

Table B-1 – Calibration, Standardization and Check Procedures & Worksheets

Procedures	Worksheets	Equipment
1	1	Drying Oven Temperature
2	2	Mechanical Sieve Shaker
3	3	Sand Equivalent Apparatus
4	4	Wire cloth sieves
5	5	Sieves
6	6	Splitter (Riffle)
7	7	Timer
8	8	Straight Edge
9	9	Ignition Furnace Equipment
10	10	Maximum Theoretical Specific Gravity Bowl
11	11	Plungers, Followers, Supports, Shims and Rods
12	12	Vacuum System
13	13	Immersion / Compression Molds
13	13	Soil (R-Value) Molds
14	14	Idaho Degradation
14	14	Saybolt Viscometer Add to manual
15	15	Constant Temperature Bath, Water or Oil
16	16	4" Moisture Density (Proctor) Mold
16	16	6" Moisture Density (Proctor) Mold

17	17	5.5 lb Manual Rammer
17	17	10 lb Manual Rammer
18	18	Specific Gravity Mold & Tamper
19	19	Liquid Limit Device and Grooving Tool
20	20	Soil Pycnometer
21	21	L.A. Abrasion
21	21	L.A. Abrasion Charge (Steel Spheres)
22	22	Mechanical Soil Compactor
23	23	Slump Cone
24	24	Constant Temperature Bath for Concrete & Cement Specimens
25	25	Unit Weight Measure Bucket
26	26	Thermometer or Temperature Recorder
27	27	Air Meter, Pressure Type Concrete
28	28	Capping Compound
29	29	Cylinder Capping Mold
30	30	Bearing Blocks
AASHTO T 106	31	Cube Mold
AASHTO T 231	32	Concrete Capping Stand
ASTM C1231	33	Unbonded Cap Retaining Ring
ASTM C1231	34	Unbonded Cap

Procedure 1

Standardization Procedure: ITD-D2

Drying Oven StandardizationInspection Equipment Required:

1. A standardized thermometer, per Procedure 26, graduated in 1.0° C increments having a range which 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.
3. A clothes pin to hold the thermometer in place to enable the operator to read the scale easily from outside of the oven.

Tolerance:

Drying ovens shall be capable of maintaining a constant temperature range listed in the appropriate test methods.

Procedure:

1. Place the thermometer inside the brass well with the clothes pin attached to the thermometer. Position the thermometer on the shelf where the samples are normally dried.
2. Take the first reading at least 1 hour after closing the oven (oven should remain undisturbed).
3. Take as many readings as necessary to determine if the temperature range is within the specified tolerance (three consecutive readings, taken no less than 1/2 hour apart, within the tolerance allowed are adequate.)
4. Adjust the temperature of the oven if an observed temperature reading is outside the tolerance specified (allow at least 1/2 hr. for the temperature to stabilize between each adjustment.) If temperature is adjusted, return to step 3.
5. Record the Serial No. of the thermometer being used.

Worksheet 1

Drying Oven Temperature Standardization Record

Standardization Procedure: ITD-2

Standardization Frequency: 12 months

Identification Number:	Date Standardized:
Manufacturer:	Model No:
Serial No.:	Temperature Working Range:
Standardized Thermometer Number:	Standardization Data: <input type="checkbox"/> As Found <input type="checkbox"/> As Adjusted

Reading	Time1	Temp1	Time2	Temp2	Time3	Temp3
1						
2						
3						

Oven Temperature Control Setting:	
Accuracy Requirement: $\pm 5^{\circ}\text{C}$, 9°F	Within Required Range? <input type="checkbox"/> Yes <input type="checkbox"/> No
Temperature Range for which oven is qualified:	Disposition of Oven: <input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable

Remarks:

Standardized by:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE- STANDARDIZATION DUE DATE:

Procedure 2

Check Procedure: ITD-D5

Mechanical Sieve Shaker CheckGeneral Equipment:

1. Ensure shaker imparts a vertical, or lateral and vertical motion to the sieve, so as to cause particles to present different orientations to the sieving surface.
2. Lubricate shaker as specified by manufacturer.
3. Evaluate all mechanical and operational moving parts of the shaker for wear and proper operating tolerances specified by manufacturer's maintenance specifications.
4. Record the observation, deficiency and any comments.

Sieve Shaker Check

AASHTO T 27, Sections 6.3 & 8.4

Apparatus:

1. Typical sieve or screen stack used in the shaker
2. Balance readable to 0.1g
3. Timer

Sample Size

A dry aggregate sample with coarse and fine material will be used as follows:

1. For 12" round sieve shaker – use minimum of 2000 grams (+50 grams) with the maximum sieve size the 3/8" sieve.
2. For 8" round sieve shaker – use minimum of 1000 grams (+50 grams) with the maximum sieve size the 1/2" sieve.
3. For 14" or 16" coarse screen shaker – use minimum of 4000 grams (+50 grams) with the maximum screen size the 1" screen

Procedure:

1. Determine total sample mass and record
2. Place sample in top of sieve stack and begin shaker.
3. Shake sieve stack for a set amount of time between 5 and 10 minutes.

