to the allowable tolerance.
3. Take 4 random measurements of the inside height of the TFO pans. Record the measurement on the work sheet.
4. Average the four measurements and compare the average to the allowable tolerance.
5. Using the verified straight edge and feeler gauge verify that the bottoms of the pans are flat by applying the straight edge in two locations and determining that the feeler gauge cannot be inserted between the straight edges and the pans.

Worksheet for VP-61

Equipment Verified:

THIN FILM OVEN PANS

Standard References:

AASHTO T-179

Equipment ID# _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 12 Months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

INSIDE DIAMETER					INSIDE HEIGHT		THICKNESS		RELATIVELY FLAT	ACCEPT
PAN #	1ST	2ND	AVG	SPEC	mm	SPEC	mm	SPEC	Y/N	Y/N
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		



INSIDE DIAMETER					INSIDE HEIGHT		THICKNESS		RELATIVELY FLAT	ACCEPT
PAN #	1ST	2ND	AVG	SPEC	mm	SPEC	mm	SPEC	Y/N	Y/N
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		
				140 mm ± 0.5		9.5 mm min.		0.381 min.		

Equipment Used To Verify:

Straight edge used: _____

Date Calibrated: _____

Feeler gauge used: _____

Date Calibrated: _____

Micrometers used: _____

Date Calibrated: _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 62

Equipment Verified : BENDING BEAM RHEOMETER:
STANDARD WEIGHTS

Standard References : AASHTO T313

Purpose :

This procedure provides instructions for the verification of the standard weights that are used in the verification of the Bending Beam Rheometer.

Inspection Equipment Required

1. Verified Balance, readable to 0.1 grams.
2. Worksheet for VP-62.

Tolerance

Measurement determined as the mean of three individual readings shall conform to the requirements defined in AASHTO T 313.

Procedure

1. Measure and record three readings for each weight as identified on the work sheet for the standard weight set.
2. Determine if the mean of the weights are within the allowable tolerance.

Worksheet for VP-62

Equipment Verified:

BENDING BEAM RHEOMETER-WEIGHTS

Standard References:

AASHTO T 313

Equipment ID# _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Weight	1 st	2 nd	3 rd	Mean	Specification	Acceptable Y/N
					100 ± 0.2 g	
					100 ± 0.2 g	
					100 ± 0.2 g	
					100 ± 0.2 g	

Equipment Used To Verify:

1.) Balance # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 63

Equipment Verified : **BENDING BEAM RHEOMETER ACCESSORIES:
SAMPLE MOLDS
STAINLESS STEEL PERFORMANCE TEST BEAM
STAINLESS STEEL COMPLIANCE TEST BEAM**

Standard References : **AASHTO T 313**

Purpose :

This procedure provides instruction for verification of the dimensions for the sample molds, and the performance and compliance testing beams for the Bending Beam Rheometer test.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm.
2. Verified straight edge
3. Thickness (feeler) gauge, 0.01 mm
4. Worksheet for VP-63.

Tolerance

Measurements defined, as the mean of three readings shall conform to the requirements defined in AASHTO T 313.

Procedure

1. Check the sides and bottom of the sample molds to determine that there are no deviations exceeding 0.01 mm.
2. Measure and record on the worksheet the height of the sides at the midpoint and at 25 mm from each end.
3. Assemble the Mold.
4. Measure and record on the worksheet the inside length of the assembled mold and the width of the assembled mold at the midpoint and at 25 mm from each end.
5. Measure and record three readings for each dimension as identified on the work sheet for the stainless steel compliance and performance beams.
6. Determine if the mean of the three readings of dimensions are within the allowable tolerances.

Worksheet for VP-63

Equipment Verified:

**BENDING BEAM RHEOMETER ACCESSORIES
SAMPLE MOLDS
STAINLESS STEEL PERFORMANCE TEST BEAM
STAINLESS STEEL COMPLIANCE TEST BEAM**

Standard References:

AASHTO T 313

Equipment ID# _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: _____

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

	1 ST	2 ND	3 RD	Mean	Specification	Acceptable Y/N
Base Plate					Flat	
Side Plate A					Flat	
Side Plate B					Flat	
Beam Thickness					6.35 ± 0.05 mm	
Beam Width					12.70 ± 0.05 mm	
Beam Length					127.0 ± 2.0 mm	

Verification Equipment used:

Calipers, readable to 0.01 mm. Caliper # _____

Date Calibrated: _____

Verified Straight Edge. Straight Edge # _____

Date Verified: _____

Thickness feeler gauge readable to 0.01 mm. # _____

Date Verified: _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 64

Equipment Verified : **DYNAMIC SHEAR RHEOMETER PLATES**

Standard References : **AASHTO T 315**

Purpose :

This method provides instruction for the calibration of the Dynamic Shear Rheometer parallel plates and sample trimming tool.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm
2. Worksheet for VP-64

Tolerance

The dimensions shall meet the tolerances defined in AASHTO T 315.

Procedure

1. On both the top and bottom 8 mm and the 25 mm plates, measure the diameter by means of two measurements taken at right angles to each other. Record the measurements on the work sheet.
2. Average the two measurements and compare the average to the allowable tolerances.
3. Measure the height of the raised portion of the 8 mm and 25 mm bottom plates. Record the measurements on the work sheet.
4. Take measurements of the width of the specimen trimming tool. Record the measurements on the worksheet. Compare to the allowable tolerance.

Worksheet for VP-64

Equipment Verified: DYNAMIC SHEAR RHEOMETER PLATES

Standard References: AASHTO T 315

Equipment ID# _____

PLATE SET # _____

Trimming Tool # _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: State Materials Laboratory Plates 12 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

8 mm and 25 mm Plates

	1 st reading	2 nd reading	Average	Specification	Acceptable Y/N
8 mm top				8.00 ± 0.05 mm	
8 mm bottom				8.00 ± 0.05 mm	
25 mm top				25.00 ± 0.05 mm	
25 mm bottom				25.00 ± 0.05 mm	
8 mm raised				2-5 mm	
25 mm raised				2-5 mm	

Specimen Trimming Tool

	Specification	Acceptable Y/N
Width	≥ 4.0 mm	

Equipment Used To Verify:

1.) Caliper: # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 65

Equipment Verified : **BROOKFIELD ROTATIONAL VISCOMETER**

Standard References : **AASHTO T 316**
 MANUFACTURER'S OPERATING MANUAL

Purpose :

This procedure identifies the equipment needed to calibrate the Brookfield Rotational Viscometer in accordance with the manufacturer's operating instructions.

Inspection Equipment Required

1. Verified Temperature Probe
2. Manufacturer's HT Calibration Oil.
3. Worksheet for VP-65.

Tolerance

Tolerances shall be in accord with AASHTO T 316 and the Manufacturer's recommendations.

Procedure

1. Place an asphalt binder sample in the thermosel unit and heat it to equilibrium at 135C. Place a calibrated Temperature Probe into the asphalt and make three readings at 15 minutes apart. Average and record the readings on the work sheet. Compare the average to the set temperature and insure that they are within the allowable tolerance.
2. Repeat Step 2 at 170C using a 100C thermometer
3. Calibrate the rotational viscometer in accordance with the manufacturer's instructions using the calibration fluid.

Worksheet for VP-65

Equipment Verified: BROOKFIELD ROTATIONAL VISCOMETER

Standard References: AASHTO T316

Equipment ID# _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: State Materials Laboratory - 6 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

TEMPERATURE DETECTOR

	1 ST	2 ND	3 RD	AVERAG E	TOLERANC E	ACCEPTABL E Y/N
*135 C					135 ± 1.0 C	
*170 C					170 ± 1.0 C	

* Unit shall be calibrated at 135 C for PG Asphalts or 204 C for Flexible Adhesives.

VISCOMETER

Type of Standard Fluid used: _____ **Expiration Date:** _____

Spindle Used: _____

Standard Viscosity	1 ST	2 ND	3 RD	AVERAG E	TOLERANC E ± 2%	ACCEPTABL E Y/N

Equipment Used To Verify:

Verified Temperature Probe # _____ **Date Verified:** _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 66

Equipment Verified : **FALLING HEAD APPARATUS**

Standard References : **ASTM D 4491**

Purpose :

This procedure provides instructions for checking the various parts of the falling head test apparatus.

Inspection Equipment Required

1. Ruler readable to 1 mm.
2. Timer, readable to 0.1 second.
3. Thermometer, verified and readable to 1C.
4. Calibrated vacuum Gauge.

Tolerance

Equipment shall meet the dimensional tolerances specified in the applicable test method.

Procedure

1. A sample of the de-aired water shall be taken to the Chemistry Lab for determination of dissolved oxygen by one of the methods indicated in ASTM D 4491. Verification requires that the dissolved oxygen content is less than 6 parts per million.
2. The de-aired water system will be run for 15 minutes and a sample of water taken and routed to the Chemistry Lab for determination of dissolved oxygen by either commercially available chemical kits or by a dissolved oxygen meter. Verification requires that the dissolved oxygen content is 6 parts

per million maximum.

