

VERIFICATION PROCEDURE : VP-1 - Regions

Equipment Verified: SIEVES

Standard References: AASHTO M 92

Purpose

This method provides instructions for rechecking the physical condition of laboratory test sieves ranging in size from 75mm (3 inches) to 0.075mm (No. 200) for initial acceptance and at prescribed intervals thereafter

Inspection Equipment Required

1. An eyepiece with a scale readable to 0.1mm (for use when checking sieves finer than No. 4).
2. A caliper readable to 0.01mm
3. A set of gauge blocks with one side equal to $\frac{1}{2}$ the sieve opening and the other side stepped having a minimum dimension equal to the minimum specified opening, and a maximum dimension equal to the maximum specified size of the opening as stated in the applicable tolerances from AASHTO M-92. As a minimum the gauge block shall have the following sizes 1-1/2", 1- 1/4", 1", 3/4", 5/8", 1/2", 3/8", #4.

Tolerance

Sieves shall meet the physical requirements specified in AASHTO M - 92 (ASTME - 11).

Procedure

1. For sieves having openings equal to or greater than 4.75 mm, select and measure the dimensions of at least 4 or 5 sieve openings in each sieve to ensure that the openings in the wire cloth conform to the requirements in Table 1. Be sure to include, in the selection, any openings that appear distorted or unusual in size. Measure each opening in both the x (horizontal) and y (vertical) directions. These measurements can be taken using the calipers, or a set of standard gauge blocks.
 - a. When using the calipers, measure each of the openings as the distance between parallel wires measured at the center of each opening. Record the measurements for each of the selected openings. If a sieve has less than 5 full openings, measure all full openings.
 - b. When using the gauge blocks, measure and record the minimum and maximum dimension of each step for each block prior to use. The block shall be inserted into each opening to be measured in the horizontal and vertical directions. If the opening is undersized, the block will not pass the minimum step, if the opening is oversized, then the block will be allowed to pass the maximum step. Along with the measurements of each gauge block, record a pass or fail for each sieve measured. If a sieve has less than 5 full openings, measure all full openings.

2. For sieves smaller than No. 4, inspect the sieve cloth against a uniformly illuminated background. Use the eye comparator or magnifier to examine any suspicious areas of the cloth. If obvious deviations, such as weaving defects, creases, wrinkles, or foreign matter in the cloth, are found, the wire cloth is unacceptable.
3. Inspect the general condition of the sieve. Check the frame and solder joints for cracks or holes (check for pin holes in the finer sieves).
4. Make sure the sieve has an appropriate label, i.e. the ID # and sieve size.
5. Insure that the screen is not excessively bowed upward or downward. Pressing on the screen from either side should not flex the screen more than 1/8".
6. Sieves which are acceptable shall be marked by placing a signed and dated acceptability certification sticker on the frame of the sieve.

Table 1 Sieve Sizes and Permissible Deviations

| Size (in) or # | Metric (mm) | Hole Size English | | Hole Size Metric | |
|-------------------|----------------|-------------------|-----------|------------------|-----------|
| | | Max. (in) | Min. (in) | Max. (mm) | Min. (mm) |
| 3" | 75 | 3.039 | 2.866 | 77.2 | 72.8 |
| 2-1/2" | 63 | 2.555 | 2.406 | 64.9 | 61.1 |
| 2" | 50 | 2.028 | 1.909 | 51.5 | 48.5 |
| 1-1/2" | 37.5 | 1.520 | 1.433 | 38.6 | 36.4 |
| 1-1/4" | 31.5 | 1.280 | 1.201 | 32.5 | 30.5 |
| 1" | 25 | 1.016 | 0.953 | 25.8 | 24.2 |
| 3/4" | 19 | 0.772 | 0.724 | 19.6 | 18.4 |
| 5/8" | 16 | 0.650 | 0.610 | 16.5 | 15.5 |
| 1/2" | 12.5 | 0.507 | 0.477 | 12.89 | 12.11 |
| 3/8" | 9.5 | 0.386 | 0.362 | 9.8 | 9.2 |
| 5/16" | 8 | 0.325 | 0.305 | 8.25 | 7.75 |
| #4 | 4.75 | 0.193 | 0.181 | 4.9 | 4.6 |

Worksheet for VP-1 - Regions

Equipment Verified:

SIEVES

Standard References:

AASHTO M 92

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: Region - Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

| Metric (mm) | Size (in) or # | Hole Size | | Number Inspected | Number OK | Remarks |
|------------------------|----------------|-----------|-----------|------------------|-----------|---------|
| | | Max. (mm) | Min. (mm) | | | |
| 75 | 3" | 78.7 | 72.8 | | | |
| 63 | 2-1/2" | 66.2 | 61.1 | | | |
| 50 | 2" | 52.6 | 48.5 | | | |
| 37.5 | 1-1/2" | 39.5 | 36.4 | | | |
| 31.5 | 1-1/4" | 33.2 | 30.5 | | | |
| 25 | 1" | 26.4 | 24.2 | | | |
| 19 | 3/4" | 20.1 | 18.4 | | | |
| 16 | 5/8" | 17 | 15.5 | | | |
| 12.5 | 1/2" | 13.31 | 12.11 | | | |
| 9.5 | 3/8" | 10.16 | 9.2 | | | |
| 8 | 5/16" | 8.58 | 7.75 | | | |
| 4.75 | #4 | 5.14 | 4.6 | | | |
| 3.35 | #6 | 3.66 | 3.24 | | | |
| 2.36 | #8 | 2.6 | 2.28 | | | |
| 2 | #10 | 2.215 | 1.93 | | | |
| 1.7 | #12 | 1.89 | 1.64 | | | |
| 1.18 | #16 | 1.33 | 1.135 | | | |
| 0.85 | #20 | 0.97 | 0.815 | | | |
| 0.6 | #30 | 0.695 | 0.575 | | | |
| 0.425 | #40 | 0.502 | 0.406 | | | |
| 0.3 | #50 | 0.363 | 0.286 | | | |
| 0.25 | #60 | 0.306 | 0.238 | | | |
| 0.15 | #100 | 0.192 | 0.142 | | | |
| 0.075 | #200 | 0.103 | 0.07 | | | |
| Total Number of Sieves | | | | | | |
| Pans and Covers OK? | | | | No | Yes | |

Equipment Used To Verify:

1.) Caliper # _____ 2.) Eyepiece # _____
3.) Gauge Block # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-1 – Regions
SIEVES GAUGE BLOCK

Equipment Verified:

Standard References:

AASHTO M 92

Invoice/Bill of Lading Number: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: Region - Prior to Each Use

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

| Nominal Size | Measures | | Allowable | |
|--------------|----------|---------|-----------|---------|
| | Maximum | Minimum | Maximum | Minimum |
| 1 1/2 | | | 38.6 | 36.4 |
| 1 1/4 | | | 32.5 | 30.5 |
| 1 | | | 25.8 | 24.2 |
| 3/4 | | | 19.6 | 18.4 |
| 5/8 | | | 16.5 | 15.5 |
| 1/2 | | | 12.9 | 12.1 |
| 3/8 | | | 9.8 | 9.2 |
| 1/4 | | | 6.5 | 6.1 |
| No. 4 | | | 4.9 | 4.6 |
| | | | | |

Equipment Used To Verify:

1.) Caliper # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP-1 OSC Laboratory**Equipment Verified:** SIEVES**Standard References:** AASHTO M 92**Purpose**

This method provides instructions for rechecking the physical condition of laboratory test sieves ranging in size from 75mm (3 inches) to 0.075mm (No. 200) for initial acceptance and at prescribed intervals thereafter

Inspection Equipment Required

1. An eyepiece with a scale readable to 0.1mm (for use when checking sieves finer than 4.75 mm (No. 4).
2. A caliper readable to 0.01mm (use for No. 4 and coarser)

Tolerance

Sieves shall meet the physical requirements specified in AASHTO M - 92 (ASTM E - 11).

Procedure

1. For sieves having openings equal to or greater than 4.75 mm, select and measure, using the calipers, the dimensions of at least 4 or 5 sieve openings in each sieve to ensure that the openings in the wire cloth conform to the requirements in Table 1. Be sure to include openings that appear distorted or unusual in size in the area to be examined. Measure each of the openings as the distance between parallel wires measured at the center of each opening. Measure each opening in both the x (horizontal) and y (vertical) directions. Record the measurements for each of the selected openings. If a sieve has less than 5 full openings, measure all full openings
2. For sieves smaller than No. 4, inspect the sieve cloth against a uniformly illuminated background. Use the eye comparator or magnifier to examine any suspicious areas of the cloth. If obvious deviations, such as weaving defects, creases, wrinkles, or foreign matter in the cloth, are found, the wire cloth is unacceptable.
3. Inspect the general condition of the sieve. Check the frame and solder joints for cracks or holes (check for pin holes in the finer sieves).
4. Make sure the sieve has an appropriate label, i.e. the ID # and sieve size.
5. Insure that the screen is not excessively bowed upward or downward. Pressing on the screen from either side should not flex the screen more than 1/8".
6. Sieves which are acceptable shall be marked by placing a signed and dated acceptability certification sticker on the frame of the sieve.

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| 2" | 50 | 2.028 | 1.909 | 51.5 | 48.5 |
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| 1-1/4" | 31.5 | 1.280 | 1.201 | 32.5 | 30.5 |
| 1" | 25 | 1.016 | 0.953 | 25.8 | 24.2 |
| 3/4" | 19 | 0.772 | 0.724 | 19.6 | 18.4 |
| 5/8" | 16 | 0.650 | 0.610 | 16.5 | 15.5 |
| 1/2" | 12.5 | 0.507 | 0.477 | 12.89 | 12.11 |
| 3/8" | 9.5 | 0.386 | 0.362 | 9.8 | 9.2 |
| 5/16" | 8 | 0.325 | 0.305 | 8.25 | 7.75 |
| #4 | 4.75 | 0.193 | 0.181 | 4.9 | 4.6 |

Worksheet for VP-1 OSC Laboratory

Equipment Verified:
Standard References:

SIEVES
AASHTO M 92

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - 6 Months

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

| Sieve Size: | | | Tolerances: | | | | | |
|----------------------|---|---|----------------------|---|---|----------------------|---|---|
| Sieve ID #: | | | Sieve ID #: | | | Sieve ID #: | | |
| | X | Y | | X | Y | | X | Y |
| Opening 1 | | | Opening 1 | | | Opening 1 | | |
| Opening 2 | | | Opening 2 | | | Opening 2 | | |
| Opening 3 | | | Opening 3 | | | Opening 3 | | |
| Opening 4 | | | Opening 4 | | | Opening 4 | | |
| Opening 5 | | | Opening 5 | | | Opening 5 | | |
| Opening 6 | | | Opening 6 | | | Opening 6 | | |
| | | | | | | | | |
| Action Taken: | | | Action Taken: | | | Action Taken: | | |

| Sieve Size: | | | Tolerances: | | | | | |
|----------------------|---|---|----------------------|---|---|----------------------|---|---|
| Sieve ID #: | | | Sieve ID #: | | | Sieve ID #: | | |
| | X | Y | | X | Y | | X | Y |
| Opening 1 | | | Opening 1 | | | Opening 1 | | |
| Opening 2 | | | Opening 2 | | | Opening 2 | | |
| Opening 3 | | | Opening 3 | | | Opening 3 | | |
| Opening 4 | | | Opening 4 | | | Opening 4 | | |
| Opening 5 | | | Opening 5 | | | Opening 5 | | |
| Opening 6 | | | Opening 6 | | | Opening 6 | | |
| | | | | | | | | |
| Action Taken: | | | Action Taken: | | | Action Taken: | | |

Equipment Used To Verify:

1.) Caliper # _____ 2.) Eyepiece # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-2

Equipment Verified: SINGLE USE CONCRETE CYLINDER MOLDS

Standard References: AASHTO M-205

Purpose

This procedure provides instructions for verifying compliance of single use plastic cylinder molds.

Inspection Equipment Required

1. Inside Caliper reading to 1/16" (1 mm)
2. 18-inch Scale reading to 1/16" (1 mm)

Tolerance

Single use molds shall meet criteria described in sections 3 and 6 of AASHTO M-205.

Procedure

Inspect three molds from each shipment delivered to the Materials Laboratory as follows:

1. Measure the inside diameter of the mold and record on the worksheet.
2. Measure the inside height of the mold at two locations and record on the worksheet.
3. Check the resistance of the mold to damage under use by filling it in three lifts with a 1" #4 crushed aggregate. Rod each lift 25 times. After filling the mold, empty it, wipe lightly with a clean cloth and examine for damage.
4. Check mold for watertightness by filling it with room temperature water and allowing it to stand for three (3) hours, then note any visible leakage.
5. When the inspection is complete, report the following:
 - Brand of molds;
 - Shipment or lot samples taken from;
 - Date sampled, date tested;
 - Brief description, type of mold, nominal dimensions, type of material;
 - Watertightness (complies or fails); and
6. If sample fails, record average diameter or height and maximum and minimum diameter or height.

Mark the boxes of molds that have been inspected with the inspection date, pass or fail, and the inspector's name.

Worksheet for VP-2

Equipment Verified: SINGLE USE PLASTIC CONCRETE CYLINDERS MOLDS

Standard References: AASHTO M-205 SECTION 55

Equipment ID: _____

Lot/Bill of Lading #: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC - Each Shipment - Regions - Each Shipment

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

| | Single Use Plastic | Single Use Plastic | Single Use Plastic |
|--------------|--------------------|--------------------|--------------------|
| BRAND | | | |
| LOT # | | | |
| DATE SAMPLED | | | |
| DATE TESTED | | | |

| | SAMPLE #1 | SAMPLE #2 | SAMPLE #3 |
|-----------------------------|-----------|-----------|-----------|
| HEIGHT +/- 2% | | | |
| DIAMETER +/- 1% | | | |
| WALL THICKNESS | | | |
| WATER TIGHTNESS (Leak Test) | | | |

Equipment Used To Verify:

- 1.) Caliper or micrometer # _____
- 2.) 18" scale # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-3

Equipment Verified: CONCRETE PAN MIXER

Standard References: AASHTO T 126

Purpose:

This procedure provides instructions for verifying the condition of the Concrete Pan Mixers.