4. Hand-sieve each individual sieve, that has been snugly fit with a pan and cover, by holding the sieve in a slightly inclined position in one hand. Strike the side of the sieve sharply and with an upward motion against the heel of the other hand at the rate of about 150 times per minute, turn the sieve about one-sixth of a revolution at intervals of about 25 strokes.
5. Determine the mass of the material in the pan after hand-sieving for 1.0 minute.
6. Divide the mass of the material in the pan (B) by the total sample mass (A).
7. The mass in the pan but be not more than 0.5 percent (0.005) of the total sample mass. If B/A is greater than 0.005 then the time shaken is not sufficient. Restart the procedure with step 3 and shake the sieve stack for 2.0 minutes longer than the previous trial time until the tolerance of 0.005 is obtained after 1.0 minute of hand-sieving. The tolerance must be obtained without the shake time exceeding 15.0 minutes.
8. Continue to hand-sieve, record each individual sieve and calculate whether the percent is within the 0.005 tolerance.
9. Determine and record the required shake time. The required shake time is the minimum amount of time to achieve the 0.005 tolerance.

Worksheet 2**Mechanical Sieve Shaker Efficiency Check**

Check Procedure: ITD-D-5

Check Frequency: 12 months

Date Checked:	Shaker Manufacturer:
Model No. :	Identification No. :
Standard Balance Number:	Mass of Total Sample:

Sieve Size	Sieve Ident. No.	Mass retained by mechanical sieving	Hand Sieving Mass Passing	Hand Sieving % Passing	Acceptable (Y/N) ¹
1"					
3/8"					
No. 8					

Note 1: No more than 0.5%, by mass, of the total sample shall pass any one sieve after one minute of continuous hand sieving.

Minimum mechanical shaking time required	minutes
Shaker was cleaned: <input type="checkbox"/>	Shaker was lubricated: <input type="checkbox"/>

Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE- CHECK DUE DATE:

Procedure 3

Check Procedure: ITD-D3

Sand Equivalent Apparatus CheckInspection Equipment Required:

1. A Timer readable to 1 sec.
2. A Ruler of at least 300 mm in length, reading in mm.
3. A balance capable of reading to 1 g.
4. A number 60 drill bit.
5. A caliper readable to 0.01mm.

Tolerance:

Shaker shall be capable of maintaining constant range listed in the appropriate test methods.

Procedure:

1. Check and record the timer setting at 45 Sec.
2. Measure and record the throw of the shaker arm.
3. Measure and record the number of cycles for 45 seconds.
4. Measure and record the capacity of the tinned box.
5. Verify the wide-mouth funnel to insure it is approximately 100 mm in diameter
6. Weigh and record the weight of the foot.
7. Measure and record the diameter of the foot.
8. Measure and record the height from the top of the working surface to the top of the shelf where solution sits.
9. Measure and record the length, diameter of the irrigator tube.
10. Measure and record that the openings in the end of the irrigator tube are within tolerance.
11. Record Checked By.
12. Record the date of inspection
13. Record any comments

Worksheet 3

Sand Equivalent Test Apparatus Check Record

Apparatus Requirements: ITD-D3

Check Frequency: 12 months

Identification No.:	Date Checked:
Calibration Balance Number:	

Siphon assembly of proper material and configuration:	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Unsatisfactory
Graduated cylinder:(1.5" dia., 0 to 15" marks +/- 0.3")	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Unsatisfactory
Weighted foot assembly meets proper dimensional requirements: 256.5 mm from bottom of foot to top of ring and 1" (25.4mm) diameter	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Unsatisfactory
Weighted foot assembly: g (ASTM-D2419 range: 995 to 1005g)	<input type="checkbox"/> Satisfactory	<input type="checkbox"/> Unsatisfactory
Electronic SE Shaker Ident. No. :	8 inch stroke	
Note: <u>If only manual shaking then tester must be qualified.</u>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	130 to 134 strokes per 45 seconds	
Solution Temperature: 72° F ± 5°	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Shelf Height: 36" ± 1"	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Tin: Approx. 2.25" in Diameter and holds 85ml ± 5 ml	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Stainless Steel Irrigation Tube: 510mm long, 6.4mm (1/4") outside diameter	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Irrigation Holes: Two #60 drill bit size on each side at end	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Disposition of Sand Equivalent Test Apparatus:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Not Acceptable
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Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE- CHECK DUE DATE:

Procedure 4

Check Procedure: ITD-D11

Wire Cloth Sieve Check

AASHTO M 92 (ASTM E11)

Procedure for Sieves No. 6 and finer:

1. Record the sieve identification number.
2. Inspect the general condition of the sieve frame as specified in AASHTO M 92 (ASTM E11) 6.3 Test Sieve Frame
3. AASHTO M 92 ANNEX A1.1.1:
 - a. View the sieve cloth against a uniformly illuminated background. If obvious deviations, for example weaving defects, creases, wrinkles foreign matter in the cloth, are found, the wire cloth is unacceptable
4. AASHTO M 92 (ASTM E11) ANNEX, A1.1.2:
 - a. Carefully and methodically examine the appearance of all the openings, in order to detect oversize openings, sequences of large openings and local irregularities. If any opening is found to be oversize by more than tolerance X in Column 5 of Table 1, the sieve is unacceptable.
5. Record Checked By.
6. Record Date checked.
7. Record any comments.