**** If not previously performed – continue with steps 3, 4, & 5 ****

3. Check the diameter of the falling head tube.
4. Check the diameter of the exposed portion of the test specimen.
5. Check the 150 mm, 80 mm, and 20 mm level marks on the falling head tube.

Worksheet for VP-66

Equipment Verified:

Falling Head Test Apparatus

Standard References:

ASTM D 4491

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Sample of deaired water : _____ PPM dissolved oxygen

Falling Head Device	Measured
Diameter of falling head tube	
Diameter of exposed portion of test specimen	
Falling Head Levels @ 150 mm	
Falling Head Levels @ 80 mm	
Falling Head Levels @ 20 mm	

Equipment Used To Verify:

1.) Thermometer # _____
3.) Steel Ruler # _____

2.) Vacuum Gauge # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 67**Equipment Verified : PYCNOMETER, RICE****Standard References : AASHTO T 209 WSDOT T 606****Purpose:**

This method provides instructions for verifying the mass of each Rice pycnometer used in the determination of the maximum specific gravity. The procedure applies to either flask type: Glass Jars or Metal Vessels.

Inspection Equipment Required

1. Balance with a 11,000 gram capacity and readable to 0.1 gram.
2. Vacuum pump or water aspirator capable of 30 ml Hg or less absolute pressure, for evacuating air from the flask.
3. Calibrated liquid in glass thermometer of suitable range and readable to 0.1°C (0.2°F)
4. Water bath large enough to accommodate up to six 2000 ml flasks and capable of maintaining a temperature of $25^{\circ} \pm 0.5^{\circ}\text{C}$ ($77^{\circ} \pm 1^{\circ}\text{F}$) for rice specific gravity and $20^{\circ} \pm 0.5^{\circ}\text{C}$ ($68^{\circ} \pm 1^{\circ}\text{F}$) for T606 specific gravity.

Tolerance

The weight of the pycnometer, cover plate, and the enclosed water at 25°C (77 °F) for rice specific gravity and 20° C (68 °F) for T606 specific gravity shall not vary more than 0.1 gram after three weighings.

Procedure

1. Glass Jars shall be inspected prior to use to ensure they are suitable for use. All used jars that are suitable for use can be recalibrated. All jars may need to be ground with silicon carbide powder to assure the openings are smooth.
2. Fill the jars or vessels approximately 3/4 full with water at 25°C (77 °F) for rice specific gravity and 20° C (68 °F) for T606 specific gravity.

3. Connect the jars(vessels) to the vacuum system, apply a partial vacuum of 30 ml Hg or less absolute pressure for a period of 15 ± 2 minutes. Agitate container either continuously by mechanical device or manually by vigorous shaking at 2 minute intervals.
4. Release vacuum and disconnect the hoses, fill pycnometers with water and bring contents to a temperature of 25°C (77 °F) for rice specific gravity and 20° C (68 °F) for T606 specific gravity by placing in a constant temperature water bath of 25°C (77 °F) for rice specific gravity and 20° C (68 °F) for T606 specific gravity for 10 minutes.
5. With pycnometer completely full of water, slide glass cover plate over pycnometer opening, remove from water bath, For metal vessels, place the cover and fill the unit completely with water, Wipe all moisture off of pycnometer and plate or cover. Weigh and record.
6. Repeat steps 3 - 6 until each pycnometer has at least three readings that are within 0.1 gram of each other.
7. Record the average of the three readings in step 6 as the calibration weight.

Worksheet for VP- 67

Equipment Verified: PYCNOMETER, RICE

Standard References: AASHTO T 209, WSDOT 606

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 3 Months **Regions** Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

First Reading	Second Reading	Third Reading	Add'l Reading	Add'l Reading	New Calibration

Condition of Rice Jar: _____

Equipment Used To Verify:

- 1.) Balance # _____
- 2.) Thermometer # _____
- 3.) Vacuum System# _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 68

Equipment Verified : LINEAR VARIABLE DISPLACEMENT TRANSDUCERS(LVDT)

Standard References : AASHTO T 292-91, T 294-94, W 614

Purpose :

This procedure provides instructions for checking the accuracy of LVDT's used in these test procedures.

Inspection Equipment Required

1. Standard LVDT calibration frame.
2. Two LVDT's
3. Micrometer, readable to 0.0025 mm (0.001 in)

Tolerance

The response characteristics for the LVDT's shall meet the tolerances specified in the applicable test method listed above.

Procedure

1. Measure and record the necessary characteristics.

Worksheet for VP-68

Equipment Verified

Linear Variable Differential Transformers (LVDT)

Standard References:

AASHTO T 292-91 and Washington Test Method 614

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 12 Months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Dimension	Calibration Factor	Coef. of Determination
LVDT #1		
LVDT #2		
Computer printout attached?		

Equipment Used To Verify:

- 1.) Micrometer # CA-2
- 2.) Computer Program Install.exe from H&V Materials

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 69**Equipment Verified :** MOLD BASE PLATE**Standard References :** AASHTO T99 & T 180_**Purpose :**

This procedure provides instructions for the verification of the flatness of the base plate for the rammer.

Inspection Equipment Required

1. Feeler Gauge, readable to 0.125 mm (0.005 inch).
2. Verified straight edge or mechanic's square.

Tolerance

The base plate shall be flat within 0.127 mm (0.005 inch)

Procedure

1. Place the edge of the straightedge or mechanic's square into the recessed area of the base plate.
2. Attempt to slide the feeler gauge between the base plate and the level.
3. If the feeler gauge fits between the base plate and the level, the base plate is not plane.
4. Record whether or not the base plate is plane.

Worksheet for VP-69

Equipment Verified:

Rammer Base Plate

Standard References:

AASHTO T 99 and T 180

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 12 Months - Regions - Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Dimension	Measurements
Base Plate Plane? (0.125mm (0.005 inch) feeler gauge will not fit between base plate and straightedge.	

Equipment Used To Verify:

1.) Calibrated Straight Edge # _____

2.) Feeler Gauge # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 70**Equipment Verified : MUFFLE FURNACE****Standard References : AASHTO T 105 Et. AI****Purpose :**

This procedure provides instructions for calibrating the muffle furnace used for determining the silica levels in Hydraulic Cement and determining organic content by loss of ignition for other materials.

Inspection Equipment Required

1. NIST Sample of Zinc Certified to have a melting point of 419.527 °C
2. NIST Sample of Copper Certified to have a melting point of 1084.8 °C

Tolerance

Dial temperature setting and the resultant calibration chart will indicate temperature to the nearest degree Celsius on the muffle furnace at the certified melting temperatures of the NIST samples.

Procedure

1. Suspend a sample of NIST certified zinc from a piece of platinum wire in the muffle furnace.
2. Bring muffle furnace dial temperature setting to 410 °C and allow to stabilize.
3. Now increment the dial temperature setting 1 degree up allowing the muffle furnace 20 minutes to stabilize and check to see if the zinc sample has melted.
4. Repeat step 3 until the sample of zinc melts. At that point record the dial setting on the muffle furnace.
5. Allow the furnace cool down and suspend a sample of NIST-certified copper from a platinum wire in the furnace in the same manner as the zinc sample in Step 1
6. Bring the muffle furnace to 1075 °C and allow to stabilize.
7. Repeat steps 3 and 4 for the copper sample.

8. Oven settings within $\pm 50\text{C}$ of the certified NIST melting points are acceptable.

Worksheet for VP- 70

Equipment Verified : MUFFLE FURNACE

Standard References : AASHTO T 105 Et. Al

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC - 12 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

NIST Sample of **Zinc** Certified to have a melting point of 419.527 °C

Oven setting when sample melted _____

Oven setting when sample melted _____

NIST Sample of **Copper** Certified to have a melting point of 1084.8 °C

Oven setting when sample melted _____

Oven setting when sample melted _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 71

Equipment Verified : ENVIRONMENTAL CHAMBER (Eaxternal)

Standard References : Signal Controller Evaluations
(NEMA TSI: FHWA IP-78-16 (7/85); SCC Mod 1000 TS Manual; ATSI DMCT-700 Manual)

Purpose :

This procedure provides instructions for verifying the time, temperature and relative humidity operational characteristics of the Environmental Chamber.

Inspection Equipment Required

1. Verified timer.
2. Verified Thermometer, readable to 1°C (2°F)
3. Verified Sling Psychrometer

Tolerance

1. The temperature range will be -34.4 °C to 73.9 °C .
2. The humidity range will be up to 90%.
3. Time shall be determined to the nearest one minute.
4. Temperature shall be determined to the nearest degree Celsius.
5. Relative Humidity shall be determined to the nearest percent humidity.

Procedure

1. Set the chamber controls to go to -34.4 °C in 3 hours. Start the verified timer at the same time the chamber controls are activated.
2. Mount thermometer in wall of chamber so temperature can be read from outside the chamber.
3. After 3 hours read the timer and thermometer and record.
4. Hold this temperature for 2 hours more read and record the time and temperature.
5. Allow chamber to come back to room temperature.
6. Set the controls to segment 4 of the 9 segment Traffic controller program in the WSDOT test procedure.
7. Activate the controls and the timer.
8. At the end of each segment hit the hold button, stop the timer, read and record the time, temperature, and humidity where appropriate.
9. Release the hold button and restart the timer.
10. Repeat steps 8 and 9 until you reach the end of the program.