Inspection Equipment Required:

Tolerance: NA

Procedure:

1. Inspect for general condition.
2. Inspect to ensure that the pan is watertight.
3. Check that the paddles are in good condition and free of built-up concrete.
4. Determine the RPM of the mixer and compare with previous check(s). A change may indicate that belt condition or other power transmission condition must be remedied.
5. Document the date of inspection, condition, corrections, if any and identify the inspecting technician.

Worksheet for VP-3

Equipment Verified: CONCRETE PAN MIXER

Standard References: AASHTO T-126

Equipment ID: _____

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

Frequency of Verification: OSC 12 Months

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

1. Good general condition? _____
2. Is the pan watertight? _____
3. Are the paddles in good condition and free of built up concrete? _____
4. RPM _____ Difference _____ Previous check _____
5. If RPM changed, any action taken to correct the problem? _____

Equipment Used To Verify:

- 1.) Counter _____
- 2.) Timer _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-4

Equipment Verified: CONCRETE AIR METER PRESSURE GAUGE

Standard References: AASHTO T 152, Annex A 1.9, Manufacturer's Instructions

Purpose

To perform a Calibration test to check the Air Content Graduations on the Pressure Gauge, Type B Meter.

Inspection Equipment Required

Calibration tubes and measures as provided by the Gauge Manufacturer..

Tolerance

Adjust gauge hand if two readings at 5% are in error by more than 0.2%.

Procedure

Note: - The procedures described below generally follow the manufacturers written instructions for Type B meters manufactured by "Forney or Watts. Consult the manufactures instruction for meter manufactured by others.

1. Fill the base full of water
2. Screw the short piece of straight tubing into the threaded petcock hole on the underside of the cover. Clamp the cover on the base with the tube extending down into the water.
3. With both petcocks open, add water with the syringe through the petcock having the pipe extension below, until all air is forced out opposite petcock.. Leave both petcocks open.
4. Pump up air pressure to a little beyond the pre-determined initial pressure line. Wait a few seconds for compressed air to cool to normal temperature and then stabilize the gauge hand at the proper initial pressure by pumping or bleeding off as needed.
5. Close both petcocks and immediately press down on the thumb lever exhausting air into the base. Wait a few seconds until the hand is stabilized. If all the air was eliminated and the initial pressure line was correctly selected, the gage should read 0%. If two or more tests show a consistent variation from zero% in the result, then change the initial pressure line to compensate for the variation. Use the newly established "initial pressure" line for subsequent tests.
6. Screw curved tube into the outer end of the petcock and by pressing on thumb lever end controlling flow with petcock lever, fill the 5% calibrating vessel (345 ml) level full of water from the base.
7. Release the air at the free petcock. Open the other petcock and let the water in the curved pipe run back into the base. There is now 5% air in the base.
8. With petcocks open, pump air pressure in exact manner outlined in paragraph 4. Close petcocks and immediately press thumb lever. Wait a few seconds for the exhaust air to warm to normal temperature, and for the needle to stabilize. The dial should now read 5%.
9. If two or more consistent tests show that gage reads incorrectly at 5% air in excess of 0.2%, then remove gauge glass and reset the dial hand to 5% by turning the recalibrating screw.
10. When gauge hand reads correctly at 5%, additional water may be withdrawn in the same manner to check results at 10%, 15%, 20%, etc.

The recalibrating screw is located near the center of the dial.

Worksheet for VP- 4

Equipment Verified: **PRESS-UR-METER**

Standard References: **AASHTO T-152**

Equipment ID: _____

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

Frequency of Verification- SML - 6 Months **Regions – Yearly**
Region – Weekly when in use

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

- 1. Base filled with water all the way? _____
- 2. Tubing screwed into petcock hole? _____
- 3. Both petcocks open? _____
- 4. Water added to right petcock (one with the tube under it)? _____
- 5. All air forced out of opposite petcock? _____
- 6. Both petcocks open? _____
- 7. Pumped up just past initial pressure line? _____
- 8. Waited until temperature stabilized? _____
- 9. Bled or pumped up to initial pressure line? _____
- 10. Both petcocks closed? _____
- 11. Needle valve opened immediately? _____
- 12. Gauge reads "0" ? _____ If not, another attempt made? _____
- 13. If 2 attempts show variation from "0", initial pressure reset? _____
- 14. Water withdrawn from base to fill the calibrating vessel? _____
- 15. Water in curved pipe allowed to flow back into base? _____
- 16. Steps 7 through 12 repeated? _____
- 17. Gauge reads 5% ? _____ If not, gauge hand reset? _____
- 18. If checked at 10, 15, and 20%, is it good? _____
- 19. Calibrated & documented weekly when in use? _____

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

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

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-5**Equipment Verified:** **UNIT WEIGHT MEASURES****Standard References:** **AASHTO T 19, T 121, T 152****Purpose**

This method provides instructions for the calibration of unit weight measures used in the Materials Laboratory.

Inspection Equipment Required

1. Calipers having a range sufficient to measure the diameter of the measure being calibrated and readable to at least 0.001 inch (0.025 mm)
2. Feeler gauge; 0.01 inch (0.25mm) .
3. Ruler or scale, readable to at least 1/16 inch (1 mm).
4. Inside diameter calipers, 12 inch (300mm) range.
5. Diameter tape, readable to 0.01 inch (1 mm).
6. A plate, either of glass at least ¼ inch (6 mm) thick or acrylic at least (1/2 inch (12mm) thick, and at least 1 inch (25 mm) larger than the diameter of the measure to be calibrated.
7. A supply of water pump or chassis grease, or similar substance, that can be placed on the rim of the container to prevent leakage.
8. Balance conforming to the requirements of AASHTO M231 for the class of general purpose balance required for the principal weight of the measure filled with water and the plate for calibration.
9. Thermometer, calibrated and readable to 0.2F (0.1C) having a range sufficient to determine the temperature of the water in the measure at approximately room temperature.

Tolerance

Unit weight measures shall meet all appropriate specifications described in AASHTO T-19.

Procedure

1. Measure the height and insure that it is approximately equal to the diameter. In no case shall the height be less than 80% or greater than 150% of the diameter.
2. Check to see that the top is smooth and plane by placing the plate on the top and insure that the 0.01 in. feeler gage cannot be inserted between the plate and the top of the measure.

3. Check to see that the top and bottom are parallel by measuring the distance from the plate to table on each side, divide the shorter distance by the longer distance for each two opposite sides, neither result shall exceed 0.5 degrees (0.87%).
4. Determine the thickness of metal of the upper 1 1/2 inches (38 mm) of the wall with the calipers in two locations, 90 degrees apart. Compare the average of the two measurements with the standards of T 19.
5. Measure the inside diameter with the inside calipers and scale. Determine the outside diameter by means of the diameter tape. Determine the wall thickness as one half the difference in diameters and compare with the standards of T 19.
6. Measure and record the external height of the measure at two places 90 degrees apart. Determine the inside height of the measure by measuring from the plate across the measure to the bottom of the measure. Determine the bottom thickness as the difference between the two heights
7. Record the empty weight of the measure with the plate.
8. Fill the measure with water (approx.. room temperature)
9. Cover the measure with the plate to eliminate bubbles or excess water (use grease if necessary).
10. Record the weight of the measure, plate, and water. .
11. Measure the water temperature and determine the density of water using the table on the worksheet.
12. Calculate the weight of the water.
13. Calculate the volume of the measure
14. Calculate the calibration factor.

Worksheet for VP-5

Equipment Verified: **UNIT WEIGHT MEASURES**
Standard References: **AASHTO T 19, T 121, T 152**

Equipment ID: _____

Date Verified: ___/___/___ **Verifying Technician:** _____
Frequency of Verification: **OSC - 12 Months** **Regions - Yearly**
Previous Verification Date: ___/___/___ **Next Verification Date:** ___/___/___

| | | |
|---|--|--|
| Capacity (nominal): | | cf (cm) |
| Diameter: | | in. |
| Height is 80% - 150% of diameter: Height: _____ in. | | % |
| Top rim is smooth? | | Y/N |
| Top rim is plane, within 0.01 in.? | | Y/N |
| Top and bottom are parallel within 0.5 degrees? | | Y/N |
| Thickness of metal in upper 1-1/2" of wall: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Thickness of metal in remainder of wall: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Thickness of metal at bottom: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Record empty weight of measure with plate: [1] | | lb.(kg) |
| Record weight of measure, plate and water: [2] | | lb.(kg) |
| Record temperature of water: | | °F(°C) |
| Determine density of water. <i>See Table 2 on page 3 of worksheet</i> [4] | | lb/f ³ (kg/m ³) |
| Calculate the weight of the water. [3] | | lb.(kg) |
| Calculate volume of measure. [V] | | cf (cm) |
| Calculate the calibration factor. | | |

Equipment Used To Verify:

1.) Caliper # _____ 2.) Feeler Gauge # _____ 3.) Ruler # _____
4.) Diameter Tape # _____ 5.) Balance # _____ 6.) Therm. # _____

Calculations:

Mass of Water [3] = [2] _____ lb.(kg) - [1] _____ lb.(kg) = _____ lb.(kg)

Volume of Measure [V] = [3] _____ lb.(kg) / [4] _____ lb/f³ (kg/m³) = _____ cf (cm)

Calibration Factor = 1 / [V] _____ cf (cm) = _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Table 1
Thickness of Metal
(minimum)

| Capacity Cubic feet | Bottom | Upper 1-1/2" of Wall | Remainder of Wall |
|------------------------|---------|-------------------------|----------------------|
| <0.4 | 0.2 in. | 0.10 in. | 0.10 in. |
| 0.4 to 1.5 | 0.2 in. | 0.20in. | 0.12 in. |

Table 2
(FOP for AASHTO T121)

Unit Mass 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-6

Equipment Verified: DUCTILITY APPARATUS (AASHTO T 51)

Standard References: AASHTO T 51

Purpose

This procedure provides instructions for verifying the extension rate of the equipment used to perform the ductility test.

Inspection Equipment Required

1. Ruler, readable to 1mm.
2. Timer, readable to 0.1 second.
3. Thermometer, calibrated and readable to 0.1°C (0.18°F).
4. Worksheet for VP-6.

Tolerance

The equipment shall meet the tolerances specified in the test methods listed above: Rate at 7.2 C (45F) 1 cm/min ± 5% variance, and at 25 C (77F) 5 cm/min ± 5% variance.

Procedure

1. Fill the ductility machine with water. Attach the clips of a mold to the pins or hooks of the testing machine. Measure, to the nearest 1mm, the distance from the top of the mold to the water level. Measure, to the nearest 1mm, the distance from the bottom of the testing machine to the bottom of the mold. The mold shall be immersed at least 25mm when in position for testing.
2. Set the bath to the appropriate temperature. Refer to “Tolerance” above. Observe and record the temperature of the water in the bath.
3. Start the ductility machine. Measure and record the distance through which the clips move after one minute.
4. Record rate data on worksheet for VP-6.

Worksheet for VP-06

Equipment Verified: DUCTILITY APPARATUS (AASHTO T 51)

Standard References: AASHTO T 51

Equipment ID: _____

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

Frequency of Verification: OSC 12 Months

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

| Speed Verified | 1st | 2nd | 3 rd |
|----------------|-----|-----|------|
| 1 cm/min ± 5% | | | |
| 5 cm/min ± 5% | | | |

Equipment Used To Verify:

1.) Stop Watch/Timer used # _____

Date Calibrated _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-7

Equipment Verified: **DUCTILITY MOLDS**

Standard References: **AASHTO T 51**

Purpose

This procedure provides instructions for the verification of dimension of molds used for the Ductility Test.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm.
2. Reference diagram of Ductility Mold
3. Worksheet for VP-7.

Tolerance

Measurements determined as the mean of three individual readings shall conform to the requirements defined in AASHTO T-51

Procedure

1. Measure and record three readings for each of the dimensions as identified on the work sheet.
2. Determine the mean value for each set of readings and record on worksheet for VP-7.
Express the mean reading to the indicated precision and compare with the allowable dimensions.

Worksheet for VP-7

Equipment Verified:

DUCTILITY MOLDS

Standard References:

AASHTO T 51

Mold # _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

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

Equipment Used To Verify:

Calibrated Ruler, readable to 1mm

Ruler # _____

Date Calibrated _____

Calibrated Timer, readable to 0.1 second

Timer # _____

Date Calibrated _____

Calibrated Thermometer, readable to 0.1°C (0.18°F)

Thermometer # _____

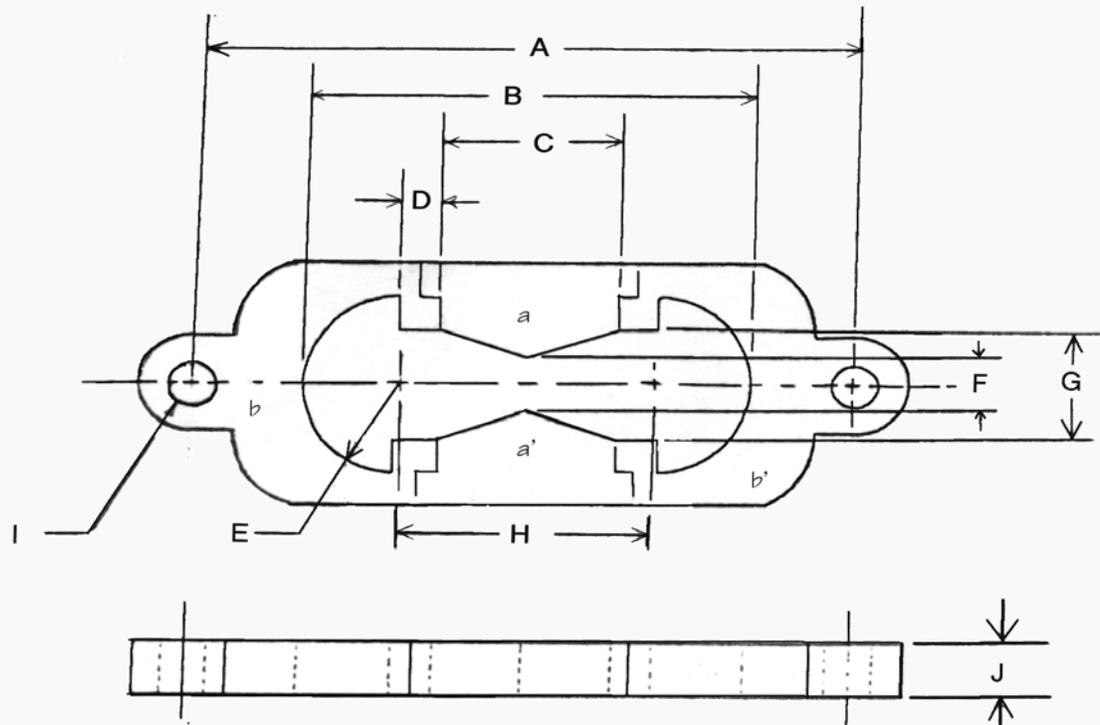
Date Calibrated _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____



Dimensions

| Section | Specification Recommended | Actual Dimension | Acceptable Y/N |
|---------|---------------------------|------------------|----------------|
| A | to 113.5 mm | | |
| B | 74.5 to 75.5 mm | | |
| C | 29.7 to 30.3 mm | / | |
| D | 6.8 to 7.2 mm | / | |
| D | 6.8 to 7.2 mm | / | |
| E | 15.75 to 16.25 mm | / | |
| F | 9.9 10.1 mm | / | |
| G | 19.8 to 20.2 mm | / | |
| H | 42.9 to 43.1 mm | | |
| I | 6.5 to 6.7 mm | / | |
| J | 9.9 to 10.1 mm | / | |
| J | 9.9 to 10.1 mm | / | |

VERIFICATION PROCEDURE : VP- 8

Equipment Verified: L.A. ABRASION MACHINE

Standard References: AASHTO T 96

Purpose

This method provides instructions for checking the critical dimensions of the L.A. abrasion machine and the mass of the spheres used as test charges.