Worksheet 4Wire Cloth Sieves Check Procedure

Check Procedure: ITD-D-11

Check Frequency: 12 months

Identification No.:	Date:
Manufacturer:	Sieve size:

General condition of sieve frame:	<input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable
General condition of sieve cloth, Annex A1.1.1 Observation of deviations, such as weaving defects, creases, wrinkles	<input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable
Sieve opening appearance, Annex A1.1.2 Observation of oversized openings must be less than Column 6 (Table 1, Column 1 + Column 5)	<input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable

Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 5

Check Procedure: ITD-D11

Sieve CheckInspection Equipment Required:

1. A caliper readable to 0.01 mm (for use with Sieve No. 4 and coarser).

Tolerance:

Sieves shall meet the physical requirements specified in AASHTO M 92 (ASTM E11)

Procedure for Sieves No. 4 and coarser:

1. Record the sieve identification number
2. Inspect the general condition of the sieve frame as specified in AASHTO M 92 (ASTM E11) 6.3 Test Sieve Frame and Table 2.
3. Measure the openings in the sieve as per AASHTO M 92 (ASTM E11) ANNEX A1.1.2 and inspect for maximum oversize openings per tolerance X given in Table 1, Column 6.
4. Measure the openings in the sieve as per AASHTO M 92 (ASTM E11) ANNEX A1.1.3 and determine the maximum allowable tolerance of average opening size, Table 1 Column 1 \pm Column 4
5. Determine and record if the sieve meets the tolerances of AASHTO M 92 (ASTM E 11) as shown on the worksheet at a, b and c.
6. Record Checked By.
7. Record Date checked.
8. Record any comments.

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w =#4 (4.75 mm)
------------------------	-------------	---

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 5.16 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 4.60 to 4.90 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w =1/4 in. (6.3 mm)
------------------------	-------------	---

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 6.81 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 6.10 to 6.50 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w = 3/8 in. (9.5 mm)
------------------------	-------------	--

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 10.18 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c 9.21 to 9.80 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w = 1/2 in. (12.5 mm)
------------------------	-------------	---

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 13.33 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 12.12 to 12.89 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w =5/8 in. (16.0 mm)
------------------------	-------------	--

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 16.99 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 15.51 to 16.49 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w = 3/4 in. (19.0 mm)
------------------------	-------------	---

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 20.13 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 18.25 to 19.75 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w = 1" in. (25.0 mm)
------------------------	-------------	--

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 26.38 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 24.24 to 25.76 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 2 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w = 1-1/2 in. (37.5 mm)
------------------------	-------------	---

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 39.35 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 36.37 to 38.63 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w =2" in. (50.0 mm)
------------------------	-------------	---

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/>	Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 52.29 mm (table 1, column 6),	Met <input type="checkbox"/>	Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 48.51 to 51.49 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/>	Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Worksheet 5

Sieve Measurements

Check Procedure ITD D11

Identification Number:	Check Date:	Nominal sieve opening, w = 3" in. (75.0 mm)
------------------------	-------------	--

Opening #	Opening Size X Vertical	Opening #	Opening Size Y Horizontal
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
Average X		Average Y	

a = General Condition of Sieve Frame (Section 6.3 and Table 2)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Max. Individual sieve Opening, b = 78.09 mm (table 1, column 6),	Met <input type="checkbox"/> Not Met <input type="checkbox"/>
Maximum allowable tolerance of average openings, c = 72.78 to 77.22 mm (Table 1, column 1 + or - column 4)	Met <input type="checkbox"/> Not Met <input type="checkbox"/>

From Table 1 in AASHTO M 92 (ASTM E11):

Verify general condition of sieve frame a; maximum opening size does not exceed b; and the average of the sieve openings meets the requirements of c.

Sieve Disposition:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Unacceptable
Remarks:		
Checked By:	Signature:	
WAQTC NO.		
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:	

Procedure 6

Procedure: ITD-D7

Splitter CheckInspection Equipment Required:

1. A steel rule readable in mm

Tolerance:

As outlined in AASHTO R 76

Procedure:

1. Select the serial number of the equipment to be checked.
2. Record the number of chutes
3. Measure and record the width of the chutes.
4. Is the dump pan equal to or slightly less than the width of the chutes assembly?
5. Record the date checked.
6. Record checked by.
7. Record any comment

Worksheet 6

Sample Splitter Check (Riffle)

Check Procedure: ITD-D7 (Ref.: AASHTO R 76)

Check Frequency: 12 months

Identification No.:	Calibration Date:
Manufacturer:	Model No.:
Calibration Standard Used:	Ruler Number:

Opening #	Opening Size	Opening #	Opening Size
1		13	
2		14	
3		15	
4		16	
5		17	
6		18	
7		19	
8		20	
9		21	
10		22	
11		23	
12		24	

Is Dump Pan Equal To or Slightly Less Than Width of Chute Assembly?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Splitter Disposition:	<input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable

Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE- CHECK DUE DATE:

Procedure 7

Check Procedure: ITD-D9

Timers CheckInspection Equipment Required:

Timer, readable to 1.0 sec., having a verified accuracy within the tolerance listed in the specified test procedure.

Tolerance:

Timers shall meet the accuracy requirements specified in the applicable test methods.

Procedure:

1. Choose the timer to be checked.
2. Enter the serial number of the timer used to check with.
3. Start both timers simultaneously.
4. Allow both timers to run at least for 15 min. then stop both timers simultaneously.
5. Record the time of the timer to be checked to the nearest 1.0 sec.
6. Record the time of the timer being used for checking the timer to the nearest 1.0 sec,
7. Record the percent of accuracy of the two timers.

$$\% \text{ Accuracy} = \left[\frac{(A - B)}{B} \right] \times 100$$

Where:

A = Reading on lab timer (Sec.)

B = Reading on standard timer (Sec.)