VERIFICATION PROCEDURE : VP- 72**Equipment Verified : WEATHEROMETER**

(Operating Light- and Water- Exposure Apparatus (Fluorescent UV- Condensation Type) for Exposure of nonmetallic Materials)

Standard References : ASTM G 53-84**Purpose :**

This procedure provides instructions for verifying the operational characteristics of the Weatherometer (Accelerated Weathering Tester). Those characteristics are Ultraviolet (UV), Time, Temperature and Condensation.

Inspection Equipment Required

1. Verified timer.
2. Verified Thermometer, readable to 1 °C (2°F)
3. Blue wool Lightfastness reference materials called out in section 8.3.1 of ASTM G53-84.
4. Clear glass or plastic blanks for specimen holders or rack.

Tolerance

1. A thermometer-thermocouple check at 70 °C. ± 1 °C
2. Timer check on 4 hour intervals for UV and condensation cycles. ± 1 minute
3. Water bath check for 50 °C and 60°C. ± 1 °C

Procedure

1. Calibration and standardization shall be in accordance with Section 8 and 9 of ASTM G53-84.

VERIFICATION PROCEDURE: VP- 73**Equipment Verified:** AIR METER (VOLUMETRIC)**Standard References:** AASHTO T 196**Purpose:**

This method provides instructions for calibrating the volume of Volumetric Air Meter and associated cup.

Inspection Equipment Required

1. A plate, either of Glass at least 6 mm (1/4 inch) thick or acrylic at least 12 mm (1/2 inch) thick and at least 25 mm (one inch) larger than the diameter of the measure to be calibrated.
2. A supply of water pump or chassis grease, or similar substance that can be placed on the rim of the container to prevent leakage.
3. A balance 10 kg (25 lb) capacity, readable to 0.01 gm (0.01 lb)
4. Thermometer, Range 0 to 50C, (66 to 80F) readable to 0.1C (0.2F).
5. Worksheet, VP-73

Tolerance

Equipment shall meet the tolerances required by the referenced standard.

Procedure**A. VOLUME CALIBRATION OF BOWL**

1. Measure the inside height and the inside diameter of the bowl.
2. Weigh and record to nearest 0.01 lb the weight of the bowl & glass plate.
3. Fill the bowl with water.
4. Weigh and record to nearest 0.01 lb the weight of the bowl and glass plate & water (use grease if necessary).
5. Determine, by subtraction, the weight of water required to fill the bowl.
6. Determine and record the temperature, to 0.1C, (0.2F) of the water in the bowl.

7. Determine, from the table, the density of the water.
8. Divide the weight of water determined in step 5 by the density of water determined in step 7 to determine the volume of the bowl to 0.001 cf.

B. VOLUME CALIBRATION OF THE TOP SECTION

1. Verify the graduated scale starts at no more than 0.5 and ends at no less than 9.0.
2. Weigh and record to nearest 0.01 lb the weight of the bowl, top section and amount of water determined to fill the bowl in step 5 above.
2. Fill the bowl and top section to the 0.0 mark with water.
3. Weigh and record to nearest 0.01 lb the weight of the bowl, top section and water.
4. Fill the bowl and top section to the 0.1 mark with water.
5. Weigh and record to nearest 0.01 lb the weight of the bowl, top section and water to the 1.0 mark.
6. Observe the junction between bowl and top section for leakage.
7. Determine and record the temperature, to 0.1C, (0.2F) of the water.
8. Determine, from the table, the density of the water.
9. Determine, by subtraction, the weight of water required to fill the top section to the 0.0 mark.
10. Divide the weight of water determined in step 10 by the density of water determined in step 8 to determine the volume of the top section to 0.001 cf.
11. Determine if the top section is at least 20% larger than the bowl.
12. Determine, by subtraction, the weight of water required to fill the top section from the 1.0 mark to the 0.0 mark.
13. Divide the weight of water determined in step 13 by the density of water determined in step 8 to determine the volume from 1.0 to 0.0 to 0.001 cf.
14. Determine if the volume from step 14 is 1 +/- 0.1 percent of the bowl.

C. VOLUME CALIBRATION OF CUP

1. Weigh and record to nearest 0.01 lb the weight of the cup and glass plate.
2. Fill the cup with water using the glass plate to insure the cup is full.
3. Weigh and record to nearest 0.01 lb the weight of the cup and glass plate and water (use grease if necessary).
4. Determine, by subtraction, the weight of water required to fill the cup.
5. Determine and record the temperature, to 0.1C, (0.2F) of the water in the cup.
6. Determine, from the table, the density of the water.
7. Divide the weight of water determined in step 4 by the unit weight of water determined in step 6 to determine the volume of the cup to 0.001 cf.
9. Determine if the volume from step 7 is 1.03 +/- 0.04 percent of the bowl.

Worksheet for VP-73

Equipment Verified:

AIR METER (VOLUMETRIC)

Standard References:

AASHTO T-196

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: 36 Months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Bowl:

Height:		in.
Diameter is 1 – 1.25 times the height? Diameter: _____ in. D/H=_____		Y/N
Record empty weight of bowl and plate: [1]		lb (kg)
Record weight of bowl, plate and water: [2]		lb (kg)
Calculate the weight of the water = [2] - [1] [3]		lb (kg)
Record temperature of water:		°F (°C)
Determine density of water. <i>See Table 2 on page 2 of worksheet</i> [4]		lb/ft ³ (kg/m ³)
Calculate volume of bowl. Must be 0.075 ft ³ or more [V _b]		ft ³ (m ³)

Calculations:

Volume of Bowl [V_b] = [3] _____ lb (kg) / [4] _____ lb/ft³ (kg/m³) = _____ ft³ (m³)

Top Section:

Transparent Scale graduated from 0.5 max to 9.0 min:		Y/N
Record weight of bowl with top section filled with [3] lbs. water: [5]		lb. (kg)
Record weight of bowl with top section filled with water to the 0.0 mark: [6]		lb. (kg)
Record weight of bowl with top section filled with water to the 1.0 mark: [6 _a]		
Is the bowl / top section junction watertight?		Y/N
Calculate the weight of the water in top section = [6] - [5] [7]		lb. (kg)
Record temperature of water:		°F (°C)
Determine density of water. <i>See Table 2 on page 2 of worksheet</i> [8]		lb/ft ³ (kg/m ³)
Calculate volume of top section. [V _t]		ft ³ (m ³)

Volume of top section at least 20% larger than bowl? $[V_t] > 1.2[V_b]$		Y/N
Calculate volume from 0.0 to 1.0 : Must be accurate to +/-0.1% of bowl	$[V_g]$	ft ³ (m ³)

Calculations:

Volume Top Section $[V_t] = [7]$ _____ lb (kg) / $[8]$ _____ lb/ ft³ (kg/m³) = _____ ft³ (cm)

Volume 1 Graduation $[V_g] = ([6]$ _____ lb (kg) - $[6_a]$ _____ lb (kg) / $[8]$ _____ lb/ ft³ (kg/m³) = _____ ft³ (m³)

Cup:

Record empty weight of cup and plate:	$[9]$	lb.(kg)
Record weight of cup, plate and water:	$[10]$	lb.(kg)
Calculate the weight of the water = $[10] - [9]$	$[11]$	lb. (kg)
Record temperature of water:		°F (°C)
Determine density of water. <i>See Table 2 on page 2 of worksheet</i>	$[12]$	lb/ ft ³ (kg/m ³)
Calculate volume of cup.	$[V_c]$	ft ³ (m ³)
Volume of cup is 1.03 +/- 0.04% volume of bowl		Y/N

Calculations:

Volume of Cup $[V_c] = [11]$ _____ lb (kg) / $[12]$ _____ lb/ ft³ (kg/m³) = _____ ft³ (m³)

Equipment Used To Verify:

1)Ruler # _____ 2) Balance # _____ 3) Therm. # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Table 2
Unit Weight of Water

°F	°C	lb./ft. ³	kg/m ³		°F	°C	lb./ft. ³	kg/m ³
59.0	15	62.372	999.10		73.4	23	62.274	997.54
60.0	15.6	62.366	999.01		75.0	23.9	62.261	997.32
60.8	16	62.361	998.94		75.2	24	62.259	997.29
62.6	17	62.350	998.77		77.0	25	62.243	997.03
64.4	18	62.340	998.60		78.8	26	62.227	996.77
65.0	18.3	62.336	998.54		80.0	26.7	62.216	996.59
66.2	19	62.328	998.40		80.6	27	62.209	996.50
68.0	20	62.315	998.20		82.4	28	62.192	996.23
69.8	21	62.302	997.99		84.2	29	62.175	995.95
70.0	21.1	62.301	997.97		85.0	29.4	62.166	995.83
71.6	22	62.288	997.77		86.0	30	62.156	995.65

VERIFICATION PROCEDURE : VP-74**Equipment Verified: CUBE MOLDS AND TAMPERS****Standard References: AASHTO T 106****Purpose**

This method provides instructions for checking the critical dimensions of the cube mold and tamper used in the above test method.