Inspection Equipment Required

1. Steel Rule readable to 1/16 inch (1 mm)
2. Stopwatch readable to 0.1 sec.
3. Balance, 5 kg capacity, readable to 1g.

Tolerance

The L.A. abrasion machine shall meet the dimensional tolerances specified in the applicable test method listed above and shall be in good operating condition. The steel spheres used to charge the L.A. machine shall meet the mass tolerances specified in the applicable test method listed above.

Procedure**L.A. Abrasion Machine**

1. Measure and record the inside diameter of the drum at the left and right edges to the nearest 5mm.
2. Measure and record the width and height of the opening to the nearest 1mm.
3. Measure and record the wall thickness at the left and right edges to the nearest 1/8".
4. Determine if the cylinder is horizontal using a steel ball to check left-to-right roll.
5. Measure and record shelf width inside the drum to the nearest 1 mm..
6. Measure and record the distance from the shelf to the opening in the direction of rotation.
7. Using the stopwatch, determine the RPM to the nearest whole number over a five-minute period. Record the RPM.
8. Check that the number of revolutions is 500 by looking at the counter on the machine.

Seel Spheres

1. Determine and record the mass of each individual sphere to the nearest 1g.
2. Determine and record the mass of the collective charge(s) to the nearest 1g.

Worksheet for VP-8

Equipment Verified:

LA Machine & Balls

Standard References:

AASHTO T-96

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: **OSC - 24 Months**

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

| | |
|--|-------|
| Los Angeles Machine | |
| 1.) Inside diameter of the drum @ the left edge.....(711mm, +/- 5mm) | _____ |
| 2.) Inside diameter of the drum @ the right edge.....(711mm, +/- 5mm) | _____ |
| 3.) Width of the opening.....(approx. 20") | _____ |
| 4.) Height of the opening.....(approx. 6") | _____ |
| 5.) Wall thickness @ the left edge.....(1/2", +/- 1/8") | _____ |
| 6.) Wall thickness @ the right edge.....(1/2", +/- 1/8") | _____ |
| 7.) Determine if the cylinder is horizontal..... | _____ |
| 8.) Shelf width inside the drum.....89mm, +/- 1mm) | _____ |
| 9.) Distance from the shelf to the opening, in the direction of rotation.....min. 1.27m) | _____ |
| 10.) RPM recorded over five minute period..... | _____ |
| 11.) Number of revolutions is 500?..... | _____ |

| | |
|---|-------|
| Steel Spheres (Balls) | |
| 1.) Number of spheres tested..... | _____ |
| 2.) Number of spheres weighing 390-445 grams..... | _____ |

| | |
|--|----------------|
| Weight of collective Charge(s): (nearest gram) | |
| A - 12 balls = 4975-5025 grams? _____ | (5000 +/- 25g) |
| B - 11 balls = 4559-4609 grams? _____ | (4584 +/- 25g) |
| C - 8 balls = 3310-3350 grams? _____ | (3330 +/- 20g) |
| D - 6 balls = 2485-2515 grams? _____ | (2500 +/- 15g) |

Equipment Used To Verify:

- 1.) Timer # _____
- 2.) Balance # _____
- 3.) Steel Ruler # _____

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

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

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-9**Equipment Verified:** CONICAL MOLDS AND TAMPERS**Standard References:** AASHTO T 84**Purpose**

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

Inspection Equipment Required

1. Calipers or ruler readable to 1mm.
2. Balance, 500g capacity, readable to 0.1g.
3. Straight-edge or ruler.

Tolerance

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

Procedure

(Cone)

1. Measure the inside diameter at the top of the cone to the nearest 1mm by taking two readings 90° apart using the calipers and record the results.
2. Invert the cone and repeat Step 1 using a ruler.
3. Place the cone on a flat glass surface. Measure the depth of the cone by using the calipers and a straight-edge or ruler and record the results.
4. Measure the thickness of the metal to the nearest 0.1mm by taking two (2) readings 90° apart at the top of the cone and two (2) readings 90° apart at the bottom of the cone and record the results.

(Tamper)

1. Measure and record the diameter of the tamper face to the nearest 1mm by taking two (2) readings 90° apart using the calipers and record the results.
2. Determine and record the mass of the tamper to the nearest 1g.

Worksheet for VP-9

Equipment Verified:

Conical Molds and Tamper

Standard References:

AASHTO T-84

Equipment ID: _____ **and** _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: **OSC 24 Months**

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

Conical Mold

| Section to be measured | Specification | Measurement |
|--|---------------|-------------|
| Inside diameter @ top of cone | 40 +/-3mm | |
| Inside diameter @ top of cone (90) | 40 +/-3mm | |
| Inside diameter @ top of cone <i>inverted</i> | 90 +/-3mm | |
| Inside diameter @ top of cone <i>inverted</i> (90) | 90 +/-3mm | |
| Depth of the cone (height) | 75 +/-3mm | |
| Wall thickness @ top of cone | 0.8mm min. | |
| Wall thickness @ top of cone (90) | 0.8mm min. | |
| Wall thickness @ top of cone <i>inverted</i> | 0.8mm min. | |
| Wall thickness @ top of cone <i>inverted</i> (90) | 0.8mm min. | |

Tamper

| Section to be measured | Specification | Measurement |
|-----------------------------|----------------|-------------|
| Mass of the tamper (weight) | 340 +/- 15 g's | |
| Diameter of tamping face | 25 +/-3mm | |
| Diameter of tamping face | 25 +/-3mm | |

Equipment Used To Verify:

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

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

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

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP-10

Equipment Verified: **GENERAL PURPOSE DRYING OVEN**
Without Access Opening

Standard References: AASHTO R 18

Purpose

This method provides instructions for checking the ~~dial-temperature settings- indicator~~ on general-purpose drying ovens.

Inspection Equipment Required:

1. A calibrated ~~thermometer~~ temperature measuring device graduated capable of reading in 1° increments and having a range that includes the temperature range to be checked.
2. A brass thermometer well to retain heat while the oven door is open. This is essential for a constant temperature reading. If a thermocouple is used the brass well is not required.
3. A clothespin to hold the thermometric device in such a manner as to enable the operator to read the scale easily from outside or inside the oven. (Not required for thermocouples)

Tolerance:

Drying ovens shall be capable of maintaining the constant temperature range stated in each test method performed in the oven.

Procedure:

1. Position the thermometer or thermocouple probe ~~on the shelf where the samples are normally dried.~~ in the area of the oven that best represents the overall temperature of the oven.

Note: If using a thermometer, place the thermometer inside the brass well with the clothespin attached to the thermometer.

2. Set the oven's temperature indicator device to the mid-temperature of the temperature range required by the test procedure performed in the oven.
Example: 230 ± 9 ° F set temperature indicating device to 230 ° F
3. Take the first reading at least 1 hour after closing the oven (oven should remain undisturbed).

4. Take as many readings as necessary to determine if the setting on the temperature indicating device accurately represents the internal temperature of the oven (three consecutive readings, taken no less than 1/2 hour apart if using a liquid-in-glass thermometer and no less than 15 minutes apart if using a thermocouple, are adequate.)
5. If the internal temperature measured in the oven does not agree with the setting on the temperature indicating device, adjust the temperature indicating device to the measured internal temperature. Allow at least 1/2 hour for the temperature to stabilize and repeat step 3. Continue until the setting on the temperature indicating device and the internal temperature are the same.
6. Repeat the procedure from step 2 until temperature ranges are checked for all test procedures which require the oven.
7. If the oven does not have a means of adjusting the temperature indicator. Record the setting of the temperature indicating device where you achieve the target temperature. Record this setting in the "As Left" line of the worksheet and set it equal to the target temperature.

Example: Temperature indicating device is set at 231 ° F to reach target temperature of 230 ° F. "As Left" is 231 ° F = 230 ° F.

Worksheet for VP-10

DRYING OVEN WITHOUT ACCESS OPENING

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: __/__/__

| Condition of Equipment | Target Temp | Indicator Setting | Time | Time | Time |
|------------------------|-------------|-------------------|-------------------------|-------------------------|-------------------------|
| | | | 1 ST Reading | 2 ND Reading | 3 RD Reading |
| As Found | | | | | |
| As Left | | | | | |
| As Found | | | | | |
| As Left | | | | | |
| As Found | | | | | |
| As Left | | | | | |
| As Found | | | | | |
| As Left | | | | | |

Note 1: Record temperatures to the nearest whole degree

| |
|------------------------|
| COMMENTS: _____ |
| |
| |
| |
| |
| |
| |

Action Taken: Replaced _____ None _____ Other _____

Time Charge: _____

5. If the internal temperature measured in the oven does not agree with the setting on the temperature indicating device, adjust the temperature indicating device to the measured internal temperature. Allow at least 1/2 hour for the temperature to stabilize and repeat step 3. Continue until the setting on the temperature indicating device and the internal temperature are the same.
6. Repeat the procedure from step 2 until temperature ranges are checked for all test procedures which require the oven.
7. If the oven does not have a means of adjusting the temperature indicator. Record the setting of the temperature indicating device where you achieve the target temperature. Record this setting in the "As Left" line of the worksheet and set it equal to the target temperature.

Example: Temperature indicating device is set at 231 ° F to reach target temperature of 230 ° F. "As Left" is 231 ° F = 230 ° F.

Worksheet for VP-10

DRYING OVEN WITHOUT ACCESS OPENING

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: ___/___/___

| Condition of Equipment | Target Temp | Indicator Setting | Time | Time | Time |
|------------------------|-------------|-------------------|-------------------------|-------------------------|-------------------------|
| | | | 1 ST Reading | 2 ND Reading | 3 RD Reading |
| As Found | | | | | |
| As Left | | | | | |
| As Found | | | | | |
| As Left | | | | | |
| As Found | | | | | |
| As Left | | | | | |
| As Found | | | | | |
| As Left | | | | | |

Note 1: Record temperatures to the nearest whole degree

| |
|------------------------|
| COMMENTS: _____ |
| |
| |
| |
| |
| |
| |

Action Taken: Replaced _____ None _____ Other _____

Time Charge: _____

VERIFICATION PROCEDURE: VP-12

Equipment Verified: **Thermometric Device (Ice point)**

Standard References: ASTM E 77, NIST Special Publication 819

Purpose

This method provides instructions for the verification of accuracy of high-quality liquid-in-glass thermometers or metal probe thermometers at the ice point.

Inspection Equipment Required

1. Dewar Flask (to prevent excessive melting of ice during process)
2. Appropriate stand
3. Thermometer retention clip
4. 10x power magnifier
5. Siphon tube (to remove excess water from flask)
6. Ice (made from distilled water)
7. Ice Shaving Machine
8. Protective gloves (surgical or equivalent)
9. Worksheet for VP-12, VP-13 and VP-75.

Tolerance One tenth of the readability of the device

Procedure

1. Surgical or plastic gloves free of foreign particles shall be worn by the operator.
2. Ice is shaved to the consistency of a “snow-cone” with particles 2 to 5 mm diameter.

3. Place ice in the Dewar flask with distilled water and pack firmly. After approximately 15 to 30 minutes, siphon excess water, resulting from melting of the ice from the flask and add ice to replace that which has melted. The ice bath is ready to use when it has set for 15 to 30 minutes, no ice is floating in the flask, and there is no excess water on the surface of the ice. Put as much ice in the flask as possible and fill the crevices with distilled water. Throughout the procedure, replace excess water with ice.
4. Clean the thermometer or metal probe with distilled water at or below room temperature.
5. Loosen the ice at the center of the bath with an object such as a clean glass rod to a depth approximately equal to the thermometric device's immersion depth. Gently place the thermometric device through the holder into the region of the loosened ice. If the thermometric device touches a firm surface before it is immersed to the immersion line or 0 °C marks then remove it and loosen the ice to a greater depth to permit the thermometric device to be immersed to the proper depth. If the immersion line or 0 °C mark on the thermometric device passes below the surface of the bath before resting on a firm foundation, remove the thermometric device, repack the ice, and loosen the ice to the correct depth.
6. After the thermometric device is properly immersed and perpendicular to the magnifier, (magnifier is not required for probe thermometers with digital displays) firmly pack the ice around the thermometric device.
7. When the thermometric device is resting on a solid section of the ice in the bath and cannot be immersed further, when it is perpendicular to the magnifier and when ice is firmly packed to the immersion line or one scale division below the 0 °C mark, the thermometric device is ready to be read.
8. The thermometric device should remain in the ice bath for approximately one to two minutes. (Thermometers using an organic liquid instead of mercury as the thermometric fluid will require approximately 15 minutes because the organic fluid tends to cling to the wall of the capillary.) When stability is reached, (i. e.: the meniscus stops moving), gently tap the thermometric device (to free the mercury meniscus or the dial indicator) and record the ice-point reading.
9. Take two more readings no less than 1 minute apart. The three readings must agree within one tenth of the readability of the thermometric device.