Worksheet 7Timer Check

Check Procedure: ITD-D9

Check Frequency: 12 months

Identification No.:	Check Date:
Manufacturer:	Model:
Serial No.:	Standardized Standard Timer Identification No:

Start both lab timer and standard timer at the same time, allow to run for at least 15 minutes, then stop both timers simultaneously.

Record time to nearest second on Lab Timer:	= A (seconds)
Record time to nearest second on Standard Timer:	= B (seconds)
$\% Accuracy = \left[\frac{(A - B)}{B} \right] \times 100$	
% Error =	

Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE- CHECK DUE DATE:

Procedure 8

Check Procedure: ITD-D43

STRAIGHT EDGE CHECK

AASHTO T 99 Section 3.6

Inspection Equipment Required

1. Tape measure readable to 1/16 "
2. Calipers readable to 0.0001"

Tolerance:

The straight edge shall be made of hardened steel at least 250 mm long (10"). It shall have one beveled edge planed to a tolerance of 0.250 mm per 250 mm (0.01" per 10"). The straight edge should not flex enough to cause the cutting edge to cut a concave surface on the sample.

Procedure:

1. Measure the straight edge with a tape measure.
2. Measure the beveled edge with calipers, along the entire length of the straight edge.
3. Check the straight edge for flex by placing it on an empty mold and apply pressure in the center of the straight edge.
4. Check planeness of the beveled edge within 0.005" with certified straight-edge.

Worksheet 8Straightedge Check Record

Check Procedure: ITD-D-43

Check Frequency: 12 months

Straightedge Identification No.:	Date Checked:
Standard Used: Caliper Number:	

DIMENSIONAL DATA:

Length: Greater than 10"?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Thickness: if greater than 1/8", is scraping edge beveled?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Planeness of edge within 0.005"?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Certified Straightedge used to check planeness	Ident. No.	
Is straight edge non-flexible?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Disposition of Straightedge:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Not Acceptable
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Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE- CHECK DUE DATE:

Procedure 9

Standardization Procedure: ITD-NCAT1

Ignition Furnace Equipment Standardization Procedure

Standardization Frequency: Lift Test – weekly when in use

Internal Balance – 30 days and following furnace transport

Equipment: Ignition Furnace

** NOTE: These procedures were developed around the Thermolyne (NCAT) ignition furnace.

Other manufactures furnaces may be slightly different.

Standard References: AASHTO T 308

Manufacturer's Operation and Maintenance Manual

Purpose:

- This method provides instruction on:
- checking the airflow rates through the tester and cleaning the filtration system when needed.
- how to lubricate the blower motor and other routine maintenance and checks.
- transportation in a mobile laboratory.
- field inspection and verification of internal balance verification.
- These procedures are in addition to the required annual calibration of the ignition furnaces by a commercial laboratory.

Inspection Equipment Required:

1. Vacuum Cleaner with brush
2. Protective Gloves
3. Synthetic lubricant such as Anderoll 465
4. Screwdriver
5. Calibrated weight set consisting of two 4,000 gram N.I.S.T. traceable Class 3 weights. A copy of the N.I.S.T. traceable weight certificates must be retained with the verification weights.

Tolerances:

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

Internal balance verification should be within $\pm 0.05\%$ of applied weight.

Procedure:

THE FILTRATION SYSTEM MUST BE CLEANED.

BLOWER MOTOR BEARINGS NEED TO BE OILED YEARLY.

(Mixes containing latex, crumb rubber, or polymer modifiers generate more smoke and soot and burning large samples also produce more smoke/soot.)

Checking Airflow Rates:

1. Ignition Furnace must be COLD when checking.
2. Turn the Furnace on using the switch on the control panel.
3. Allow the scale to stabilize (about 20 seconds).
4. Press the START button on the keypad.
5. Watch the scale indicator display once the blower starts. The numbers should be in the range of -3.5 to -10 grams. If the reading is closer to -10, your furnace is getting the correct amount of air. If the reading is at -3.5 grams or lower, the filtration system needs to be cleaned.

Cleaning The Filtration System:

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

(The entire filter cleaning operation should appropriately thirty minutes.)

Lubricating The Blower Motor:

There are two rubber plugs on the motor with small holes in the center of each plug. Remove the plugs and insert about 10-20 drops of synthetic lubricant such as ANDEROLL 465 in each bearing. DO NOT OVER-OIL AND DO NOT USE PETROLEUM BASED PRODUCTS.

Other Items:

1. Check that the following furnace components are operating in accordance with the manufacturer's written directions.
2. Pay particular attention to the operation of the door locking system and that the lock device and limit switch is properly adjusted.
3. Door seal: check for condition of seal and air tightness.
4. Filter gaskets: check for condition and proper fit.
5. Heating elements.

Weekly Lifts Checks:

A copy of the Ignition Furnace Equipment Verification Record shall be available for each furnace showing the weekly lift checks. The lift is to be checked by the operator every fifth day of operation preferably on a Monday morning prior to starting the furnace. Period when the unit is not in operation should be noted on the record.

Transporting Ignition Furnaces Fixed In A Mobile Laboratory:

Before a mobile laboratory containing an ignition furnace is moved the furnace must be secured. The furnace must be firmly attached to the counter top or placed on the floor of the mobile laboratory. The internal balance must be secured for transportation. See the manufactures instructions. For the NCAT furnaces with a Setra or Ohaus balance at a minimum the carbide hearth tray and the support tubes will be removed and safely stored before the furnace and /or the mobile laboratory is moved.