Inspection Equipment Required

1. Calipers or ruler readable to 1mm (0.01 in.).
2. Straight-edge or ruler.
3. Thickness gauges

Tolerance

Equipment shall meet the dimensional tolerances specified in the test method.

Procedure

(Cube Mold)

1. Measure the surface flatness of each side of mold using a straight-edge or ruler and thickness gauges to the nearest 0.1mm (0.01 in.) and record the results.
2. Repeat step 1 for all sides of the mold
3. Measure the distance between opposite inside surfaces of the mold at the the mid point (half way between the top and bottom) of each mold section. Measure the distance to the nearest 1mm (0.01 in.), using the calipers and record the results.
4. Measure the height of each compartment using the caliper and straight edge.
5. Using a machinist square determine the angle between adjacent sides and record the results

(Tamper)

1. Measure and record the dimesions of the tamper face to the nearest 1mm (0.01 in.) by.

Worksheet for VP-74

Equipment Verified:

CUBE MOLDS & TAMPERS

Standard References:

AASHTO T- 106

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: **OSC 30 Months - Regions Yearly**

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Parameter to be measured	Specification (New)	Specification(Used)	Measurement
1. Planeness of sides section 1	< 0.001 in	< 0.002 in	
2. Planeness of sides section 1	< 0.001 in	< 0.002 in	
3. Planeness of sides section 1	< 0.001 in	< 0.002 in	
4. Planeness of sides section 1	< 0.001 in	< 0.002 in	
5. Planeness of sides section 2	< 0.001 in	< 0.002 in	
6. Planeness of sides section 2	< 0.001 in	< 0.002 in	
7. Planeness of sides section 2	< 0.001 in	< 0.002 in	
8. Planeness of sides section 2	< 0.001 in	< 0.002 in	
9. Planeness of sides section 3	< 0.001 in	< 0.002 in	
10. Planeness of sides section 3	< 0.001 in	< 0.002 in	
11. Planeness of sides section 3	< 0.001 in	< 0.002 in	
12. Planeness of sides section 3	< 0.001 in	< 0.002 in	
1. Distance between opposite side of cube (section 1)	2 in. \pm 0.005	2 in. \pm 0.02	
2. Distance between opposite side of cube (90°)	2 in. \pm 0.005	2 in. \pm 0.02	
3. Distance between opposite side of cube (section 2)	2 in. \pm 0.005	2 in. \pm 0.02	
4. Distance between opposite side of cube (90°)	2 in. \pm 0.005	2 in. \pm 0.02	
5. Distance between opposite side of cube (section 3)	2 in. \pm 0.005	2 in. \pm 0.02	
6. Distance between opposite side of cube (90°)	2 in. \pm 0.005	2 in. \pm 0.02	
1. height of each compartment (section 1)	2 in. + 0.01 to -0.005 in.	2 in. + 0.01 to -0.015 in.	
2. height of each compartment (section 2)	2 in. + 0.01 to -0.005 in.	2 in. + 0.01 to -0.015 in.	
3. height of each compartment (section 3)	2 in. + 0.01 to -0.005 in.	2 in. + 0.01 to -0.015 in.	
1. Angle between adjacent faces (section 1)	90 \pm 0.5°	90 \pm 0.5°	
2. Angle between adjacent faces (section 1)	90 \pm 0.5°	90 \pm 0.5°	
3. Angle between adjacent faces (section 1)	90 \pm 0.5°	90 \pm 0.5°	

4. Angle between adjacent faces (section 1)	90 ± 0.5°	90 ± 0.5°	
5. Angle between adjacent faces (section 2)	90 ± 0.5°	90 ± 0.5°	
6. Angle between adjacent faces (section 2)	90 ± 0.5°	90 ± 0.5°	
7. Angle between adjacent faces (section 2)	90 ± 0.5°	90 ± 0.5°	
8. Angle between adjacent faces (section 2)	90 ± 0.5°	90 ± 0.5°	
9. Angle between adjacent faces (section 3)	90 ± 0.5°	90 ± 0.5°	
10. Angle between adjacent faces (section 3)	90 ± 0.5°	90 ± 0.5°	
11. Angle between adjacent faces (section 3)	90 ± 0.5°	90 ± 0.5°	
12. Angle between adjacent faces (section 3)	90 ± 0.5°	90 ± 0.5°	
Tamping Block	13x25mm(1/2x1 in)	13x25mm(1/2x1 in)	

Equipment Used To Verify:

- 1.) Caliper # _____
- 2.) Straightedge _____
- 3.) Machinist Square _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-74

Equipment Verified: CUBE MOLDS AND TAMPERS, Region

Standard References: WSDOT T 813

Purpose

This method provides instructions for checking the critical dimensions of the cube mold and tamper used in the above test method.

Inspection Equipment Required

1. ruler readable to 1mm (0.01 in.).
2. Straight-edge or ruler.

Tolerance

Equipment shall meet the dimensional tolerances specified on the VP Checklist.

Procedure

(Cube Mold)

1. Visually inspect all surfaces that will come into contact with the grout to ensure they are essentially plane. A straightedge may be used if necessary.
2. Measure the length, width, and height using the ruler to verify the distances are 2 +/- 0.02 inches.
3. Visually inspect all angles to ensure that they are approx. 90 degrees.
4. Visually inspect the overall condition of the cube mold.

(Tamper)

1. Measure dimensions of the tamper face.
2. Visually inspect the overall condition of the tamper.

Worksheet for VP-74

Equipment Verified: CUBE MOLDS & TAMPERS, Regions

Standard References: *Molds & Tampers for 2" Field Grout Cubes*

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification Regions Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

	Yes	No
Are the sides which contact the grout essentially plane?	<input type="checkbox"/>	<input type="checkbox"/>
Are all cube dimensions (L, W, H) 2 +/- 0.02 inches?	<input type="checkbox"/>	<input type="checkbox"/>
Are all angles visually verified to be approx. 90 degrees?	<input type="checkbox"/>	<input type="checkbox"/>
Is the tamping block end area approx. 1/2 x 1 inch?	<input type="checkbox"/>	<input type="checkbox"/>
Is the condition of the mold and tamper visually acceptable?	<input type="checkbox"/>	<input type="checkbox"/>

Equipment Used To Verify:

Straightedge _____
Ruler _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-76

Equipment Verified: **MANUAL SAND EQUIVALENT TEST SHAKER**

Standard References: **AASHTO T 176**

Purpose

This method provides instruction for checking the manual shaker to insure operation at the specified amplitude and that the counter is functioning properly.

Inspection Equipment Required

1. A measuring device capable of measuring the specified throw of 5 inches and accurate to at least 1/16 inch. (2 mm)
2. Handheld mechanical counting device capable of reading to 500 counts, minimum.
3. Verified timer, readable to 1 second.

Tolerance

Manual shakers shall be capable of operation at 100 cycles in 45 ± 5 seconds have a hand assisted half stroke of 5 ± 0.2 inches (127 ± 5.08 mm).

Procedure

1. With manual shaker in the center position, check that the half stroke indicator is aligned with the center mark on the back of the shaker box or the wall. The half stroke indicator is usually an arrow shaped pointer located in the middle of the upper platform.. If the half stroke indicator is not proper aligned with the center mark the back of the shaker box or the wall mark a new center mark opposite the half stroke indicator at the proper position.
2. Measure the half stroke distance along a straight line parallel to the movement of the shaker, from the center mark. Mark offsets of 0.1 inch from the half stroke distance. Repeat this for the half stroke distance on either side of the center mark.

3. While holding one of the spring steel uprights apply enough force in the direction of the counter to move the half stroke indicator to the stroke limit mark. See 2 above.
4. If needed adjust the counter so it will advance one digit each time the half stroke indicator is within the range of stroke limit mark.
5. Operate the shaker through three complete test cycles to determine if the counter is functioning properly.

Worksheet for VP- 76

Equipment Verified:

MANUAL SE SHAKER

Standard References:

AASHTO T-176

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 12 Months - Regions - Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Half Stroke Indicator Aligned with Center Mark		Yes _____ No _____	
Measure Half Stroke Distance		Left _____ Right _____	
0.1 inch marks made		Yes _____ No _____	
Cycles per 45 seconds		Throw (nearest 0.1")	
Measured	Specified	Measured	Specified
	100 complete cycles in 45 ± 5 seconds		10 +/- 0.4 in (254 +/- 10 mm)
	100 complete cycles in 45 ± 5 seconds		10 +/- 0.4 in (254 +/- 10 mm)
	100 complete cycles in 45 ± 5 seconds		10 +/- 0.4 in (254 +/- 10 mm)

Equipment Used To Verify:

- 1.) 18" scale # _____
- 2.) Verified Timer # _____
- 3.) Handheld mechanical counter # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 77**Equipment Verified : Sand Equivalent Irrigation Tubes****Standard References : AASHTO T 176****Purpose :**

To ensure the proper control of the hydraulic force and amount of solution is used in irrigating (i.e. flushing) the fines from the sand particles.