Worksheet for VP-12 and VP-13

Equipment Verified: Thermometric Device (Ice point)
Thermometric Device (Working Range Verification)

Standard References: ASTM E 77, NIST Special Publication 819

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

Frequency of Verification: OSC 6 Months - Regions Yearly

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

| Thermometric Device Serial # _____ | | | | |
|------------------------------------|----------------------------------|-----------------------------|--------------------------|------------------|
| Type _____ | | | | |
| VP 12-Ice Point | | | | |
| °C / °F | 1st reading | 2 nd reading | 3 rd reading | Within Tolerance |
| | | | | Yes ___ No ___ |
| VP 13-Working Range: | | | | |
| Desired Temperature | Verification Thermometric Device | Working Thermometric Device | Scale Error (difference) | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| | |
|----------------------------------|-----------------------------------|
| Equipment Used To Verify: | |
| Serial # _____ | Calibration expiration date _____ |
| Type _____ | |
| Temperature _____ °C | _____ °F |

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-13**Equipment Verified: THERMOMETER (Working Range Verification)****Standard References: ASTM E 77, AASHTO procedures as noted
Verification Procedures VP-22, VP-23****Purpose**

This method provides instructions for the verification of thermometers used in testing.

Inspection Equipment Required

1. NIST calibrated thermometer(s) appropriate to the test temperature(s).
2. A thermostatically controlled water or oil bath at the appropriate test temperature **or a sand-filled container in an oven.**
3. Corks or thermometer holders as necessary.

Tolerance

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

Specifications

1. T-48 - Cleveland Open Cup - 11 °F or 11 °C.
2. T-49 - Penetration - for warm bath 17 °F or 17 °C, for cold bath 63 °C or 63 °F - must be calibrated at 25.0 °C (±0.1 °C) (77.0 °F (± 0.2 °F)) for warm bath and 4.0 °C (± 0.1 °C) (39.2 °F (± 0.2 °F)) for cold bath.
3. T-50 - Float Test - 15 °F or 15 °C - must be calibrated at 60.0 °C (± 0.5 °C) (140.0F(± 1F)).
4. T-51 - Ductility - for warm bath 17 °F or 17 °C, for cold bath 63 °C or 63 °F - must be calibrated at 25.0 °C (± 0.1 °C) (77.0 °F (± 0.2 °F)) for warm bath and 7.2 °C (± 0.1 °C) (45.0 °F (± 0.2 °F)) for cold bath.
5. T-53 - Ring and Ball Softening Point - 113 °F or 113 °C.
6. T-78 - Cutback - 8 °F or 8 °C.
7. T-201 - Kinematic Viscosity - 110 °C or 110 °F - must be calibrated at 135.0 °C (± 0.02 °C), (275 °F (± 0.04 °C)).

8. T-202 - Absolute Viscosity – 47 °F or 47 °C - must be calibrated at 60.0 °C (± 0.1 °C) (140.0 °F (± 0.2 °F)).
9. T-228 - 63 °F or 63 °C - must be calibrated at 25.0 °C (± 0.1 °C) (77.0 °F (± 0.2 °F)).
10. T-240 - Rolling Thin Film Oven - 13 °C.-must be calibrated at 163 °C (± 0.5 °C) (325 °F ± 1.0 °F).
11. T-59 - (Distillation) - 7 °C or 7 °F.
12. T-59 - (Saybolt) - 17 °C or 17F for tests at 25 °C (± 0.05 °C) (77 °F (± 0.1 °F)), 19C or 19 °F for tests at 50 °C (± 0.05 °C) (122 °F ± 0.1 °F).

13. Other thermometers at the temperature defined by their intended use.

Procedure

1. Set the bath at the appropriate temperature; refer to VP-22 or VP-23. Place a calibrated thermometer and thermometer(s) to be verified in the bath. **For oven procedure, set the oven at the desired temperature**
2. Adjust bath or oven temperature to test temperature according to calibrated thermometer, if necessary.
3. After 1/2 hour record the temperature of the calibrated and working thermometers.
4. Record two more readings not less than 1/2 hour apart.
5. Determine the average correction between the working thermometers and the calibrated thermometer.
6. Indicate the temperature correction on the thermometer and record data on VP-13 form. **For dial thermometers, adjust the dial reading to agree with the verified thermometer reading if possible.**

VERIFICATION PROCEDURE : VP-14**Equipment Verified: BITUMINOUS SPECIMEN MOLDS , SPECIMEN FOLLOWER****Standard References: AASHTO T 247, TP 312, WSDOT W 702****Purpose**

This procedure provides instructions for checking the critical dimension of compressive strength molds, Hveem molds, specimen followers, gyratory compaction molds and bottom plates.

Inspection Equipment Required

1. Calipers or interior micrometer capable of measuring an inside diameter and readable to 0.001 inch (0.01 mm).
2. Ruler, readable to 1/16 inch (1 mm).
3. Verified straight edge
4. Feeler Gauge, 0.001 inch (0.025 mm)

Tolerance

The height and diameter of the molds and followers checked shall meet the dimensional tolerances specified in the applicable test method listed above.

Procedure

(Molds)

1. Measure and record the inside diameter of the mold to the nearest 0.001 inch (0.01 mm). Rotate the mold 90° (¼ turn) and measure and record the inside diameter again.
2. Turn the mold over and repeat Step 1.
3. Average the four measurements.
4. Determine if the average is within required tolerance.
5. Measure and record the height of the mold to the nearest 1/16 inch (1 mm).

(Follower, not applicable for Gyratory compactors)

1. Measure and record the outside diameter of the bottom of the follower to the nearest 0.001 inch. Rotate the follower 90 degrees (1/4 turn) and measure and record the outside diameter again.
2. Average the two measurements.
3. Determine if the average is within the required tolerance.
4. Measure and record the height of the follower to the nearest 1/16 inch (1mm).

(Gyratory Bottom Plate)

1. Using a verified straight edge, and feeler gauge, ensure that the bottom plate is flat by taking two observations at right angles to each other attempting to insert the feeler gauge between the bottom plate and the straight edge. Record the results on the work sheet.
2. Using verified calipers, measure the diameter of the bottom plate in two locations, at right angles to each other. Record the measurements on the work sheet. Average the two readings and compare to the prescribed tolerances.

Worksheet for VP-14

Equipment Verified:

Gyratory Compactor Mold

Standard References:

AASHTO T 247, T 312, WSDOT W 702

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months - Regions Yearly

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

MOLD

| Dimension | Tolerance | 1 st Reading | 2 nd Reading | Average |
|-----------------------|--------------------|----------------------------|----------------------------|---------|
| Inside Dia. Top | 149.90 to 150.00mm | | | |
| Inside Dia. Bottom | 149.90 to 150.00mm | | | |
| Height | 250mm min. | | | |

BOTTOM PLATE

| Dimension | Tolerance | 1 st Reading | 2 nd Reading | Average |
|--------------|--------------------|----------------------------|----------------------------|---------|
| Outside Dia. | 149.50 to 149.75mm | | | |
| Surface | Flat | | | |

TOP PLATE (IF APPLICABLE)

| Dimension | Tolerance | 1 st Reading | 2 nd Reading | Average |
|--------------|--------------------|----------------------------|----------------------------|---------|
| Outside Dia. | 149.50 to 149.75mm | | | |
| Surface | Flat | | | |

Equipment Used To Verify:

- 1.) Caliper # _____ 3.) Straight Edge # _____
 2.) 450 mm Steel Ruler # _____ 4.) Feeler Gauge # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

Comments:

Time Charge: _____

VERIFICATION PROCEDURE : VP-15**Equipment Verified:** **ROLLING THIN FILM OVEN****Standard References:** **AASHTO T-240****Purpose**

This procedure provides instructions for checking the critical components of a rolling thin film oven..
Flow meter is verified prior to completing the verification of other components.

Inspection Equipment Required**FLOW METER VERIFICATION**

1. 4000 ml Ehrlenmeyer Flask
2. Bubble Tubing
3. Lab Timer, readable to 1 second
4. Large sink
5. Worksheet for VP-15

OVEN VERIFICATION

1. Ruler, readable to 1/16 inch (1 mm)
2. Timer, readable to 0.1 second.
3. Calipers, readable to 0.01 inch (0.1 mm)
4. Flowmeter (verified)
5. Thermometer, 13C
6. Laboratory Tubing
7. Drill Bit, No. 60, (1.02 mm diameter)
8. Worksheet for VP-15

Tolerance

The equipment shall meet the tolerances specified in the test methods listed above.

Procedure

FLOW METER VERIFICATION

1. Make sure that oven is off and cooled down.
2. Fill sink with water, sufficient to submerge 4000 ml flask.
3. Attach one end of bubble tubing to orifice in RTFO oven and the other end to the 4000 ml flask.
4. Submerge flask in water until completely full.
5. With oven blower on, have one technician place tubing on orifice and start the time while another person holds flask in water.
6. The technician holding the flask watches the progress of the air filling. When one Minute has elapsed, the technician with the flask marks on the flask and measures the amount of water displaced.

OVEN VERIFICATION

1. Open the oven door. Measure and record the distance from the thermometer to the right side of the oven. Measure and record the distance from the thermometer bulb to the horizontal axis running through the center of the carriage.
2. Insert the No. 60 drill bit in the air jet outlet to determine the diameter.
3. With flow meter attached to laboratory tubing, place on the orifice and record reading.
4. Perform the test according to the test methods listed above. After placing the test samples in the oven, record the time needed for the oven to recover to test temperature.
5. Record the number of carriage rotations in one minute.
6. Record the oven temperature at half-hour intervals until the test is complete.

SAMPLE BOTTLE VERIFICATION

Measure dimensions with calipers for conformance to above referenced specification (Required for new bottles only). Only acceptable bottles will be placed in service.

Worksheet for VP-15

Equipment Verified: ROLLING THIN FILM OVEN

Standard References: AASHTO T-240

Equipment ID# _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

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

AIR FLOW:

Equipment: 4000 ml flask, bubble tubing, timer# _____, large sink

| Specification | Measurement | Acceptable Y/N |
|----------------------|-------------|----------------|
| 4000 ml \pm 300 ml | | |

CARRIAGE ROTATION:

Equipment: Timer# _____, seconds _____, revolutions _____

| Specification | Rate | Acceptable Y/N |
|------------------|------|----------------|
| 15 \pm 0.2 rpm | | |

CHAMBER:

Equipment: Ruler# _____

| Specification | Measurement | Acceptable Y/N |
|-----------------------------|-------------|----------------|
| Height 15" (\pm 1/2") | | |
| Width 19" (\pm 1/2") | | |
| Depth 17 1/2" (\pm 1/2") | | |

AIR JET:

Equipment: Caliper# _____

| Specification | Measurement | Acceptable Y/N |
|-------------------------------|-------------|----------------|
| Orifice 0.04" (\pm 0.003") | | |

THERMOMETER PLACEMENT:

Equipment: Ruler# _____

| Specification | Measurement | Acceptable Y/N |
|--------------------------------|-------------|----------------|
| Distance 2" from right side | | |
| Bulb 1" within horizontal axis | | |

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP-16

Equipment Verified: PENETRATION APPARATUS

Standard References: AASHTO T 49, T 187, ASTM D 217

Purpose

This procedure provides instructions for checking the equipment and needles used to perform the penetration test.

Inspection Equipment Required

1. Balance, readable to 0.01g.
2. Calibrated stopwatch, readable to 0.1 second.
3. Microscope or eyepiece, 10x, with micrometer scale
4. Calipers, readable to 0.01mm
5. Lead shot
6. Worksheet for VP-16

Tolerance**(Penetration: T 49)**

The mass of the spindle shall be $47.5 \pm .05$ g. Weights shall be $50.0 \pm .05$ g, and $100 \pm .05$ g. The needles shall weigh 2.50 ± 0.05 g and meet the tolerances specified in AASHTO T 49. The needle and spindle shall weigh 50.0 ± 0.05 g. Timer shall be accurate to 0.1 second for desired test intervals.

(Penetration T 187)

The cone shall conform to the requirements given in the Standard Method of Test for Cone Penetration of Lubricating Grease (ASTM D 217) except that the interior construction may be modified as desired. The total mass of the cone and attachment shall be 150.0 ± 0.01 g.

Procedure**(T 49 Penetration)**

1. Remove the spindle, 50 and 100g weights from the penetrometer. Record the weight of each to the nearest 0.01g.

2. Weigh each needle to the nearest 0.01 g and record
3. Visually examine each needle with microscope or eyepiece. Each needle shall be free of burrs and the tip shall conform to dimensions referenced in AASHTO T 49.
4. With calipers, measure the length and width to ensure conformance with AASHTO T 49.
5. Weigh needle with spindle and record. Use lead shot to adjust weight as necessary.
6. Compare the timer with a calibrated stopwatch. Record the comparisons for both five (5) seconds and sixty (60) seconds to the nearest 0.1 second.

(T 187 Cone Penetration)

1. Repeat Step 3 as above.
2. Repeat Step 4 as above except check conformance to ASTM D 217.
3. Weigh assembly and record. Use lead shot to adjust weight as necessary.

Worksheet for VP-16

Equipment Verified: **PENETRATION APPARATUS**

Standard References: **AASHTO T 49, T 187, ASTM D 217**

Equipment ID: _____

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

Frequency of Verification: **OSC 6 Months**

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

Equipment Used To Verify:

Verified Balance, readable to 0.01g Balance # _____

 Date Verified _____

Calibrated Timer, readable to 0.1 second Timer # _____

 Date Calibrated _____

Calibrated Caliper, readable to 0.01mm Caliper # _____

 Date Calibrated _____

| Apparatus | Specification | Actual | Acceptable Y/N |
|-------------------------|-----------------|--------|----------------|
| Needle Weight | 2.50+/-0.05g | | |
| Cone Weight | 102.5+/-0.05 g | | |
| Spindle Weight | 47.5 +/- 0.05 g | | |
| Spindle Weight w/Needle | 50.0 +/- 0.05 g | | |
| Total Assembly Weight | | | |

| Needle | Specification | Actual | Acceptable Y/N |
|------------------|-----------------|--------|----------------|
| Length | 40.0 to 45.0 mm | | |
| Diameter | 1.00 to 1.02 mm | | |
| Tip Diameter | 0.14 to 0.16 mm | | |
| Ferrule Length | 38 +/- 1 mm | | |
| Ferrule Diameter | 3.2 +/- 0.05 mm | | |

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

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

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-17

Equipment Verified: **MECHANICAL SIEVING DEVICE**

Standard References: **AASHTO T 27**

Purpose

This procedure provides instructions on testing for sieving thoroughness. Separate instructions are provided for Round sieves, 12 inches (300 mm) in diameter or less and for rectangular screens, and round screens exceeding 12 inches (300 mm) in diameter.