Balance Inspection:

If a mobile laboratory or a fixed site is being used for housing an ignition furnace and the furnace has been transported to that site the balance must be inspected. The support tubes and carbide hearth tray must be placed back into the furnace.

Open the furnace door. Insert the four support tubes through the tube ports located in the bottom of the furnace chamber. The tubes should seat on the appropriate pins on the balance plate. The support tubes should not be in contact with the sides of the tube ports. If any of the support tubes will not seat on the appropriate pins or are rubbing on the side of the tube port the balance has moved during transport and must be adjusted. See manufactures instructions.

Once the support tubes are in place, place the carbide hearth tray on the tubes. Center the hearth tray on the four tubes, equal distance from side to side.

Internal Balance Verification of calibration:

Verification of the internal balance calibration is required every 30 days when the furnace is in use and after any transport or movement of the ignition furnace. This is in addition to the required annual balance calibration by a commercial calibration company.

A copy of the Ignition Furnace Equipment Verification Record shall be available for each furnace showing internal balance verifications.

Identify the type of internal balance in the ignition furnace (typically Setra or Ohaus).

1. The furnace must be COLD before verifying its internal scale; however the balance must be on for at least 20 minutes prior to verification. This can be done by leaving the chamber door open with the furnace on.
2. Insert a paper or cloth for the weights to set on, re-zero the balance.
3. Place the 4000 gram weight as close to the center of the silicon carbide hearth tray as possible.
4. Record the reading and verify the reading is within $\pm 0.05\%$ (2.0 grams).
5. Place the other 4000 gram weight on the scale with both weights as close to the center of the silicon carbide hearth tray as possible.
6. Record the reading and verify the reading is within $\pm 0.05\%$ (4.0 grams).

If both readings are within the limits, the internal balance is within specifications. If either reading is not within the limits, then the internal balance cannot be used until it is serviced by a certified commercial company.

External Balance Verification of calibration:

Verification of the external balance is required at the same time with the internal balance verification.

1. Place a paper or cloth for the weights to set on, re-zero the balance. Place the 4000 gram weight as close to the center of the silicon carbide hearth tray as possible.
2. Record the reading and verify the reading is within $\pm 0.05\%$ (2.0 grams).
3. Place the other 4,000 gram weight on the scale with both weights as close to the center of the silicon carbide hearth tray as possible.
4. Record the reading and verify the reading is within $\pm 0.05\%$ (4.0 grams).

If both readings are within the limits, the external balance is within specifications. If either reading is not within the limits, then an external balance that meets the requirements must be provided.

Worksheet 9

Ignition Furnace Equipment Standardization Record

Standardization Procedure: ITD-NCAT1

Standardization Frequency: As noted

Ignition Furnace Ident No.		Furnace Manufacturer:		Internal Balance Manufacturer:				External Balance Ident No.			
Verification		Air Flow Rate Range: -3.5g to -10g	Cleaning? Yes or No	Internal Balance		Disposition of Internal Balance		External Balance		Disposition	
Date	By			4,000 ± 2.0 g	8,000 ± 4.0 g	Within Specs	Out of Specs (use external balance)	4,000 ± 2.0 g	8,000 ± 4.0 g	Within Specs	Out of Specs
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								
			<input type="checkbox"/> Y <input type="checkbox"/> N								

Procedure 10

Procedure No. ITD-D21

Procedure For Standardizing Maximum Specific Gravity Bowls

AASHTO T 209, ASTM D240

Standardization Equipment Required:

1. Balance with "below the scale" weighing for gravity baths, capable of weighing to nearest 0.1g.
2. Thermometer capable of reading to nearest 0.1°F.

Tolerance:

Bowl mass recorded to nearest 0.1g.

Procedure:

1. Fill gravity bath and wait until water level overflow has stopped.
2. Bring water temperature to $25 \pm 0.1^\circ\text{C}$.
3. Determine the mass of the bowl dry in air and record, as mass in air.
4. Suspend bowl in water to a depth sufficient to cover the entire bowl.
5. When all overflow water has stopped record the weight of the bowl as weight in water.
6. Perform these determinations at least twice with the difference between any two determinations not exceeding 0.1 grams.

Procedure 11

Procedure No.: ITD-D20

Plungers, Followers, Shims, Supports And Round Rod CheckEquipment Checked:

Plungers, followers, shims, supports, round rod. (AASHTO T 167, Idaho IT-8).

Purpose:

To check the critical dimensions of Compressive Strength and Hveem. plungers, followers, shims, supports and round rod.

Inspection Equipment Required:

1. Micrometer readable to 0.01 mm.

Tolerance:

The critical dimensions shall meet the applicable method(s).

Procedure:

1. Measure and record the outside diameter to nearest 0.01 mm.
2. Rotate 90 degrees (1/4 turn) and repeat step 1.
3. Where height measurement is required repeat steps 1 and 2.