Inspection Equipment Required

No. 60 drill bit or wire gauge.

Tolerance

None

Procedure

1. Inspect the tube to insure that it is reasonably straight.
2. Measure the tube to see if it is approximately 500 mm.
3. Inspect the soldered joint at the end of the tube. Check that the end of the tube is completely sealed off except for the 2 drilled holes. The integrity of the soldered end may be tested by allowing water or working solution to flow freely from the tube. If any fluid flows from the tube except from the two drilled holes the tube is defective and must be replaced.
4. Check the drilled holes using either a No. 60 wire gauge or No. 60 wire drill. Insert the wire gauge or drill in each hole, do not force the wire gauge or drill into the hole. If the wire gauge or drill does not fit in the hole use a No. 60 wire drill to carefully enlarge the hole to the proper size. If the hole is too large the irrigation tube must be replaced.

Worksheet for VP-77

Equipment Verified:

Sand Equivalent Irrigation Tube

Equipment ID #: _____

Standard References:

AASHTO T 176

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

SE Tube Straight	Yes _____ No _____
SE Tube Length	
No Leaks Through Soldered End	Yes _____ No _____
2 Holes Open and Free Flowing	Yes _____ No _____
Diameter of Holes Satisfactory	Yes _____ No _____

Equipment Used To Verify:

1.) No. 60 drill bit or wire gauge. # _____

2.) 18" minimum scale # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP - 78

Equipment Verified: **FIELD PLATFORM SCALES AND BALANCES**

Standard References : **AASHTO M 231**

Purpose

This method provides instruction for interium checking of the calibration of general purpose platform scales and balances as defined in AASHTO M 231.

Inspection Equipment Required

1. Standard weights (checked on calibrated balances or scales) and/or weights provided by an outside agency performing the calibration.
2. The total mass of the standard weights shall be at least equal to one-half the maximum capacity of the scale or balance and represent the loads normal expected to be used. Such as a 22.7 kg (50 lb) and 11.3 kg (25 lb) weights.
3. Appropriate cleaning equipment, tools, and misc.

Tolerance

The platform scale or balance conform to the standard specification listed in the applicable table of AASHTO M 231, for the type and class of balance being calibrated. In general the tolerance will be one percent of the capacity of the balance or 0.3 percent of the test load at any point within the range of use, whichever is less. For example a 60kg scale or balance checked using a 22.7 kg (50 pounds) would have a tolerance of 60 gm (0.15 pounds). This should be within the readability or smallest division of the balance beam.

Procedure

1. Clean, level, and otherwise prepare the balance as necessary to perform the calibration procedures.
2. Check linear performance of the balance throughout its full range of operation as specified in AASHTO M 231.
3. Check General purpose balances with half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load receiving element (shift test).
4. Record the results of the calibration procedures on the record form.

Worksheet for VP-78

Equipment Verified:

FIELD PLATFORM SCALES AND BALANCES

Standard References :

AASHTO M 231

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 12 Months **Regions -** Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Linier Evaluation

% of Capacity	Actual Weight	Balance Reading	Difference
0 %			
10 %			
20 %			
30 %			
40 %			
50 %			
60 %			
70 %			
80 %			
90 %			
100 %			

Shift Test				
Position	Front	Left	Back	Right
Balance Reading				

Equipment Used To Verify:

1.) Weight Set # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP - 79

Equipment Verified: NCAT Asphalt Content Tester (Ignition Furnace)

Standard References: AASHTO T-308
Manufacturers Operation and Maintenance Manual

Purpose:

This method provides instruction for checking the airflow rates through the tester and cleaning the filtration system when needed. Also provides instruction on how to lubricate the blower motor, clean and inspect the control cabinet, and other routine maintenance and checks.

Inspection Equipment Required

1. Vacuum Cleaner with brush
2. Protective Gloves
3. Anderoll 465 synthetic lubricant *
4. Screwdriver

Tolerance

Lift on the scale should be between -3.5 and -10 grams.

Procedure

THE FILTRATION SYSTEM AND CONTROL CABINET NEED TO BE CLEANED AND THE BLOWER MOTOR BEARINGS NEED TO BE OILED YEARLY.

CHECKING AIRFLOW RATES

1. Ignition Furnace must be COLD when checking.
2. Turn the Furnace on using the switch on the control panel.
3. Allow the scale to stabilize (about 20 seconds).
4. Press the START button on the keypad.

5. Watch the scale indicator display once the blower starts. The numbers should be in the range of -3.5 to -10 grams. If the reading is closer to -10 , your furnace is getting the correct amount of air. If the reading is at -3.5 grams or lower, the filtration system needs to be cleaned.

CLEANING THE FILTRATION SYSTEM

1. Turn off power to the Furnace using the circuit breaker at the left rear corner.
2. Disconnect the exhaust hose from the Furnace and remove the outer metal cap.
3. Remove the four screws holding the blower and remove the blower assembly. (TIP: Chances are pretty good that there will be an accumulation of soot up there, so have the vacuum cleaner handy!) Vacuum out the vanes in the blower.
4. Remove the eight screws holding down the stainless steel plenum chamber and lift chamber off the top of the Furnace. Vacuum everything in sight!
5. Remove the three baffle plates (2 screws each), and vacuum them. Also remove the five ceramic tubes and clean them with a brush/vacuum cleaner. Replace when clean.
6. Reassemble upper filtration system and run scale lift diagnosis as above. It should be breathing much easier now.
7. The exhaust stack also should be cleaned at this time.

(The entire filter cleaning operation should only take about twenty minutes. Mixes containing latex, crumb rubber, or polymer modifiers generate more smoke and soot and burning large samples also produce more smoke/soot.)

LUBRICATING THE BLOWER MOTOR

There are two rubber plugs on the motor with small holes in the center of each plug. Remove the plugs and insert about 1-2 drops of ANDEROLL 465* synthetic lubricant in each bearing. DO NOT OVER-OIL AND DO NOT USE PETROLEUM BASED PRODUCTS.

CLEAN AND INSPECT THE CONTROL CABINET

1. Turn off power to the Furnace using the circuit breaker at the left rear corner.
2. Remove the four screws holding the control cabinet face plate.
3. Tilt the face plate forward and down on its hinges to open the control cabinet.
4. Vacuum all lint and dust in control cabinet using care not to damage electric components

5. Inspect control cabinet for any sign of electric component failure i.e. charred, melted, loose, or disconnected wires. (If any problems are noted do not proceed until repairs are made once repairs are made continue to step 6)
6. Close control cabinet face plate and replace four screws.

OTHER ITEMS:

Check that the following components or items of the furnace are operating in accordance with the manufacturer's written directions.

1. Pay particular attention to the operation of the door locking system and that the lock device and limit switch is properly adjusted,
2. Door seal, check for condition of seal and air tightness,
3. Filter gaskets for condition and proper fit,
4. Heating elements

WEEKLY LIFTS CHECKS:

Affix a copy of the Ignition Furnace Service Record to each furnace. The lift is to be check by the operator every fifth day of operation preferably on a Monday morning prior to starting the furnace.

Note : A supply of Anderoll 465 should have been provided with each unit. Additional supply of Anderoll 465 may be purchased from:

Q/C Resources
10470C Wilden Dr.
Ashland, VA 23005
1(800) 296-7171
FAX (804) 550-2770

Worksheet for VP-79

Equipment Verified: NCAT Ignition Furnace

Standard References: AASHTO T 308

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 12 months Regions Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Filters Cleaned and Serviced
Door Lock Device Checked
Filter Gaskets Checked

Bearings Oiled
Door Seal Checked
Heating Elements Checked

Equipment Used To Verify:

1.)

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time charge: _____

VERIFICATION PROCEDURE: VP-80***Equipment Verified:*** VACUUM OVEN***Standard Reference:*** AASHTO R 28***Purpose:***

This procedure provides instructions for checking the vacuum oven used in the Accelerated Aging of Asphalt Binder (PAV) process.

Inspection Equipment Required

1. 13C thermometer, verified.
2. Calibrated Timer
3. Vacuum source
4. Instruction manual

Tolerance

1. Temperature must be maintained at 170 ± 5 C for 30 ± 1 minute
2. Vacuum must be maintained at 25-26.5 inches of mercury for 30 ± 1 minutes.

Procedure

1. Place verified thermometer in oven thermometer holder. Latch vacuum oven door.
2. Turn on vacuum oven and adjust temperature to allow temperature to stabilize at 170 ± 5 C. Temperature stability is obtained when the HEATING light circulates on and off at the set point.
3. After 10 minutes of temperature equilibrium, close the vent valve.
4. Open vacuum valve and apply a vacuum until the vacuum gauge reaches 26 inches of mercury (Hg). Close the vacuum valve.
5. Begin timing and allow oven to operate for 30 ± 1 minutes. It should still read 26 inches Hg. If vacuum has changed, check the vacuum valve, it should be tight. Refer to oven manual.
6. Verify temperature is at 170 ± 5 C. If not, refer to oven manual.
7. Open vent valve and turn oven off.