Inspection Equipment Required

1. A set of sieves with standard or non-standard frames as appropriate for the sieving device being checked.
2. Balance, with a capacity required for the principal weight of the sample and readable to at least 0.1 g.
3. Pans, weighing pans, and other appropriate sieve cleaning tools as required.

Tolerance

As specified in AASHTO T 27, sieving action and time shall be sufficient to assure that, after completion, not more than 0.5 percent by weight of the total sample passes any sieve during one minute of continuous hand sieving . (For rectangular sieves or others exceeding 12 inch (300 mm) diameter, one minute of additional mechanical sieving shall be used in the evaluation.)

Procedure

(Use a sample of sufficient size and particle distribution to cover the full range of sieve sizes normally used with the shaker being checked. In no case shall the amount of material on any one sieve smaller than 4.74 mm (No. 4) exceed 4 g per square inch of sieving surface. For sieves larger than 4.74 mm, (No. 4), limit the amount of material to one particle deep.)

1. Weigh and record the total weight of the sample being used.
2. Operate the shaker for the period of time normally used for the type of material under test and record this time period.
3. Remove the sample from the shaker and check thoroughness of sieving as follows:

- 3.1. Round sieves, 12 inches (300 mm) in diameter or less:
- 3.1.1 Remove the sample from the shaker and, beginning with the largest sieve, hand sieve the material retained on the sieve for one minute as specified in AASHTO T 27 and record the weight of material passing the sieve.
Note: To prevent hand injury WSDOT allows a rubber mallet to be used in lieu of the palm of the hand for the one minute check. The force of the blow delivered by the rubber mallet should not exceed the force of a blow delivered by the palm of the hand.
 - 3.1.2. Determine and record the percent passing the sieve based on the total weight of the sample before sieving.
 - 3.1.3 Repeat steps 3.1.1 and 3.1.4 for all sieves used.
 - 3.1.4 If the percent passing any of the sieves exceeds 0.5 percent by weight of the total sample used to check the shaker, increase sieving time, sieve the material again and repeat steps 3.1.1 thru 3.1.4 until this criterion is met.
 - 3.1.5 Record the extended sieving time, if any, found in step 3.1.4 above, as the minimum time for the shaker in question.
- 3.2. Rectangular sieves, or round sieves exceeding 12 inches (300 mm) diameter:
- 3.2.1 Remove the sample from the shaker and, beginning with the largest sieve, record the weight of the sieve and retained material after the initial shaking.
 - 3.2.2 Then, starting with the largest screen, return the screen to the shaker, placing it over a pan. Agitate for one additional minute.
 - 3.2.3 Remove and weight the screen again and determine if less than 0.5% of the original sample passes the screen Repeat this process for all screens
 - 3.2.4 If any screens show an increase of more than 0.5% passing, increase the base shaking time for the machine by one minute, and repeat steps 3.2.1 thru 3.2.4.
 - 3.2.5 When no screens show an increase exceeding 0.5% record the new shaking time as minimum for the device.

VERIFICATION PROCEDURE : VP-18

Equipment Verified: **DEGRADATION TEST SHAKER**

Standard References: **WSDOT TEST METHOD 113**

Purpose

This method provides instruction for checking the modified Tyler sieve shaker to insure operation at the specified amplitude and number of cycles per minute.

Inspection Equipment Required

1. 18 inch scale readable to 1/16 inch (1 mm).
2. Hand held Mechanical counting device readable to 500 units minimum. A tachometer capable of reading to 500 unit per minute may also be used (A Mitutoyo Non-contact Digital Tachometer, Model 982-522, has been found to be satisfactory for this purpose.)
3. Verified timer, readable to 1 second.

Tolerance

Degradation shaker (modified Tyler sieve shaker) shall be capable of operation at 300 \pm 5 complete cycles per minute. Cam throw shall be 1 3/4 inch \pm 1/8 inch.

Procedure

1. If a mechanical counting device is used, the counting device shall be able to determine the number of complete agitation cycles per minute. If such a device as the non-contact tachometer is used, start the shaker and hold the tachometer in such a manner as to cause the beam of light emitted from the lens to be broken by one edge of the moving part of the shaker that causes agitation as specified in the above procedure.
2. Operate the shaker for a one minute period and record the number of cycles. Repeat for a total of three times and average the results.
3. Measure the throw of the shaker with the shaker at each of its extremes.
4. Record the results and insure that the values obtained meet the tolerances referenced above.
5. If the values do not meet the tolerances, adjust the shaker and repeat steps 1 and 2 above.

Worksheet for VP- 18

Equipment Verified: MODIFIED TYLER SIEVE SHAKER

Standard References: **WSDOT T-113**

Equipment ID: _____

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

Frequency of Verification: OSC 12 Months - Regions Yearly

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

Cam

1.) Cam throw measurement..._____

2.) Specifications:..... (1 3/4", +/- 1/8")

Number of cycles per minute

1.) Measured cycles....._____

2.) Specifications:..... (300 +/- 5)

Equipment Used To Verify:

1.) Caliper # _____

2.) 18" scale # _____

Equipment found to be: Satisfactory_____ Unsatisfactory_____

Action Taken: Replaced_____ None_____ Other_____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-19

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

Standard References: **AASHTO T 176**

Purpose

This method provides instruction for checking the mechanical shaker to insure operation at the specified amplitude and number of cycles per minute.

Inspection Equipment Required

1. A measuring device capable of measuring the specified throw of 8 inches and accurate to at least 0.001 inch. (0.02 mm)
2. Handheld mechanical counting device capable of reading to 500 counts, minimum. A noncontact tachometer readable to 500 units per minute may also be used.
(A Mitutoyo Non-contact Digital Tachometer, Model 982-522, has been found to be satisfactory for this purpose.)
3. Verified timer, readable to 1 second.

Tolerance

Mechanical shakers shall be capable of operation at 175 ± 2 cycles per minute (2.92 ± 0.03 Hz) and have a throw of 8 ± 0.04 inches (203.3 ± 1.02 mm).

Procedure

1. If a mechanical counting device is used to determine the number of cycles per minute, operate the shaker for 60 ± 1 seconds and record the number of cycles in one direction as cycles per minute.. If such a device as the non-contact tachometer is used, start the shaker and hold the tachometer in such a manner as to cause the beam of light emitted from the lens to be broken by one edge of the moving part of the shaker, and record the reading displayed on the tachometer as cycles per minute.
2. Having first taken the proper steps to insure personal safety, manually operate the mechanism to one extreme of its throw.
3. Measure the distance along a straight line parallel to the movement of the shaker, from a stationary point on the frame to a fixed point on the part that holds the graduated plastic cylinder.

4. Slowly, manually operate the shaker in such a way as to cause the movable part of the shaker to move to its extreme position and record the difference between the first measurement and the second. This value equals the throw of the shaker.
5. Record the results and insure that the values obtained meet the tolerances referenced above.
6. If either of the values, cycles per minute or throw, do not meet the tolerances, the shaker shall be taken out of service and either replaced or made to conform to the referenced tolerances.

Worksheet for VP- 19

Equipment Verified: MECHANICAL SE MECHANICAL 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:** ___/___/___

| Cycles per minute | | Throw (nearest 0.00") | |
|-------------------|------------------------------|-----------------------|-----------------------------------|
| Measured | Specified | Measured | Specified |
| | 175 +/- 2 (2.92 +/- 0.03 Hz) | | 8 +/- 0.04 in (203.2 +/- 1.02 mm) |
| | 175 +/- 2 (2.92 +/- 0.03 Hz) | | 8 +/- 0.04 in (203.2 +/- 1.02 mm) |

Timer.....(+/- 1 second)_____

Equipment Used To Verify:

- 1.) Caliper # _____
- 2.) 18" scale # _____

Equipment found to be: Satisfactory_____ Unsatisfactory_____

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

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-20

Equipment Verified: SAND EQUIVALENT WEIGHTED FOOT ASSEMBLY

Standard References: AASHTO T 176

Purpose

This method provides instructions for the verifying the condition and mass of the weighted foot assembly.

Inspection Equipment Required

1. Calipers, readable to 0.001 inch
2. Balance, 5 kg capacity, readable to 1 g.

Tolerance

The mass of the weighted foot assembly shall be 1000 grams \pm 5 grams.

The distance from the bottom of the foot to the top of the sand indicator shall be 256.5 mm \pm 0.40 mm.

Procedure

1. Determine and record the weight of the weighted foot assembly to the nearest 1 g.
2. Measure the distance from the bottom of the weighted foot to the top of the sand indicator to the nearest 0.01 mm.

Worksheet for VP- 20

Equipment Verified: SAND EQUIVALENT WEIGHTED FOOT ASSEMBLY

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:** ___/___/___

| | |
|---|-------------|
| 1.) Measure and Record Mass of Weighted Foot Assembly | _____ grams |
| (Specifications: 1000 grams +/- 5 grams) | |
| | |
| 2.) Measure Distance From Bottom of Weighted Foot Assembly to Top of Sand Indicator | _____ mm |
| (Specifications: 256.5 mm +/- 0.40 mm) | |

Equipment Used To Verify:

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

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-21

Equipment Verified:

TIMING DEVICES

Standard References: As required by AASHTO T 27, T 49, T 72, T 88, T 100,
T 176, T 201, and T 202.

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 6 Months - Regions - Yearly

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

| 1st Reading | 2nd Reading | 3rd Reading |
|-------------|-------------|-------------|
|-------------|-------------|-------------|

| | | | |
|--------------------|--|--|--|
| (A) Timer # _____ | | | |
| (B) Standard Timer | | | |
| Difference | | | |
| % Of Accuracy = | | | |
| ACCEPTABLE (Y/N) | | | |

| | | | |
|--------------------|--|--|--|
| (A) Timer # _____ | | | |
| (B) Standard Timer | | | |
| Difference | | | |
| % Of Accuracy = | | | |
| ACCEPTABLE (Y/N) | | | |

| | | | |
|--------------------|--|--|--|
| (A) Timer # _____ | | | |
| (B) Standard Timer | | | |
| Difference | | | |
| % Of Accuracy = | | | |
| ACCEPTABLE (Y/N) | | | |

Equipment Used To Verify:

Standard Timer #: _____ (B) Date Calibrated: _____

Calculations:

% OF ACCURACY = (A-B)100/B A = TIMER TO BE CALIBRATED B = STANDARD TIMER
(ALREADY CALIBRATED)

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP-22

Equipment Verified:

OIL BATHS

Standard References:

AASHTO T 201, AASHTO T 59

Purpose

This method provides instructions for verifying the temperature settings on oil baths.

Inspection Equipment Required

1. Thermometer, calibrated and readable to 0.05C.
2. Cork of appropriate size or thermometer holder.
3. Worksheet for VP-22 and VP-23.

Tolerance

1. The bath shall be at 135C ($\pm .06$ C) for AASHTO T 201.
2. The bath shall be at 50C (± 0.05 C), or 25C (± 0.05 C) for Saybolt viscosity, AASHTO T 59.

Procedure

1. Refer to appropriate test method for Oil Bath Specification.
2. Place the thermometer through cork or thermometer holder.
3. Take the first reading at least one hour after the thermometer and bath have come to temperature.
4. Take three consecutive readings, no less than 30 minutes apart and record. If any reading is not within the range allowed for that bath, adjust the bath and start readings over.

Worksheet for VP-22 and VP-23

Equipment Verified: OIL BATHS/Water Baths

Standard References: SEE VP-22 AND VP-23

Equipment ID# _____ **TYPE OF BATH:** _____

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

Frequency of Verification: OSC Liquid Asphalt 12 Months
 OSC Mix Laboratory 6 Months
 Regions Yearly

Verification Procedure Used: _____

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

| Target Temperature | After 1 Hour | After ½ Hour | After ½ Hour | After ½ Hour | Acceptable Y/N |
|--------------------|--------------|--------------|--------------|--------------|----------------|
| | | | | | |
| | | | | | |
| | | | | | |

Equipment Used To Verify:

1.) Thermometer #'s: _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-23

Equipment Verified:

WATER BATHS

Standard References:

See Tolerances section below.

Purpose

This method provides instructions for verifying the temperature settings on water baths.

Inspection Equipment Required

1. Thermometer, calibrated and readable to 0.03C (± 0.05 F)
2. Cork of appropriate size or thermometer holder.
3. Worksheet for VP-22 and VP-23.

Tolerance

1. Absolute Bath - AASHTO T-202 - Range of 60 ($\pm .03$ C).
2. Float Bath - AASHTO T-50 - 60 C.
3. Warm Penetration Bath - AASHTO T-49 - Range 25.0 (± 0.1 C).
4. Cold Penetration Bath - AASHTO T-49, 50 - Range 4.0 (± 0.1 C).
5. Emulsion Bath - AASHTO T-59 - 71 C.
6. Saybolt Bath - AASHTO T-59 (Saybolt Viscosity) – 71 (± 3 C).
7. **Other Baths at the temperature defined by their intended use.**

Procedure

1. Refer to appropriate test procedure for water bath specifications.
2. Place the thermometer through cork or thermometer holder. Position the thermometer in the water bath so that the appropriate portion of thermometer scale is readable.
3. Take the first reading at least one hour after the thermometer and bath have come to temperature.
4. Take three consecutive readings, no less than 30 minutes apart and record. If any reading is not within the range allowed for that bath, adjust the bath and start readings over.

Worksheet for VP-22 and VP-23

Equipment Verified: OIL BATHS/Water Baths

Standard References: SEE VP-22 AND VP-23

Equipment ID# _____ **TYPE OF BATH:** _____

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

Frequency of Verification: OSC Liquid Asphalt 12 Months
OSC Mix Laboratory 6 Months
Regions Yearly

Verification Procedure Used: _____

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

| Target Temperature | After 1 Hour | After ½ Hour | After ½ Hour | After ½ Hour | Acceptable Y/N |
|--------------------|--------------|--------------|--------------|--------------|----------------|
| | | | | | |
| | | | | | |
| | | | | | |

Equipment Used To Verify:

1.) Thermometer #'s: _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-24**Equipment Verified:** **KINEMATIC VISCOSITY TUBES****Standard References:** **AASHTO T-201, Annex A.3. Calibration of Viscometers****Purpose**

This method provides instructions for the annual calibration of Zeitfuchs Cross-arm viscometers.