Worksheet 11

Check Record for Plungers, Followers, Supports, Shims and Rods

Check Procedure: ITD-D20

Check Frequency: 12 Months

Date of Check:

Micrometer No.:

Item	Measurements		Within Tolerances	Action Taken
Leveling Load	Diameter, mm	Height, mm	Diameter 101.09 to 101.31 mm	
Follower: Height 140.0 mm			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Follower: Height 38.1 mm			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Stabilometer	Diameter, mm	Height, mm	Diameter 101.47 to 101.73 mm Height 140.0 mm	
Calibration Follower			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Immersion Compression	Diameter, in.	Height, in.	Followers, Diameter 4.000 in. Plungers, Height 2 +/- 1/8 in. Supports 25.4 mm	
Follower #1			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Follower #2			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Plunger #1			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Plunger #2			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Support #1			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Support #2			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Miscellaneous	Diameter, mm	Length, mm	Rod Diameter 9.5 mm Rod Length 406.0 mm Shims 6.4 x 19 X 64 mm	
Round Nose Rod			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Steel Shims, Hveem			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Stability			Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remarks:				
Checked by:			Signature:	
WAQTC NO.				
PREVIOUS CHECK DATE:			RE- CHECK DUE DATE:	

Procedure 12

Procedure No. ITD D-18

Vacuum Systems Standardization

Equipment Checked:

Vacuum Systems (AASHTO T 100, T 209) (ASTM D854, D2041)

Inspection Equipment Required:

1. Standardized absolute pressure gauge.
2. Water vapor trap.
3. Hoses, connectors, tools etc.

Tolerance:

Vacuum systems shall be capable of applying and maintaining the vacuum specified in the applicable test method.

Procedure:

1. Connect the standardized vacuum gauge to the system with the trap in-line between the system and the standardized gauge.
2. Make sure all connections are air tight.
3. Apply a vacuum to the number of vessels normally used in testing. Read and record the pressure indicated on the calibrated vacuum gauge.

Procedure 13

Procedure: ITD-D19

Immersion-Compression, or R-Value Specimen Molds Check

AASHTO T 167, Idaho IT-8

Inspection Equipment Required:

Calipers capable of measuring the inside diameter and readable to 0.01mm.

Tolerance:

The diameter of the molds checked must meet the dimensional tolerances specified in the test methods referenced above.

Procedure:

1. Measure and record the inside diameter of the mold to the nearest 0.01mm. Rotate the mold 90 degrees (1/4 turn) and measure and record the inside diameter again.
2. Turn the mold over and repeat step 1.

Procedure 14

Procedure: IT-15 ITD-B26

Saybolt Viscometers Standardization

Inspection Equipment Required:

1. Oil standard, minimum efflux time of 90 seconds.
2. Bath maintained at 50°C. ± 0.05°C. (122°F. ± 0.10°F.)
3. Thermometer, Type ASTM 19C
4. Timer

Tolerance:

Tolerances can be found in AASHTO T 72 Section 9.4

Procedure:

1. Establish and control the bath temperature at the selected test temperature of 50°C. ± 0.05°C. (122°F. ± 0.10°F.)
2. Insert a cork stopper into the air chamber at the bottom of the viscometer a small chain or cord may be attached to the cork to facilitate rapid removal. The cork shall fit tightly enough to prevent the escape of air, as evidenced by the absence of oil on the cork when it is withdrawn later as described.
3. Stir the sample in the viscometer with the appropriate viscosity thermometer equipped with the thermometer support (T 72 Fig.3). Use a circular motion at 30 to 50 rpm in a horizontal plane.
4. When the sample temperature remains constant within 0.05°C. (0.100°F.) of the test temperature during one minute of continuous stirring, remove the thermometer.
5. Immediately place the tip of the withdrawal tube in the gallery at one point, and apply suction to remove oil until its level in the gallery is below the overflow rim with the withdrawal tube.
6. Check to be sure that the receiving flask is in proper position: then snap the cork from the viscometer and start the timer at the same instant.
7. Stop the timer the instant the bottom of the oil meniscus reaches the graduation mark on the receiving flask.
8. Record the efflux time in seconds to the nearest 0.1 second.
9. The certified Saybolt viscosity of the standard shall equal the measured efflux time at 50°C. (122°F). If the efflux time differs from the certified value by more than 0.2%, calculate a correction factor, F, for the viscometer as follows:

$$F = \frac{V}{t}$$

Where:

V = certified Saybolt viscosity of the standard.

t = measured efflux time at 50°C. (122°F.)

Worksheet 14Saybolt Viscometer Standardization Record

Standardization Procedure: ITD-B26

Calibration Frequency: 36 months

Saybolt Viscometer Ident No. Serial No.:		Standardization Date:	
Standardization equipment and serial numbers			
19°C (122°F.) Thermometer:	Standard Type:		Standardization Temperature
Lot #:	Expiration date:	Viscosity. Of Standard At Standardization Temperature:	

Orifice No.	Reading #1	Reading #2	Reading #3	Average	Date Of Replacement	New Constants

Remarks:	
Standardized by:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE-STANDARDIZATION DUE DATE:

Procedure 15

Procedure: ITD-B24

Asphalt Constant Temperature Baths, Water or Oil CalibrationInspection Equipment Required:

1. A standardized thermometer that reads to 0.1°F. (0.06°C.)

Tolerance: Constant temperature baths shall be maintained at:

1. Penetration Bath (Water) 77°F. (25°C.) \pm 0.2°F. (0.1°C.)
2. Absolute Viscosity Bath (Oil) 140°F. (60°C.) \pm 0.05°F. (0.03°C.)
3. 140°F. Kinematic Bath (Oil) 140°F. (60°C.) \pm 0.10°F. (0.06°C.)
4. 275°F. Kinematic Bath (Oil) 275°F. (135°C.) \pm 0.10°F. (0.06°C.)
5. Saybolt Furol Viscosity Bath (Oil) 77°F. (25°C.) \pm 0.10°F. (0.05°C.)
6. Saybolt Furol Viscosity Bath (Oil) 122°F. (50°C.) 0.10°F. (0.05°C.)