Worksheet for VP-80

Equipment Verified: VACUUM OVEN

Standard References: AASHTO R 28

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC - 12 Months

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

	READING	TOLERANCE	ACCEPTABLE Y/N
Temperature		170 ± 5 C for 30 ± 1 minute	
Vacuum		25-26.5 inches of mercury (Hg) for 30 ± 1 minute.	

Equipment Used To Verify:

- 1.) Verified 13C Thermometer # _____ Date Verified: _____
- 2.) Calibrated Timer # _____ Date Calibrated: _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:



Time Charge: _____

VERIFICATION PROCEDURE : VP- 81**Equipment Verified:** **RETAINING RINGS****Standard References:** **AASHTO T 22, ASTM C1231****Purpose:**

This method provides instruction for checking the retaining rings used in conjunction with neoprene inserts for testing cylinders.

INSPECTION EQUIPMENT REQUIRED:

1. Calipers
2. Straightedge
3. Feeler Gauge
4. Machinist's Square
5. Ruler

TOLERANCE:

The 4 inch retaining rings shall meet the requirements of ASTM C 1231

The 6 inch retaining rings shall meet the requirements of AASHTO T 22, Annex A4.1

PROCEDURE:

1. Using the straightedge, machinist's square, and feeler gauge, determine if the bearing faces are plain and that outside dents or gouges do not exceed specifications.
2. Measure the inside diameter.
- ~~3. Measure the thickness of the walls.~~
3. Measure the thickness of the bearing surface.

Worksheet for VP – 81a

Equipment Verified: 4 INCH DIAMETER RETAINING RINGS

Standard References: ASTM C 1231

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Bearing surfaces plain within 0.002 inch inside and out _____
Outside bearing surface free of gouges and dents larger than 0.010 inch in depth _____
or 0.05 in² surface area _____
Average inside diameter between 4.080 and 4.280 inches _____
(102% to 107% of specimen diameter) _____
~~Wall Thickness minimum 0.438 inches~~ _____
Retainer depth is at least twice the thickness of neoprene pad (>1.00 in.). _____
Neoprene Pads 0.5 ± 0.063 in. thick _____
Neoprene Pads shall be a maximum of 0.063 smaller than the inside diameter _____

Equipment Used To Verify:

- 1.) Caliper #::
- 2.) Straightedge #:
- 3.) Feeler Gauge #
- 4.) Machinist Square #
- 5.) Ruler #

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP - 81

Equipment Verified: 6 INCH DIAMETER RETAINING RINGS

Standard References: AASHTO T 22

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Bearing surfaces plain within 0.002 inch inside and out _____
Outside bearing surface free of gouges and dents larger than 0.010 inch in depth _____
or 0.05 in² surface area _____
Inside Diameter between 6.188 and 6.219 inches _____
~~Wall Thickness between 0.469 and 0.531 inches~~ _____
Bearing Surface Thickness between 0.484 and 0.516 inches _____
Retainer depth between 0.984 and 1.016 inches _____
Neoprene Pads 0.5 in. thick _____
Neoprene Pads 6.125 in. diameter _____

Equipment Used To Verify:

- 1.) Caliper #::
- 2.) Straightedge #:
- 3.) Feeler Gauge #
- 4.) Machinist Square #
- 5.) Ruler #

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-82

Equipment Verified: **Pycnometer, Weight Per Gallon**

Standard References: **ASTM D 1475**

Purpose: This procedure provides instructions for calibrating the pycnometers used for determining the weight per gallon of paint in conformance with the above method.

Inspection Equipment Required:

1. Balance capable of weighing to 0.01 g.
2. Distilled water.
3. Water bath large enough to accommodate up to six 2000 ml flasks and capable of maintaining a temperature of $25^{\circ} \pm 0.5^{\circ}\text{C}$ ($77^{\circ} \pm 1^{\circ}\text{F}$).
4. Calibrated liquid in glass thermometer of suitable range and readable to 0.1°C (0.2°F)
5. Verification Form VP-82

Tolerance:

The weight of the pycnometer, cover plate, and the enclosed water at 25°C (77°F) shall not vary more than 0.001% of the original weighing between 2 or more weighings.

Procedure:

1. Clean and dry the pycnometer
2. Weigh pycnometer and record the weight. Continue weighing until the difference between 2 successive readings does not exceed 0.001% of the weight of the pycnometer. Record the readings as M in grams
3. Fill the pycnometer with distilled water at somewhat below the specified temperature
4. Place the filled pycnometer in the water bath at the specified test temperature and bring it to a constant temperature.
5. Record the weight of the pycnometer and water to the nearest 0.001% of its weight. Record this weight as N, in grams.
6. Calculate Factor as per Form VP-82-WS

Worksheet for VP-82

Equipment Verified: **Pycnometer, Weight Per Gallon**

Standard References: **ASTM D 1475**

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: **OSC - 12 Months**

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Test Temperature: _____ **Density of Water from Table 1:** _____

Dry Weight (M): 1st _____, 2nd _____, 3rd _____, Ave _____

Filled Weight (N): 1st _____, 2nd _____, 3rd _____, Ave _____

Volume of cup in mls (V) = (N-M)/ Density of water.

where **Density of water** at 25C is 0.997072 See Table 1

N is weight of the cup and water

M is weight of the cup

V = (_____ - _____) / _____ =

Factor (F) = K/V

Where: K= 8.3454 (Volume-Weight relationship)

F = 8.3454 / _____ =

Density (D) = W x F

Where: W= weight in grams

D = _____ x _____ =

Equipment Used To Verify:

1. Balance # _____
2. Water bath # _____
3. Thermometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Table 1 Absolute Density of Water

C	Density	C	Density
15	0.999127	23	0.997566
16	0.998971	24	0.997324
17	0.998772	25	0.997072
18	0.998623	26	0.996811
19	0.998433	27	0.996540
20	0.998231	28	0.996260
21	0.998020	29	0.995972
22	0.997798	30	0.995684

VERIFICATION PROCEDURE : VP-83**Equipment Verified: EXPANSION PRESSURE DEVICE CALIBRATOR****Standard References: AASHTO T 190, W 611**

Purpose This method provides for instructions for direct calibration of the expansion pressure calibration devices used.

Calibration of Expansion Pressure Device Calibrator

The Calibration Device has three major parts:

1. Calibrating Base
2. Weight Assembly
3. Calibrating Lever

The Calibrating Lever has several sub-components.

- a. Bearing
- b. 'Knife'
- c. Four notches on the lever at specific positions

Inspection Equipment Required

1. Straight Edge
2. Feeler Gauge
3. Balance
4. Caliper

Tolerance

See Below

Procedure

1. Visually inspect the Calibration device to determine if all parts are present and in good condition.
2. Check that the base of the Calibrating Base is generally flat, and that it is steady if placed on a flat surface.
3. With a straight-edge, and feeler gauge, check that the two flanges on top are flat, and that a 0.01" feeler gauge can not be inserted between a flange and the straight-edge.

4. Check that the (holder thingy) on the weight assembly is present and unbroken. Weigh the Weight Assembly. Check that it is 1588.5 ± 5 grams.
5. Use a straight-edge to check that the Calibrating Lever is generally straight.
6. Check that the bearing rolls. Use a caliper to check that the bearing is approximately 0.5" in diameter.
7. Visually check the 'knife edges' to ensure that they are not damaged or excessively worn.
8. Place the Weight Assembly in each of the notches to ensure that the weight assembly does not move within the notch.
9. Measure the distances between the notches to ensure that the distances are within ± 0.04 " (1 mm) of specification.

Worksheet for **VP-83**

Equipment Verified: **EXPANSION PRESSURE DEVICE CALIBRATOR**

Standard References: **AASHTO T 190, W 611**

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: _____

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Dimension	Required.	Tolerance	Measurements
Is base flat and steady if placed on a flat surface?	Yes		
Weigh Assembly Weight	1588.5 gm	1580-1597 g	
Is Calibrating Lever straight?	Yes		
Distance between notch and far end (away from bearing) of Lever			
Slot 1	1.20 in (30.48 mm)	1.16 – 1.24 in (29.48 -31.48 mm)	
Slot 2	2.95 in (74.93 mm)	2.91 – 2.99 in (73.93 -75.93 mm)	
Slot 3	4.73 in (120.14 mm)	4.69 – 4.77 in (119.14 -121.14 mm)	
Slot 4	6.50 in (165.1 mm)	6.46 – 6.54 in (164.1 -166.1 mm)	

Equipment Used To Verify:

- 1.) Caliper # _____
- 2.) Straight Edge # _____
- 3.) Feeler Gauge # _____
- 4.) Balance # _____

Equipment found to be: **Satisfactory**_____ **Unsatisfactory**_____

Action Taken: **Replaced**_____ **None**_____ **Other**_____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-84**Equipment Verified: UNCOMPACTED VOID APPARATUS****Standard References: AASHTO T-304****Purpose:**

This method provides instruction for checking the acceptability of the Uncompacted Void Apparatus.