Inspection Equipment Required

1. Thermometer, calibrated and readable to 0.03C (0.05F) for the appropriate temperature.
2. A thermostatically controlled water or oil bath at the appropriate test temperature.
3. Corks or thermometer holders as necessary.
4. ASTM viscosity oil standards. Refer to AASHTO T 201, Annex 3 for the appropriate standard.
5. Materials Lab Computer program "Viscont"
6. Verified Timer

Tolerance N/A**Procedure**

1. Place a calibrated thermometer in the bath. Set the bath at the appropriate temperature, and verify bath according to VP-22 for Oil baths or VP-23 for Water Baths.
2. Make sure all tubes are immaculately clean.
3. Access, from the computer, the "Viscont" program and locate viscometer tube record by tube number. Archive the existing record by adding that year to the tube number. For example T 736 changes to T 73695. Then create a new record by tube number.
4. Input appropriate information.
5. Run two viscosities in each tube using the appropriate standard and record the results, carefully cleaning the tubes between viscosities.

6. Review the results to determine whether they are within 1.8% of their mean. If not rerun both viscosities
7. Document all work in the “Viscont” program.

VERIFICATION PROCEDURE : VP-25**Equipment Verified:** ABSOLUTE VISCOSITY TUBES**Standard References:** AASHTO T-202, Appendix X4, Calibration of Viscometers**Purpose**

This method provides instructions for the annual calibration of absolute viscosity tubes.

Inspection Equipment Required

1. Thermometer, calibrated and readable to 0.01C. for the appropriate temperature.
2. A thermostatically controlled water bath at the appropriate test temperature, verified in conformance to VP-23.
3. Corks or thermometer holders as necessary.
4. ASTM viscosity oil standards, refer to AASHTO T 202, Appendix X4.
5. Verified timer, readable to 0.1 seconds.
6. Pressure Regulator
7. Materials Lab computer, Program "Viscont".

Tolerance N/A**Procedure**

1. Place a calibrated thermometer in the bath Set the bath at the appropriate temperature and verify the bath temperature in conformance to VP - 23.
2. Verify that pressure regulator conforms to VP - 26.
3. Make sure all tubes are immaculately clean, refer to AASHTO T 202.
4. Access from the computer, the "Viscont" program and locate the viscometer tube record by tube number. Archive the existing record by adding that year to the tube number. For example, tube T 736 change to T 73695. Then create a new record by tube number.
5. Input the appropriate information..

6. Run two viscosities in each tube using the appropriate standard and record the results, carefully cleaning the tubes between viscosities.
7. Check the results to ensure that they are within 2% of their mean. If not rerun both viscosities.
8. Document all work in the “Viscont” program.

VERIFICATION PROCEDURE: VP-26

Equipment Verified: **DIGITAL PRESSURE REGULATOR**

Standard References: **AASHTO T-202**

Purpose

This procedure provides instructions for checking the Digital Pressure Regulator used to control the vacuum in the absolute viscosity test.

Inspection Equipment Required

Instruction Manual Appendix C, Calibrating the Meriam Gauge, from the Cannon Instrument Company.

Tolerance

The vacuum must be maintained at 300 (± 0.5) mm Hg.

Procedure

1. Zero the differential gauge by performing the following:
 - A. The gauge must be in Measurement mode displaying the current vacuum/pressure reading. Toggle the DVR power switch on the front panel to METER. Bleed DVR by opening stopcock and disconnect vacuum source tube. Wait a minimum of 5 minutes for the system pressure to stabilize at atmospheric. The gauge reading should be no greater than 0.1.
 - B. Press the UP and DOWN keys simultaneously. The gauge LCD will begin flashing a 5 second countdown.
 - C. During the countdown press and release the PRGM key. The countdown will begin again from 0005.
 - D. During countdown press UP and DOWN keys simultaneously. LCD will flash 0000 several times while the new zero reading is taken. The gauge will return to MEASUREMENT mode and display the vacuum/pressure using the new reading.
 - E. Reattach vacuum hoses and close stopcock. Switch DVR to RUN.
2. Attach the calibrated measuring device by threading a “presto lock 1/8” fitting into the end of the tube normally connected to a viscosity tube using teflon tape. Ensure the connection is tight.

3. Turn on the DVR and allow it to regulate vacuum at 300 (± 0.5) mm Hg.
4. Once DVR has stabilized, compare the reading on the DVR LCD screen to the reading on the NIST traceable pressure meter.
5. Compare the readings for 5 minutes. Record the two readings. If the difference is greater than 0.20 mm Hg, then the regulator is out of specification.

Worksheet for VP-26

Equipment Verified:

DIGITAL PRESSURE REGULATOR

Standard References:

AASHTO T-202

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: _____

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

| VACUUM RELEASE D | VACUUM ON | | SYSTEM CLOSED | ACCEPTANCE |
|--|-------------------|---------------------|---------------------------|------------------------------------|
| SCALE ADJUSTED TO READ 0.00? Y/N | VACUUM READING | TOLERANCE | LOSS OF VACUUM Y/N* | ACCEPTABLE PER VP-87 Y/ N |
| | mmHg | 300 mmHg (± 0.5) | | |
| | mmHg | 300 mmHg (± 0.5) | | |

* If vacuum loss is noted, repair leaks in the system and refer to the Instruction Manual.

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-27

Equipment Verified: CLEVELAND OPEN CUP APPARATUS AND TEST CUPS

Standard References: AASHTO T 48

Purpose

This procedure provides instruction for checking the physical dimensions, performance, and operation of the Cleveland Open Cup Apparatus and test cups as outlined in AASHTO T 48.

Inspection Equipment Required

1. Calipers, readable to 0.1 mm
2. Certified Reference Material (CRM), as listed in AASHTO T 48 annex A2.
3. Worksheet for VP-27.

Tolerance

Equipment shall have dimensions within the tolerances shown in Figures 1, 2, and 3 of AASHTO T 48.

Performance of the apparatus shall be within the limits of AASHTO T 48 table A2.1.

Procedure

Measure the dimensions shown in Figures 1, 2, and 3 of AASHTO T 48 and record on worksheet for VP-27.

Verify the performance of the apparatus by determining the flash point of a certified reference material (CRM), as listed in AASHTO T 48 annex A2. Record on worksheet for VP-27.

Worksheet for VP-27

Equipment Verified: CLEVELAND OPEN CUP APPARATUS AND TEST CUPS

Standard References: AASHTO T 48

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

| Test Cup | 1 | 2 | 3 | 4 |
|--------------------------------|---|---|---|---|
| O.D. Flange 97-101mm | | | | |
| O.D. Below Flange 67.5-69.0 mm | | | | |
| I.D. 62.5-64.0 mm | | | | |
| Rim to Fill Mark 9-10 mm | | | | |
| Depth of cup 32.5-34.0 mm | | | | |
| Bottom Thickness 2.8-3.6 mm | | | | |

Test Flame Applicator

| | |
|--|--|
| Swing Radius not less than 150 mm | |
| Orifice not more than 2.5 mm above cup | |
| Diameter of tip 1.6-5.0 mm | |
| Bead Diameter 3.2-4.8 mm | |

Certified Reference Material (CRM)

| | |
|---|--------|
| Certified Reference Material flash point | °C |
| Flash Point obtained | °C |
| Flash Point within limits of CRM? | YES/NO |
| Barometric pressure at 760 mm (\pm 15 mm Hg) | YES/NO |
| Corrected Flash Point (if needed) | °C |

Equipment Used To Verify:

Inspection Equipment Required: **Calibrated Caliper, readable to 0.1mm**

Caliper # _____

Date calibrated _____

Certified Reference Material

Lot # _____

Expiration Date _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-28

Equipment Verified: **FLOAT AND COLLARS**

Standard References: **AASHTO T 50**

Purpose

This method provides instructions for checking the critical dimensions of the float and collars.

Inspection Equipment Required

1. Calipers, readable to 0.1 mm.
2. Water Bath
3. Balance, readable to 0.01 grams.
4. Worksheet for VP-28.

Tolerance

Float shall weigh 37.90 (± 0.20) grams, have a total height of 35.0 (± 1.0) mm, height of rim above lower side of shoulder of 27.0 (± 0.5) mm, thickness of shoulder of 1.4 (± 0.1) mm, and diameter opening of 11.1 (± 0.1) mm. Top of float shall have a diameter of 92.0 (± 2.0) mm.

Collars shall weigh 9.80 (± 0.20) grams, have an overall height of 22.5 (± 0.2) mm, inside diameter at bottom of 12.82 (± 0.10) mm, and an inside diameter at top of 9.70 (± 0.05) mm.

Assembly with float and fill collar and a total weight of 53.2 grams shall float with the rim 8.5 (± 1.5) mm above the surface of the water bath. Lead shot may be necessary to bring the total weight to 53.2 grams.

Procedure

Float:

1. Measure all required dimensions of the float and record.
2. Weigh the float to 0.01 grams and record.

Collars:

1. Measure all required dimensions of the collars and record.
2. Weigh collars to 0.01 grams and record

Apparatus

1. Fill collar flush with the bottom.
2. Assemble filled collar and float. Correct weight by adding lead shot to 53.2 grams.
3. Float assembled apparatus in water bath. Measure from surface of water to rim of apparatus and record.

Worksheet for VP-28

Equipment Verified: FLOAT AND COLLARS

Standard References: AASHTO T 50

Equipment ID: _____

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

Frequency of Verification: OSC - 12 Months

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

DIMENSIONS

| | | | | | |
|---------------------------------------|---------------------------------------|-------------------------|---|---|-----------------------|
| Float Apparatus | Specification Recommended | Actual Dimension | | | Acceptable Y/N |
| Cup Dimension | 90.0 to 94.0 mm | | | | |
| Mass | 37.70 to 38.10 g | | | | |
| Total Height | 34.0 to 36.0 mm | | | | |
| Rim Height | 26.5 to 27.5 mm | | | | |
| Shoulder Thickness | 1.3 to 1.5 mm | | | | |
| Opening Diameter | 11.0 to 11.2 mm | | | | |
| Collar | Specification Recommended | Actual Dimension | | | Acceptable Y/N |
| | | A | B | C | |
| Mass | 9.60 to 10.00 g | / | / | | |
| Over-all Height | 22.3 to 22.7 mm | / | / | | |
| ID Bottom | 12.72 to 12.92 mm | / | / | | |
| ID Top | 9.65 to 9.75 mm | / | / | | |
| Depth of immersion | Specification Recommended | Actual Dimension | | | Acceptable Y/N |
| Filled float, collar & shot to 53.2 g | 8.5 (± 1.5) mm above surface of water | | | | |

Float Aluminum Alloy Y____ N____ Collar Brass Y____ N____

Equipment Used To Verify:

Calibrated Caliper, readable to 0.1mm Caliper # _____ Date Calibrated _____

Verified Balance, readable to 0.01g Balance # _____ Date Verified _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

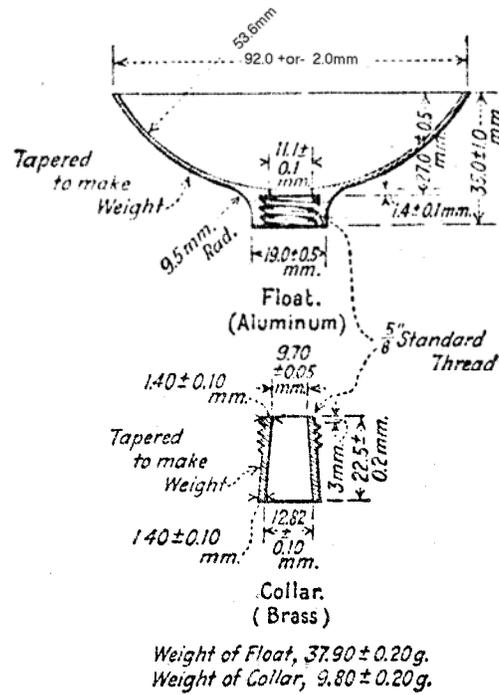


FIG. 1 Float Test Apparatus

VERIFICATION PROCEDURE : VP-29

Equipment Verified: **RING-AND-BALL APPARATUS**

Standard References: **AASHTO T 53**

Purpose

This procedure provides instruction for checking all critical dimensions of the ring-and-ball apparatus.

Inspection Equipment Required

1. Calipers, readable to 0.1 mm.
2. Ruler.
3. Balance capable of weighing to 0.01 gram.
4. Worksheet for VP-29.

Tolerance

Equipment shall have dimensions within the tolerances shown in Figures 1a - 1c of AASHTO T 53.