Procedure:

1. Place the standardized thermometer or temperature probe next to the thermometer in the water or oil bath.
2. Allow the thermometer to stabilize, and compare temperatures on thermometers.

This temperature should reflect the same reading. If they do not, make note of the difference on the work sheet.

3. Adjust thermo regulator as needed so that temperature fluctuates equal distances above and below the desired temperature.
4. Record temperature range of bath.

Worksheet 15

Verification of Calibration for Asphalt Constant Temperature Bath, Water or Oil

Verification Reference: ITD-B24

Verification Frequency: 12 months

Identification Number:	Date Calibrated:
Bath Type (water, air, oil):	Calibration Standard: Thermometer Ident Number:
ASTM (there are different test methods depending on type of bath):	Required temperature range :
Is the bath of the proper size and type as required by the specification? :	<input type="checkbox"/> Yes <input type="checkbox"/> No

After the bath is brought to the desired temperature, take successive readings at equally spaced intervals over the immersion time specified by the test method. Record readings in the following table.

Bath Temperature Readings				Specified Test Temperature	Acceptable Yes/No
1	2	3	4		

Bath Disposition:	<input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable
-------------------	---

Remarks:	
Calibrated By:	Signature:
WAQTC NO.	
PREVIOUS CALIBRATION DATE:	RE-CALIBRATION DUE DATE:

Procedure 16

Verification Procedure ITD-D42

Moisture Density (Proctor) Mold Check

AASHTO T 99

AASHTO T180

Check Equipment Required:

Calipers, readable to 0.01 mm.

Scales, readable to 0.01 lbs.

Procedure:

1. The molds shall be solid-wall metal cylinders manufactured to the dimensions shown below. They shall have a detachable collar assembly approximately 60 mm (2.375 in) in height, to permit the preparation of compacted specimens of soil-water mixtures of the desired height and volume. The mold and collar assembly shall be so constructed that it can be fastened firmly to a detachable base plate made of the same material. The base plate shall be plane to 0.005 in.
2. Record measurements verifying height, diameter, and planeness are within tolerances.
3. With a clean mold, determine the mass of the mold and baseplate without the collar. Record the mass of the mold and baseplate. Verify that the new mass is the same as the mass written on the mold.

Volume Determination:

1. Determined mold volume per AASHTO T 19.
 - a. Perform the steps in section 8 “Calibration of Measure” section.
 - b. This volume determination will require creating a water tight seal between the mold and the base plate with a small amount of petroleum jelly, silicon grease. Another method is by applying plumbers putty to the outside of the mold to create that seal. Make sure the dry mass determination is taken with the sealing product applied.
2. Record the volume of the mold in cubic feet and write the volume of the mold on the side of the mold.

Worksheet 16

4" Moisture Density (Proctor) Mold Standardization Record

Standardization Procedure: ITD-D42

Standardization Frequency: 12 months

Identification Number:	Date Standardized:
Manufacturer:	
Calibration Standard: Caliper No:	<u>New Mold Tolerances:</u> Inside Diameter 101.19 to 102.01 Height 116.27 to 116.53 <u>Used Mold Tolerances:</u> Inside Diameter 100.99 to 102.21 Height 116.27 to 116.53

DIMENSIONAL DATA: As Found

	Inside Diameter - Top, in.	Inside Diameter - Bottom, in.	Inside Height - in.
Measurement #1			
	(90°)	(90°)	(180°)
Measurement #2			
AVERAGE	Dt=	Db=	H=

New Mold : <input type="checkbox"/>	Used Mold: <input type="checkbox"/>
Mold Average Inside Diameter within tolerance :	<input type="checkbox"/> Yes <input type="checkbox"/> No
Mold Average Inside Height within tolerance :	<input type="checkbox"/> Yes <input type="checkbox"/> No
Calculated Volume of Mold: $V = \frac{B - C}{A}$	V= Volume of Mold, ft ³ A= Density of Water: _____ B= Mass of Water, Glass, and Mold: _____ C= Mass of Glass and Mold: _____
Disposition of Mold:	<input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable

Remarks:	
Standardized By:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE-STANDARDIZATION DUE DATE:

Worksheet 16

6" Moisture Density (Proctor) Mold Standardization Record

Standardization Procedure: ITD-D42

Standardization Frequency: 12 months

Identification Number:	Date Standardized:
Manufacturer:	
Calibration Standard: No:	Caliper
New Mold Tolerances: Inside Diameter 151.74 to 153.06 Height 116.30 to 116.56 Used Mold Tolerances: Inside Diameter 151.41 to 153. Height 116.30 to 116.56	

DIMENSIONAL DATA: As Found

	Inside Diameter - Top, in.	Inside Diameter - Bottom, in.	Inside Height - in.
Measurement #1			
	(90°)	(90°)	(180°)
Measurement #2			
AVERAGE	D _t =	D _b =	H=

New Mold : <input type="checkbox"/>	Used Mold: <input type="checkbox"/>
Mold Average Inside Diameter within <input type="checkbox"/> Yes <input type="checkbox"/> No	tolerance :
Mold Average Inside Height within <input type="checkbox"/> Yes <input type="checkbox"/> No	tolerance :
Calculated Volume of Mold: $V = \frac{B - C}{A}$	V= Volume of Mold, ft ³ A= Density of Water: _____ B= Mass of Water, Glass, and Mold: _____ C= Mass of Glass and Mold: _____
Disposition of Mold: <input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	Volume of Mold:

Remarks:	
Standardized By:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE-STANDARDIZATION DUE DATE:

Procedure 17

Procedure ITD-D40

Moisture Density (Proctor) Manual Rammer Check

AASHTO T 99 Sec. 3.2.1 (5.5 lb)

OR

AASHTO T 180 Sec. 3.2.1 (10 lb)

Inspection Equipment Required:

1. Calipers readable to 0.01 mm
2. Tape measure readable to 1/16 in.
3. Scale, capacity of 20,000 grams. readable to 1.0 grams.