INSPECTION EQUIPMENT REQUIRED:

1. Calipers having a range sufficient for the measurements needed and being calibrated and readable to at least 0.1 mm.
2. A glass plate at least 4 mm thick , and approximately 60 mm square.
3. A supply of grease to be used when calibrating the cylindrical measure.
4. Scale or balance accurate and readable to +/-0.1 g within the range of use, capable of weighing the cylindrical measure and its contents.
5. Thermometer, calibrated and readable to 0.1 C (0.2F) having a range sufficient to determine the temperature of the water between 18 and 24 C.
6. A supply of freshly boiled deionized water for calibrating the measure

TOLERANCE:

See AASHTO T-304 and the verification worksheet

PROCEDURE:

1. Measure the inside diameter of the cylinder.
2. Measure the inside height of the cylinder.
3. Determine the thickness of the bottom of the cylinder.
4. Determine if the alignment hole is in the center of the bottom
5. Measure from the top of the cylinder to the bottom of the cone.
6. Measure the glass plate, Length, Width, & Thickness.

7. Calibrate the cylinder.
 - A. Apply a light coating of grease to top edge of empty cylinder
 - B. Weight the cylinder, grease, and glass plate
 - C. Fill the cylinder with freshly boiled deionized water
 - D. Place glass plate on top of measure, ensuring no trapped air bubbles
 - E. Dry the outer surface of the measure
 - F. Weight the cylinder, grease, glass plate, and water
 - G. Remove the grease and reweigh the empty cylinder
 - H. Density of water determined using table 1
 - I. Calculate the volume of the measure to 0.1 mL
8. Determine the frustum slope of the cone.
9. Measure the height of the cone.
10. Measure the opening of the cone.
11. Verify the cone has at least 200 mL of volume.
12. Measure the spatula, Length & Width.
13. Determine the angles at the spatula's end in respect to the sides.

Worksheet for VP-84

Equipment Verified:

UNCOMPACTED VOID APPARATUS

Standard References:

AASHTO T-304

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months Regions Yearly

Previous Verification Date: ___/___/___ Next Verification Date: ___/___/___

Cylinder

	Measurement	Tolerance	OK?
Inside Diameter		Approx. 39 mm	
Inside Height		Approx. 86 mm	
Bottom Thickness		6 mm min.	
Cylinder	N/A	Round & Not Dented	
Alignment hole	N/A	Centered	

Glass Plate for Calibrating the Cylinder

	Measurement	Tolerance	OK?
Plate Length		Approx. 60 mm	
Plate Width		Approx. 60 mm	
Plate Thickness		4 mm min.	

Calibration of Cylinder

		Measurement
Mass of cylinder, grease, and top plate	E	grams
Mass of cylinder, grease, top plate, and deionized water	M	grams
Temperature of water		C
Density of water from table 1	D	Kg/m ³
Empty mass of cylinder		grams
Calibration value nearest 0.1 mL	V	mL

$$V = 1000 * \left[\frac{(M - E)}{D} \right]$$

Worksheet for VP-84

Funnel and Stand

	Measurement	Tolerance	OK?
Cone Frustum Angle*		60+/- 4 degrees	
Cone Height*		38 mm min.	
Inside of Cone	N/A	Smooth	
Cone Opening		12.7 +/- 0.6 mm	
Funnel Volume		200 mL min.	
Funnel Opening to Top of Cylinder		115 +/- 2 mm	

* Not required if using pycnometer top.

Spatula

	Measurement	Tolerance	OK?
Length		Approx. 100mm	
Width		Approx. 20 mm	
Sides	N/A	Straight	
End Angle	N/A	Right Angles	

Equipment Used To Verify:

- 1.) Caliper or other suitable measuring device # _____
- 2.) Balance # _____
- 3.) Thermometer # _____

Table 1
Density of Water

°C	(°F)	kg/m ³	(lb./ft. ³)	°C	(°F)	kg/m ³	(lb./ft. ³)
15	(59.0)	999.10	(62.372)	23	(73.4)	997.54	(62.274)
15.6	(60.0)	999.01	(62.366)	23.9	(75.0)	997.32	(62.261)
16	(60.8)	998.94	(62.361)	24	(75.2)	997.29	(62.259)
17	(62.6)	998.77	(62.350)	25	(77.0)	997.03	(62.243)
18	(64.4)	998.60	(62.340)	26	(78.8)	996.77	(62.227)
18.3	(65.0)	998.54	(62.336)	26.7	(80.0)	996.59	(62.216)
19	(66.2)	998.40	(62.328)	27	(80.6)	996.50	(62.209)
20	(68.0)	998.20	(62.315)	28	(82.4)	996.23	(62.192)
21	(69.8)	997.99	(62.302)	29	(84.2)	995.95	(62.175)
21.1	(70.0)	997.97	(62.301)	29.4	(85.0)	995.83	(62.166)
22	(71.6)	997.77	(62.288)	30	(86.0)	995.65	(62.156)

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 85

Equipment Verified: **FLAT and ELONGATED DEVICE**

Standard References: **ASTM D4791**

Purpose:

This method provides instruction for checking the flat and elongated measuring device

INSPECTION EQUIPMENT REQUIRED:

1. Calipers or other adequate measuring device.

TOLERANCE:

The device shall be capable of determining the ratios required.

PROCEDURE:

1. Set the device at a random opening.
2. Measure the smaller opening with the calipers.
3. Measure the larger opening with the calipers.
4. Repeat for ratios required.
5. Calculate the ratios from opening sizes measured.

Worksheet for VP-85

Equipment Verified:

FLAT & ELONGATED DEVICE

Standard References:

ASTM D4791

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Flat & Elongated Device

EQUIPMENT ID#:

Desired Ratio	Smaller Measurement	Larger Measurement	Calculated Ratio

Equipment Used To Verify:

1.) Caliper # _____

Calculations:

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-86

Equipment Verified: **CAPPING COMPOUND**

Standard References: **AASHTO T 231**

Purpose

This procedure provides instruction for determining the compressive strength of the capping compound.

Inspection Equipment Required

1. Calibrated set of Grout Cube Molds
2. Cover Plate meeting the requirements AASHTO T 231
3. Verified Compressive Strength Press
4. Straight Edge
5. Worksheet for VP-86.

Tolerance

The capping material shall have compressive strength as defined in Section 6.2.2 of AASHTO T 231.

Procedure

1. Fabricate the cubes according to Section 5.2.2.1 of AASHTO T 231
2. Check for planeness according the Section 10.6.2 of AASHTO T 106
3. Test the cubes according to AASHTO T 106.

Worksheet for VP - 86

Equipment Verified: CAPPING COMPOUND

Standard References: AASHTO T 231

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 3 Months

Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Cube Number	Plainness Checked ✓	Load (lbf)	Compressive Strength (5000 psi required)
1			
2			
3			
Average			

Equipment Used To Verify:

- 1.) Grout Cube #:
- 2.) Straightedge #:
- 3.) Cover Plate #:
- 4.) Compression Tester #:

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP - 87

Equipment Verified: BLAINE FINENESS APPARATUS

Standard References: AASHTO T 153, Section 4

Equipment ID: B-1

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: *Complete Verification - 30 months.....Time Only - 6 months*

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Standard Cement Number: _____

Calibration Temperature: _____ (Degrees Celsius)

$V = (W_A - W_B) / D$ $V = (\text{_____} - \text{_____}) / \text{_____} = \text{_____}$

$W = \rho V * (1 - \epsilon)$ $W = (\text{_____} * \text{_____}) * (1 - \text{_____}) = \text{_____}$

T _S	1st	2nd (3rd	Average
1				
2				
3				
Average				

Average of the average times is the Calibration Time ↗

$S = (S_S * \sqrt{T}) / \sqrt{T_S}$ $S = (\text{_____} * \sqrt{\text{_____}}) / \sqrt{\text{_____}} = \text{_____}$

Equipment Used To Verify:

- 1.) Thermometer #:
- 2.) Timer #:
- 3.) Blaine #
- 4.) Compression Tester #:
- 5) Balance #:

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP- 88

Equipment Verified: **Type B Air Meter Internal Calibration Vessel**

Standard Reference: **AASHTO T 152**

Purpose:

This method provides instructions for verifying the volume of metal or plastic internal calibration vessels used to verify a type B Portland cement concrete air meter.

Inspection Equipment Required

1. Calibrated Type B Portland cement concrete air meter.

Tolerance

Although no specific tolerances exist for internal calibration vessels it is the intent of the verification process to ensure that these devices provide accurate, repeatable results. There are several factors, including altitude, manufacturing variance, and air meter base dimensions that will slightly affect the *apparent* volume of an internal calibration canister. This procedure will determine the apparent volume of the vessels when they are utilized in verification of the air meter.