Procedure

1. Measure all dimensions shown in Figures 1a - 1c of AASHTO T 53 and record findings.
2. Measure and weigh the ball and record findings.
3. Measure the distance from the bottom plate to the bottom of the rings and record findings.
4. Measure the distance from bottom plate to the bottom of the bath and record findings.
5. Note that the bottom of the thermometer bulb is even with the bottom of the rings.
6. Note that the ring holder is brass

Worksheet for VP-29

Equipment Verified: RING-AND-BALL APPARATUS

Standard References: AASHTO T 53

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

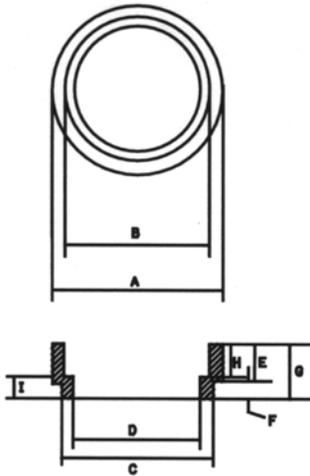
Frequency of Verification: OSC - 12 Months

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

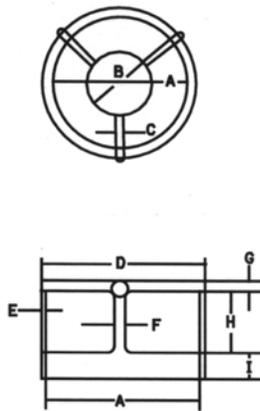
Shoulder Ring

Centering Guide

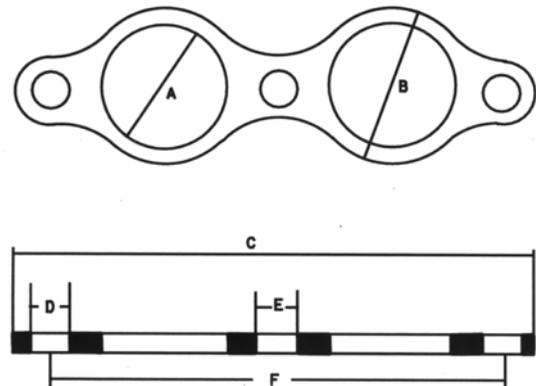
| Section | Specification | Actual | Acceptable Y/N | Section | Specification | Actual | Acceptable Y/N |
|---------|----------------|--------|----------------|---------|----------------|--------|----------------|
| A | 23.0 +/-0.3 mm | | | A | 23.1 | | |
| B | 19.8 +/-0.3mm | | | B | 9.7 | | |
| C | 18.8 +/-0.3mm | | | C | 1.5 +/-0.5 mm | | |
| D | 15.9 +/-0.3mm | | | D | 24.6+/-0.03 mm | | |
| E | 4.4 +/-0.3 mm | | | E | 0.8+/-0.5 mm | | |
| F | 2.0 +/-0.3 mm | | | F | 3.0+/-0.5 mm | | |
| G | 6.4 +/-0.4 mm | | | G | 1.5+/- 0.3mm | | |
| H | 3.6 +/-0.3 mm | | | H | 4.8+/-0.3 mm | | |
| I | 2.8 +/-0.3 mm | | | I | 4.3+/-0.3 mm | | |



Shoulder Ring



Centering Guide



Ring Holder

RING HOLDER DIMENSIONS

| Section | A | B | C | D | E | F |
|----------------|---------|--------------|--------------|-------------|-------------|--------------|
| Specification | 19.0 mm | 23.9+/-0.5mm | 76.2+/-0.5mm | 5.6+/-0.5mm | 5.6+/-0.5mm | 66.5+/-0.5mm |
| Actual | | | | | | |
| Acceptable Y/N | | | | | | |

Equipment Used To Verify:

Calibrated Caliper, readable to 0.1mm Caliper # _____ Date Calibrated _____

Calibrated Ruler, readable to 1mm Ruler # _____ Date Calibrated _____

Verified Balance, readable to 0.01g Balance # _____ Date Verified _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-30**Equipment Verified:****SAYBOLT VISCOSITY TUBES****Standard References:****AASHTO T 72****Purpose**

This method provides instructions for the replacement of Saybolt viscosity tubes.

Inspection Equipment Required

1. Orifice wrench.
2. Materials Lab Computer, Program "Viscont".

Tolerance N/A**Procedure**

1. Order Saybolt Furol orifices with a certified correction factor of 1% or less.
2. Access "Viscont" program from the computer and locate Saybolt apparatus by equipment number. Archive the record by adding that year to the equipment number. For example, N122F change to N122F95. Then create a new record.
3. Input new orifice values.

VERIFICATION PROCEDURE: VP-31

Equipment Verified: VACUUM SYSTEM

Standard References: AASHTO T 209, WSDOT W 718, T 100, WSDOT T 606

Purpose

This method provides instructions to verify that minimum vacuum is achieved and to correct readings on the vacuum gauge.

Inspection Equipment Required

1. Absolute pressure gauge.
2. Water trap.
3. Hoses, connectors, and any other miscellaneous fittings.
4. Rice jars.

Tolerance

When all jar(s) are connected to the vacuum system with the valve(s) fully open, a maximum of 30mm Hg will be measured.

Procedure

1. Connect the absolute pressure gauge to the system with the water trap in line between the system and the gauge. A hose tees off the main line to the bench mounted valve, which can be used for the connection.
2. Check all connections for air tightness.
3. Fill all jars one-half full of water and connect to the system.
4. Open the vacuum line fully and allow the system to stabilize.
5. Record the vacuum achieved.
6. Close vacuum line and bleed vacuum system slowly to atmospheric pressure.
7. Repeat steps 4 and 5. If both checks meet tolerance, stop. Mark the appropriate vacuum level on the gauge for reference. For WSDOT FOP for AASHTO T-209 bleed the vacuum slowly to 30mm Hg (4.0kPa) and mark the gauge for reference.
8. If either test fails to meet tolerance, repeat steps 4 and 5 until two consecutive tests meet

tolerance. If this cannot be done, discontinue use of the vacuum system until repairs can
_____ be made.

Worksheet for VP-31

Equipment Verified: **VACUUM SYSTEM**

Standard References: **AASHTO T209, WSDOT 718**

Equipment ID: _____

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

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

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

| Vacuum Pressure | | Air Tightness |
|-----------------|----------------|---------------|
| First Reading | Second Reading | |
| | | |

Equipment Used To Verify:

1.) Absolute Pressure Gauge # _____

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

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

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP-32

Equipment Verified: SLUMP CONE

Standard References: AASHTO T 119

Purpose

This method provides instructions for checking the critical dimensions of the slump cone used in the above test method.

Inspection Equipment Required

1. Calipers or ruler readable to 1mm.
2. Ruler readable to 1/16" (1 mm).

Tolerance

1. Metal thickness shall be not less than BWG 16 gage (0.065 inches).
If produced by a spinning process the min. thickness shall not be less than 0.045 inch (1.14 mm).
2. Base shall be $8 \pm 1/8$ inch (203 ± 3 mm).
3. Top shall be $4 \pm 1/8$ inch (102 ± 3 mm)
4. Height shall be $12 \pm 1/8$ inch (305 ± 3 mm)

Procedure

1. Measure the inside diameter at the top of the cone to the nearest 1mm by taking two readings 90° apart using the calipers and record the results.
2. Invert the cone and repeat Step 1 using a ruler.
3. Place the cone on a flat glass surface. Measure the height of the cone by using the ruler and record the results.
4. Measure the thickness of the cone to the nearest 1mm by taking two (2) readings 90° apart at the top of the cone and two (2) readings 90° apart at the bottom of the cone and record the results.
5. Examine the interior to determine that it is relatively smooth, free of projections and free of dents.

Worksheet for VP- 32

Equipment Verified: SLUMP MOLD SPECIFICATIONS

Standard References: AASHTO T-119

Equipment ID: _____

Location: _____

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

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

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

| | | | | |
|-----------------|---------------------------------|---|------|-------|
| Metal Thickness | not less than 0.045in. (1.15mm) | = | Top | _____ |
| | | | Base | _____ |
| Top Diameter | 4.0 in./102 mm (+/- 1/8 in.) | = | | _____ |
| Base Diameter | 8.0 in./203 mm (+/- 1/8 in.) | = | | _____ |
| Height | 12.0 in./305 mm (+/- 1/8 in.) | = | | _____ |

Equipment Used To Verify:

- 1.) Caliper # _____
- 2.) 18" scale # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP - 33**Equipment Verified: COHESIOMETER****Standard References : W 703****Purpose**

This method provides instruction for verifying the flow rate of water as specified in the above test procedure.

Inspection Equipment Required

1. Balance with a capacity required for the principle weight being tested.
2. Stopwatch (or other suitable timing device) for timing the duration of the flow.

Tolerance

The device shall be capable of allowing the water to flow into the receiver at the end of the lever arm at a rate of 1800 +/- 50 g/min.

Procedure

1. Allow the water to flow into the receiver at the end of the lever arm for 1 minute.
2. Weigh the water and determine compliance with the specified 1800 +/- 50 grams in the 1 minute period.
3. Adjust flow rate as necessary and repeat steps 1 and 2 until the flow rate is 1800 ± 50 g/min.

Worksheet for VP-33

Equipment Verified: **COHESIOMETER**

Standard References: **AASHTO T 246**

Equipment ID: _____

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

Frequency of Verification: Daily prior use

| Target Wt. | First reading | Second reading | Third reading | Date | Tech ID |
|-------------------|---------------|----------------|---------------|------|---------|
| 1800 +/- 25 grams | | | | | |
| In one minute | | | | | |

Equipment Used To Verify:

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

Equipment found to be: Satisfactory_____ Unsatisfactory_____

Action Taken: Replaced_____ None_____ Other_____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP - 34**Equipment Verified: CALIFORNIA KNEADING COMPACTOR****Standard References : W 702****Purpose**

This method provides instruction for checking critical dimensions and provisions for applying an average contact pressure of the various required loads to the tamper foot used in the appropriate test procedure listed above.

Inspection Equipment Required

1. Load cell of at least 1,000 lb. capacity.
2. Recording device capable of producing load-time trace, such as a strip chart recorder.

Tolerance

The peak momentary load shall be within 5% of the intended load in the range of 350 to 500 psi.

The dwell time shall be within 5% of the dwell time established for the compactor according to the manufacturer's specifications.

Procedure

1. Insure the strip chart recorder is in calibration by carefully placing a full scale load on the load cell with a calibrated compression testing device.
2. Measure and record the load-time trace using the chart recorder.
3. Verify that the applied force and dwell time is within the tolerances specified.
4. If any required measurements are not within specifications listed above, make the necessary adjustments to the compactor controls.
5. Repeat steps 2 through 4 until all measurements are within specifications.

Worksheet for VP-34

Equipment Verified: KNEADING COMPACTOR

Standard References: WSDOT 702

Equipment ID: _____

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

Frequency of Verification: OSC 12 months

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

| Plateau Pressure | Peak Pressure | Dwell Time | Date | Tech ID |
|------------------|---------------|------------|------|---------|
| | | | | |
| | | | | |

*Attach final chart recorder paper to VP worksheet.

Equipment Used To Verify:

- 1.) Load Cell # _____
- 2.) Chart Recorder # _____

Equipment found to be: Satisfactory_____ Unsatisfactory_____

Action Taken: Replaced_____ None_____ Other_____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP - 35**Equipment Verified: HYDROMETER****Standard References : AASHTO T 88****Purpose**

This method provides instructions for checking the critical dimensions of a hydrometer used in the above test.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm
2. Steel ruler readable to 0.5 mm.
3. Verified thermometer readable to 0.5C (1F).
4. Worksheet for VP-35.

Tolerance

1. The diameter of the bulb portion of the hydrometer must be within 30.5 mm to 32.0 mm at its widest portion.
2. The scale of the hydrometer, as measured from the “zero” division of the scale to the “50” division must be within 82 mm and 84 mm.
3. Scale must read “zero” at 20C.

Procedure

1. Measure the critical dimensions with the caliper.
2. Check the “zero” reading in distilled water in the hydrometer tube. The hydrometer must float at the “zero” division.
3. Record all results on the worksheet.
4. Record any wear on the worksheet.

Worksheet for VP- 35

Equipment Verified: Hydrometer

Standard References: AASHTO T-88

Equipment ID: _____

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

Frequency of Verification: OSC - 24 Months

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

| | |
|--|----------|
| 1.) Measure and Record diameter of the bulb @ widest portion | _____ mm |
| (Specifications: 30.5 mm to 32.0 mm) | |
| 2.) Check scale length of the Hydrometer (as measured from 0 - 50) | _____ mm |
| (Specifications: 82 mm to 84 mm) | |
| 3.) Scale reading @ 20C | _____ mm |
| (MUST read "zero" @ 20C) | |
| 4.) Does Hydrometer "float" @ "zero"? | _____ ok |

Equipment Used To Verify:

- 1.) Caliper # _____
- 2.) Steel Ruler # _____
- 3.) Thermometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP - 36**Equipment Verified: BALANCES AND SCALES****Standard References : AASHTO M 231****Purpose**

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

Inspection Equipment Required

1. Laboratory weights (checked by AMRL) and/or weights provided by an outside agency performing the calibration, traceable to NIST by test #.
2. Appropriate cleaning equipment, tools,and misc.

Tolerance

The balance or scale shall conform to the standard specification listed in the applicable table of AASHTO M 231, for the type and class of balance being calibrated.

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-36

Equipment Verified:

BALANCES AND SCALES

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- 37**Equipment Verified: CONCRETE BEAM MOLDS****Standard References: AASHTO T 23****Purpose**

This procedure provides instructions for checking the critical dimension of concrete beam molds.

Inspection Equipment Required

1. Calipers capable of measuring an inside dimension of six inches (152 mm) and readable to 0.001 inch (0.01 mm).
2. Ruler, readable to 1/16 inch (1 mm).
3. Straight Edge
4. Machinist's square

Tolerance

1. The sides of the molds checked shall be straight, true and free of warpage with no deviation exceeding 1/16 (1 mm) inch from a straight edge.
2. Sides, bottoms and ends of molds shall meet at a right angle with no more than 1/16 inch (1 mm) deviation from a square.
3. Assembled mold shall have no deviation exceeding 1/8 inch (3.2 mm) from the nominal cross section.

Procedure

1. Check the sides and bottom of the mold with the straight edge and ruler. Determine that no deviation from the straight-edge exceeds the referenced tolerance.
2. Assemble the mold..
3. Check at two or more points on each side for squareness with the machinist's square. Determine that no deviation from the square exceeds the referenced tolerance.

4. Measure the distance between the opposing sides of the completed mold with the calipers. Determine that there are no deviations exceeding 1/8 inch from the nominal cross section.
5. If deviations are noted and cannot be corrected, remove the mold from use and repair or replace it.

VERIFICATION PROCEDURE : VP- 38

Equipment Verified : Pycnometers, Specific Gravity (Semi-Solid)

Standard References : AASHTO T 228

Purpose :

This procedure provides instruction for checking the physical dimensions of the pycnometers. Volumetric calibration, in conformance with T 228 will be done in advance each day of testing.

Inspection Equipment Required :

1. Calipers, readable to 0.1 mm
2. Balance capable of weighing to 0.01 gm
3. Graduated cylinder, 50 ml capacity
4. Distilled Water
5. Worksheet for VP-38.

Tolerance :

Equipment shall have dimensions within the tolerances shown in Figure 1 of AASHTO T 228.