Procedure

1. Calibrate the air meter to be used in verification of the vessel in accordance with VP-4. Verify that the indicated air content is 5.0 +/- 0.1% when 5% of the water is removed from the base to ensure that the meter is functioning properly. Adjust the gauge of the air meter that is being used to verify internal calibration vessels so that it indicates exactly 5.0% air content when 5% of the water has been removed from the base of the air meter. Repeat this process if necessary to ensure consistent operation of the meter.
2. Inspect the internal calibration vessel for any signs of damage that would prevent it from operating properly.

3. Fill the base of the air meter full with water and place the internal vessel to be verified in an upright position in the base.
4. Clamp the top of the air meter to the base then remove any remaining air in the base by adding water through one of the petcocks. Gently rock the meter to assist in removing any trapped air being careful not to topple the calibration vessel in the air meter base.
5. Pump up the air meter to the initial pressure point determined in step #1. Wait a moment for the air temperature in the chamber to reach equilibrium then re-verify that the air meter is at the correct initial pressure. Adjust if necessary.
6. Close the petcocks and immediately depress the lever to release the compressed air from the chamber into the air meter base. Hold the lever down while waiting a moment for the air temperature in the chamber and base to reach equilibrium. Tap the back of the gauge gently while it is stabilizing.
7. Record the air content indicated on the gauge on the worksheet.
8. Gently release the pressure in the air meter base through the petcocks then repeat steps 3 through 7 until a uniform (within 0.1% consistently) reading is achieved. Record at least two trials on the worksheet.
9. Place a permanent label indicating the average apparent volume of the internal calibration vessel to the nearest 0.1%.

Worksheet for VP- XX

Equipment Verified: PCC AIR METER INTERNAL CALIBRATION VESSEL

Standard References: AASHTO T 152

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 12 Months Regions Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

First Reading (%)	Second Reading (%)	Additional Reading (%) (If Necessary)	Average (%)

Condition of Vessel: _____

Equipment Used To Verify:

1.) Air Meter # _____

Equipment found to be: Satisfactory _____ (5.0 +/- 0.2%) Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP- 87

Equipment Verified: **Type B Air Meter External Calibration Vessel**

Standard Reference: **AASHTO T 152**

Purpose:

This method provides instructions for verifying the volume of the metal or plastic external calibration vessels used to calibrate a type B Portland cement concrete air meter.

Inspection Equipment Required

1. Balance with a minimum 1000 gram capacity, readable to 0.1 gram.
2. Glass cover plate. (The glass plate used in VP-84 is satisfactory.)
3. Calibrated liquid in glass thermometer of suitable range and readable to 0.2°F (0.1°C)

Tolerance

The theoretical interior volume of most of these vessels is 0.0125 ft.³ for air meters with a volume of 0.25 ft.³. This corresponds to an equivalent mass of 353.3 grams of water @ 68.0°F. Correspondingly, a 7.1 gram mass of water @ 68.0°F represents 0.1% of the volume of the air meter base. Therefore, a tolerance of +/-3.0 grams of water @ 68.0°F applied to the mass of water contained in the calibration vessel represents less than 0.05% error in volume of the air meter base.

Procedure

1. Clean any debris or adherent particles from both the interior and exterior of the vessel and inspect for damage that would change the interior volume of the vessel.
2. Obtain and record the mass of the empty vessel and glass cover plate.

3. Fill the vessel completely full with water that is as close to 68 °F as possible. Use the glass cover plate (and if necessary to seal the top of the vessel a small amount of light grease). Be certain all air bubbles are removed from the vessel. Record the temperature of the water.
4. Remove any water from the exterior surface of the vessel and glass cover plate then obtain and record the mass of the vessel, water and glass cover plate.
5. Calculate the mass of the water by subtracting the mass of the empty vessel and glass cover plate from the mass of the filled vessel and glass cover plate.
6. If the mass of the water contained in the vessel is 353.3 +/- 3.0 grams the vessel is satisfactory for use.
7. If the water's mass is outside of this tolerance, machine the top rim of the vessel to achieve the desired tolerance or replace the vessel.

Worksheet for VP-XX

Equipment Verified: PCC AIR METER EXTERNAL CALIBRATION VESSEL

Standard References: AASHTO T 152

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____

Frequency of Verification: OSC 12 Months Regions Yearly

Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

Condition of Vessel: _____

Calibration of External Vessel

	Measurement
Mass of vessel, grease, and cover plate	grams
Mass of vessel, grease, cover plate, and water	grams
Mass of water	grams
Water Temperature*	OF
Mass 353.3 +/- 3.0 grams?	YES ____ NO ____
Vessel Volume Satisfactory?	YES ____ NO ____

* (The temperature of the water used for calibration should be maintained as close to 68° F as possible.)

Equipment Used To Verify:

- 1.) Balance # _____
- 2.) Thermometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:



Worksheet for VP-XX

Time Charge: _____

VERIFICATION PROCEDURE : VP-91**Equipment Verified:** **Thermometric Devices****Standard References:** **ASTM E 77****Purpose**

This method provides instructions for the standardization of thermometric devices in a Dry-well Calibrator.

Inspection Equipment Required

1. NIST traceable Dry-well Calibrator appropriate to the thermometric device working range.

Specifications

Procedure	Working Range	Accuracy
T 209	77 ±1.8 °F (25± 1°C)	0.9 °F (0.5 °C)
T 309	55 °F - 90 °F	1 °F (0.5 °C)
T 312	250 °F to 350 °F	1 °F
R 30	50 °C to 176 °C	1 °C (1 °F)

Tolerance

Thermometers shall be accurate to one degree within their accuracy range.

Procedure

1. Set the Calibrator at the lowest setting to be checked for the thermometer's working range and allow the calibrator to heat for 20 minutes
2. Insert the probe or stem of the thermometric device into the dry well and let sit for 10 minutes. Choose a well that allows probe or stem to slip in easily while maintaining contact with all sides of the well.
3. Record the temperature of the display and the thermometer being standardized.
4. Take second reading after at least 5 minutes and record the reading.
5. With the thermometric device still in the Dry-well, change the set point of the Calibrator to the middle temperature of the thermometer's working range.
6. Allow the well to reach the desired temperature and then wait 5 minutes for the Dry-well to stabilize.

7. Repeat steps 3 & 4
8. With the thermometric device still in the Dry-well, change the set point of the Calibrator to the high temperature (not to exceed Calibrator's capacity) of the thermometer's working range.
9. Allow the well to reach the desired temperature and then wait 5 minutes for the Dry-well to stabilize
10. Repeat steps 3 & 4
11. Determine the average correction between the working thermometers and the calibrated thermometer.
12. Indicate the temperature correction on the thermometer and record data on VP-91 form. **For adjustable thermometric devices, adjust the reading to agree with the verified thermometer reading.**
13. After last reading, "cool" the Calibrator per the manufacturer's recommendation before turning power off.

Worksheet for VP-91

Thermometric Device Calibration using Dry Well

Standard Reference: AASHTO R 18

Frequency of Verification: OSC - 6 Months

Regions - Yearly

Equipment ID: _____

Verified Temperature Device # _____

Verifying Technician: _____

Date Verified: __/__/__

Previous Verification Date: __/__/__

Next Verification Date: __/__/__

Range of Thermometer	Dry Well Reading	Time	Time
		1 ST Reading	2 nd Reading

Note 1: Record temperatures to the nearest whole degree

COMMENTS: _

Action Taken: Replaced _____ None _____ Other _____

Time Charge: _____

VERIFICATION PROCEDURE : VP-92**Equipment Verified:****Infrared Gun or Camera****Standard References:** SOP 733**Purpose**

This method provides instructions for the standardization of Infrared guns and cameras.

Inspection Equipment Required

1. NIST traceable Infrared Calibrator

Tolerance

Accuracy per manufacturer's statement for device

Procedure

1. Set the IR Calibrator to 50 °C and allow it to heat for 20 minutes.
2. Set the IR device to .95 emmissivity.
3. Hold the IR device at a 90° angle to the center of the calibrator and close enough so the target area of the device is completely contained within IR target of the calibrator. **Do not touch the surface of the IR calibrator!**
4. Record the temperature of the display and the reading of the IR device.
5. Set the IR Calibrator to 100 °C and wait for it to achieve the required temperature and stabilize.
6. Repeat steps 3 & 4
7. Set the IR Calibrator to 150 °C and wait for it to achieve the required temperature and stabilize.
8. Repeat steps 3 & 4
9. Determine the average correction between the IR calibrator and the temperature reading of the IR device.
10. Indicate the temperature correction on the IR device and record data on VP-92 form. **For adjustable IR devices, adjust the IR device reading to agree with the verified reading.**

Worksheet for VP-92

Infrared Gun and Camera

Standard Reference: AASHTO R 18

Frequency of Verification: OSC - 12 Months

Regions - Yearly

Equipment ID: _____

Verified Temperature Device # _____

Verifying Technician: _____

Date Verified: ___/___/___

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

Calibrator Reading °C	Time	Time	Verified
	1 ST Reading	2 ND Reading	
50			Yes No
100			Yes No
150			Yes No

Note 1: Record temperatures to the nearest whole degree

COMMENTS: _____

Action Taken: Replaced _____ None _____ Other _____

Time Charge: _____