Procedure :

1. Measure the Dimensions shown in Figure 1 of AASHTO T 228 and record.
2. Weigh each pycnometer and record the weight.
3. Fill the pycnometer with distilled water. Pour the distilled water from the pycnometer to the 50 ml graduated cylinder. Measure the amount of distilled water and record.

Worksheet for VP-38

Equipment Verified : Pycnometers, Specific Gravity (Semi-Solid)
(Bituminous)

Standard References : AASHTO T 228

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

| Pycnometer | 1 | 2 |
|--|---|---|
| Capacity 24-30 ml | | |
| Weight <40g | | |
| Ground glass stopper diameter 22-26 mm | | |
| Stopper hole 1.0-2.0 mm | | |
| Bottom concave Y/N | | |
| Concavity 4-18 mm (center) | | |

Equipment Used To Verify:

Calibrated Caliper, readable to 0.1mm Caliper # _____ Date Calibrated _____

Verified Balance, readable to 0.01g Balance # _____ Date Verified _____

Graduated Cylinder, 50 ml Capacity

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP-39**Equipment Verified: TAG OPEN CUP APPARATUS AND CUPS****Standard References: AASHTO T 79****Purpose**

This procedure provides instruction for checking the physical dimensions and operation of the Tag Open Cup Apparatus and Cups outlined in AASHTO T 79.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm
2. Balance, capable of weighing to 0.01 gm.
3. Ruler readable to 0.1 mm.
4. Worksheet for VP-39

Tolerance

Equipment shall have dimensions within the tolerances shown in Figures 1-3 of AASHTO T 79.

Procedure

Measure the dimensions shown in Figures 1-3 of AASHTO T 79 and record.

Worksheet for VP-39

Equipment Verified:

TAG OPEN-CUP APPARATUS AND CUPS

Standard References:

AASHTO T-79

Equipment ID# _____

Date Verified: ___/___/___

Verifying Technician: _____

Frequency of Verification: OSC 12 Months

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

TEST CUP

1

2

| | | |
|--|--|--|
| O.D. @ base of ring 53.2-57.0 mm | | |
| Overall height 50.0-53.2 mm | | |
| Bottom Retaining to cup rim 7.1-8.7 mm | | |
| Mass less than 95 g | | |

LEVELING DEVICE

1

2

| | | |
|--|---|---|
| Distance between two projections 25.4 mm | | |
| Height of projections 3.18 ± 0.25 mm | / | / |
| Large hole diameter < 4mm | | |
| Center of small hole 3.2 mm from bottom | | |

IGNITION TAPER

| | |
|---|--|
| Jet taper at least 152 mm from center of swivel | |
| Center of orifice 3.2 mm above upper edge cup | |
| Diameter of tip of taper 1.6 mm | |

| | ACCEPTABLE Y/N |
|-----------------|----------------|
| TEST CUP | |
| LEVELING DEVICE | |
| IGNITION TAPER | |

Equipment Used To Verify:

1. Calipers, readable to 0.01 mm # _____
2. Balance, capable of weighing to 0.01 gm. # _____
3. Ruler readable to 0.1 mm. # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE : VP- 40**Equipment Verified: CALIBRATION CYLINDER****Standard References: AASHTO T 246, WSDOT W 703****Purpose**

This procedure provides instructions for checking the critical dimension of the calibration cylinder used in the above test method.

Inspection Equipment Required

1. Calipers capable of measuring an outside diameter of four (4) inches (102 mm) and readable to 0.001 inch (0.01 mm).
2. Ruler, readable to 1/16 inch (1 mm).

Tolerance

The height and diameter of the calibration cylinder checked shall meet the dimensional tolerances specified in the applicable test method listed above.

Procedure

1. Measure and record the outside diameter of the calibration cylinder to the nearest 0.001 inch (0.01 mm). Rotate the cylinder 90° (¼ turn) and measure and record the outside diameter again.
2. Turn the calibration cylinder over and repeat Step 1.
3. Average the four measurements.
4. Determine if the average is within required tolerance.
5. Measure and record the height of the cylinder to the nearest 1/16 inch (1 mm).

Worksheet for VP-40

Equipment Verified: CALIBRATION CYLINDER

Standard References: AASTO T 246, WSDOT 703

Equipment ID: _____

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

Frequency of Verification: OSC 12 months

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

| Diameter of first end | | Diameter of second end | | Height |
|-----------------------|----------------|------------------------|----------------|--------|
| First Reading | Second Reading | First Reading | Second Reading | |
| | | | | |

Equipment Used To Verify:

- 1.) Caliper # _____
- 2.) 18" scale # _____

Equipment found to be: Satisfactory_____ Unsatisfactory_____

Action Taken: Replaced_____ None_____ Other_____

COMMENTS:

Time Charge: _____

VERIFICATION PROCEDURE: VP - 41**Equipment Verified: SOIL TEST MOLDS****Standard References: AASHTO T 99, T 180, T 190, T 193; W 606****Purpose**

This procedure provides instructions for checking the critical dimensions of 4-, 6-, and 8-inch molds used in soil testing.

Inspection Equipment Required

1. Calipers capable of measuring the height and inside diameter of the molds and readable to 0.001 inch.

Tolerance

The height and diameter of the molds checked shall meet the dimensional tolerances specified in the applicable test method listed above.

Procedure

1. Measure and record the inside diameter of the mold, determined by taking two readings 90 degrees apart, to the nearest 0.001 inch.
2. Turn the mold over and repeat step 1.
3. Measure and record the height of the mold, determined by taking two readings 90 degrees apart, to the nearest 0.001 inch.

Note: When measuring the large mold the height measurement will be the inside height of the mold.

Worksheet for VP-41

Equipment Verified:

Test Mold for T-99

Standard References:

AASHTO T-99

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

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

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

| Dimension | Required. | Tolerance | Measurements |
|-----------------|--------------------------|--|--------------|
| Inside Diameter | 101.60 mm (4.000 in.) | 101.19 - 102.01 mm (3.984 - 4.016 in) | |
| Height | 116.43 mm (4.584 in) | 116.30 - 116.56 mm (4.579 - 4.589 in) | |

Equipment Used To Verify:

1.) Micrometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-41

Equipment Verified:

Test Mold for T-180

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 | Measurements |
|-----------------|--------------------------|--|--------------|
| Inside Diameter | 152.40 mm (6.000 in.) | 151.74 – 153.06 mm (5.974 – 6.026 in) | |
| Height | 116.43 mm (4.584 in) | 116.30 - 116.56 mm (4.579 - 4.589 in) | |

Equipment Used To Verify:

1.) Micrometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-41

Equipment Verified:

Test Mold for T-190

Standard References:

AASHTO T-190

Equipment ID: _____

Date Verified: ___/___/___

Verifying Technician: _____

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

Previous Verification Date: ___/___/___

Next Verification Date: ___/___/___

| Dimension | Required. | Tolerance | Measurements |
|-----------------|--------------------------|--|--------------|
| Inside Diameter | 101.60 mm (4.000 in.) | 101.55 - 101.65 mm (3.998 - 4.002 in) | |
| Height | 116.43 mm (5.000 in) | 116.30 - 116.56 mm (4.992 - 5.008 in) | |

Equipment Used To Verify:

1.) Micrometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-41

Equipment Verified: Test Molds T-292

Standard References: AASHTO T-292

Equipment ID: _____

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

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

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

| Dimension | Required. | Tolerance | Measurements |
|-----------------|--------------------------|--|--------------|
| Inside Diameter | 101.60 mm (4.000 in.) | 100.33 - 102.87 mm (3.95 - 4.05 in) | |
| Height | 215.9 mm (8.5 in) | 214.6 - 217.2 mm (8.4 - 8.6 in) | |

Equipment Used To Verify:

1.) Micrometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-41

Equipment Verified: Test Mold for WSDOT T-606 (Small Mold Dry)

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 | Measurements |
|---------------------|-------------------------------|----------------|--------------|
| Inside Diameter (d) | 6.000 in. | 5.85 – 6.15 in | |
| Height (h) | 8.000 in | 7.9 -8.1 in | |
| Height Constant | Verified Yes ___ No ___ | | In. |

$$\text{Volume of mold [V]} = \frac{3.14159 \times \left(\frac{d}{2}\right)^2 \times h}{1728 \frac{\text{in}}{\text{ft}^3}} = \text{_____ ft}^3$$

$$\text{Mold constant} = \frac{h}{V} = \text{_____} \frac{\text{in}}{\text{ft}^3}$$

Equipment Used To Verify:

1.) Micrometer # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Time Charge: _____

Worksheet for VP-41

Equipment Verified: Test Mold for WSDOT T-606 (Small Mold Wet)

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 | Measurements |
|-----------------------------|-----------|----------------|-----------------|
| Inside Diameter (d) | 6.000 in. | 5.85 – 6.15 in | |
| Height (h) | 8.000 in | 7.9 -8.1 in | |
| Height Constant | Verified | Yes ___ No ___ | In. |
| Volume Correction Constant* | Verified | Yes ___ No ___ | ft ³ |

* Equations on Page 2

Equipment Used To Verify:

- 1.) Caliper # _____ 2) Balance# _____ 3) Thermometric Device # _____
 4.) Diameter tape # _____ 5) Ruler # _____

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

COMMENTS:

Calculations

| | | |
|--|--|---------------------|
| 1. Inside Height Mold | | In |
| 2. Tare of Mold | | lbs |
| 3. Tare of glass plate | | lbs |
| 4. Mass of mold and glass plate (2 + 3) | | lbs |
| 5. Mass of mold + glass plate + water | | lbs |
| 6. Mass of water (5-4) | | lbs |
| 7. Temp of water | | C |
| 8. Unit Mass of Water @ temp (See Table 1) | | lbs/ft ³ |
| 9. Volume | | ft ³ |
| 10. Volume Correction Constant | | $\frac{in}{ft^3}$ |

$$\text{Volume of mold wet [V]} = \frac{\text{Mass of water}}{\text{Unit mass of water}} = \text{_____} \text{ ft}^3$$

$$\text{Volume Correction Constant} = \frac{h}{V} = \text{_____} \frac{in}{ft^3}$$

Time Charge: _____

Table 1
(FOP for AASHTO T121)
Unit Mass 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 |

Worksheet for VP-41

Equipment Verified: **Soils Test Mold T 606 (Large Mold)**
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:** ___/___/___

| | | |
|---|----------|-------------------|
| Capacity (nominal): required approximately 0.5000 ft ³ | | ft ³ |
| Diameter: (inside diameter) [d] | | in. |
| Height: (internal height) [h] | | in |
| Top rim is smooth? | | Y/N |
| Top rim is plane, within 0.01 in.? | | Y/N |
| Thickness of metal in upper 1-1/2" of wall: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Thickness of metal in remainder of wall: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Thickness of metal at bottom: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Volume of Mold <i>See Calculations on page 2 of worksheet</i> [V] | | ft ³ |
| Volume Correction Constant <i>See Calculations on page 2 of worksheet</i> | | $\frac{in}{ft^3}$ |
| Height Correction | Verified | Y/N |

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

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

Equipment Used To Verify:

1.) Caliper # _____ 2.) Feeler Gauge # _____ 3.) Ruler # _____
4.) Diameter Tape # _____

COMMENTS:

Time Charge: _____



Calculations:

$$\text{Volume of mold [V] (dry)} = \frac{3.14159 x \left(\frac{d}{2}\right)^2 x h}{1728 \frac{\text{in}}{\text{ft}^3}} = \text{_____ ft}^3$$

$$\text{Volume Correction Constant} = \frac{h}{V} = \text{_____} \frac{\text{in}}{\text{ft}^3}$$

Table 1
Thickness of Metal
(Minimum)

| Capacity Cubic feet | Bottom | Upper 1-1/2" of Wall | Remainder of Wall |
|------------------------|---------|-------------------------|----------------------|
| <0.4 | 0.2 in. | 0.10 in. | 0.10 in. |
| 0.4 to 1.5 | 0.2 in. | 0.20in. | 0.12 in. |

Worksheet for VP-41

Equipment Verified: Soils Test Mold T 606 (Large Mold)
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: ___/___/___

| | | |
|---|----------|-------------------|
| Capacity (nominal): required approximately 0.5000 ft ³ | | ft ³ |
| Diameter: (inside diameter) [d] | | in. |
| Height: (internal height) [h] | | in |
| Top rim is smooth? | | Y/N |
| Top rim is plane, within 0.01 in.? | | Y/N |
| Thickness of metal in upper 1-1/2" of wall: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Thickness of metal in remainder of wall: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Thickness of metal at bottom: <i>See Table 1 on page 2 of worksheet</i> | | in. |
| Volume of Mold <i>See Calculations on page 2 of worksheet</i> [V] | | ft ³ |
| Volume Correction Constant <i>See Calculations on page 2 of worksheet</i> | | $\frac{in}{ft^3}$ |
| Height Correction | Verified | Y/N |

Equipment found to be: Satisfactory _____ Unsatisfactory _____

Action Taken: Replaced _____ None _____ Other _____

Equipment Used To Verify:

- 1.) Caliper # _____ 2) Balance# _____ 3) Thermometric Device # _____
 4.) Diameter tape # _____ 5) Ruler # _____ 6) Feeler gauge # _____

COMMENTS:

Time Charge: _____

Calculations

| | | |
|--|--|---------------------|
| 1. Inside Height Mold | | In |
| 2. Tare of Mold | | lbs |
| 3. Tare of glass plate | | lbs |
| 4. Mass of mold and glass plate (2 + 3) | | lbs |
| 5. Mass of mold + glass plate + water | | lbs |
| 6. Mass of water (5-4) | | lbs |
| 7. Temp of water | | C |
| 8. Unit Mass of Water @ temp (See Table 1) | | lbs/ft ³ |

$$\text{Volume of mold wet [V]} = \frac{\text{Mass of water}}{\text{Unit mass of water}} = \text{_____ ft}^3$$

$$\text{Volume Correction Constant} = \frac{h}{V} = \text{_____ } \frac{\text{in}}{\text{ft}^3}$$

Table 1
Thickness of Metal
(Minimum)

| Capacity Cubic feet | Bottom | Upper 1-1/2" of Wall | Remainder of Wall |
|------------------------|---------|-------------------------|----------------------|
| <0.4 | 0.2 in. | 0.10 in. | 0.10 in. |
| 0.4 to 1.5 | 0.2 in. | 0.20in. | 0.12 in. |

Table 2
(FOP for AASHTO T121)
Unit Mass 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 |