Tolerance:

Equipment shall meet the dimensional tolerances specified in AASHTO T 99 Sec. 3.2.1.

Equipment shall meet the dimensional tolerances specified in AASHTO T 180 Sec. 3.2.1.

Procedure:

1. Using the calipers measure the diameter of the rammer face by taking 2 readings 90 degrees apart.
2. Extend the rammer, measure the drop of the rammer from its highest stopping point to the bottom lip of the sleeve.
3. Remove the rammer from the sleeve by unscrewing the nut on the handle.
4. Weigh the rammer along with the nut, washers and handle.
5. Using the calipers, measure the diameter of the vent holes on the top and the bottom.
6. Measure the distance of the vent holes from the top and the bottom lips (to the center of the holes).

Worksheet 17

5.5 lb Manual Rammer Check Record

Check Procedure : ITD-D40

Check Frequency: 12 months

Identification Number:	Date Checked:
Manufacturer:	Rammer: Nominal Weight: Nominal Drop:
Calibration Standards:	Caliper Number: Balance Number:

DIMENSIONAL DATA: As Found As Adjusted

	Measurement #1	Measurement#2	ASTM REQUIREMENTS
Rammer Circular Face Diameter: mm			50.55 to 51.05 mm
Rammer Weight: grams			2486 to 2504 g
Rammer Height of Drop: mm			303 to 307 mm

Guide sleeve holes: min dia, 9.5 mm:				
TOP	#1	#2	#3	#4
BOTTOM	#1	#2	#3	#4
Guide sleeve holes: distance from end of sleeve: 18 to 20 mm				
TOP	#1	#2	#3	#4
BOTTOM	#1	#2	#3	#4

Disposition of Rammer: Acceptable Not Acceptable

Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECKED DATE:	RE-CHECKED DUE DATE:

Worksheet 17

10.0 lb Manual Rammer Standardization Record

Check Procedure: ITD-D40

Check Frequency: 12 months

Identification Number:	Date Standardized:
Manufacturer:	Rammer: Nominal Weight: Nominal Drop:
Calibration Standards:	Caliper Number: Balance Number:

DIMENSIONAL DATA:

 As Found As Adjusted

	Measurement #1	Measurement#2	ASTM REQUIREMENTS
Rammer Circular Face Diameter: mm			50.55 to 51.05 mm
Rammer Weight:			4527 to 4545 g
Rammer Height of Drop: mm			455 to 459 mm

Guide sleeve holes: min dia, 9.5 mm:				
TOP	#1	#2	#3	#4
BOTTOM	#1	#2	#3	#4
Guide sleeve holes: distance from end of sleeve: 18 to 20 mm				
TOP	#1	#2	#3	#4
BOTTOM	#1	#2	#3	#4

Disposition of Rammer:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Not Acceptable
------------------------	-------------------------------------	---

Remarks:	
Standardized By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 18

Procedure: ITD-D6

Specific Gravity T 84 Mold & Tamper CheckPurpose:

To check the critical dimensions of the sand cone and tamper

Inspection Equipment Required:

1. Calipers or ruler readable to 1 mm.
2. Balance or scale readable to 0.1 g.
3. Steel Rule.

Tolerance:

Equipment shall meet the dimensional tolerances specified AASHTO T 84.

Procedure:

1. Measure and record the inside diameter at the top of the cone to the nearest 1 mm by taking two readings 90° apart.
2. Measure and record the inside diameter at the bottom of the cone to the nearest 1 mm by taking two readings 90° apart.
3. Place the cone on a flat surface. Measure and record the depth of the cone by using the calipers and a straight-edge.
4. Measure and record the thickness of the cone to the nearest 1 mm by taking 2 readings 90° apart at the top of the cone and two readings at the bottom of the cone 90° apart.
5. Measure and record the diameter of the tamping face to the nearest 1 mm by taking two readings 90° apart using the calipers.
6. Determine the mass of the tamper to the nearest 0.1 g.

Worksheet 18Specific Gravity Mold & Tamper Check

Check Procedure: ITD-D-6

Check Frequency: 12 (mos.)

Identification No:	Manufacturer:	
Check Standards:	Caliper	Ident#
	Balance	Ident#
	Rule Graduations	mm

Check Results: As Found As Adjusted

	#1	#2	#3	ASTM Requirement
Thickness of Cone Walls (mm)				0.8mm min.

	#1	#2	ASTM Requirements
Cone Inside Diameter (mm) Top			37 to 43 mm
Cone Inside Diameter (mm) Bottom			87 to 93 mm

	#1	#2	#3	ASTM Requirement
Cone Height (mm)				72 to 78 mm

	#1	#2	ASTM Requirements
Tamper Weight (g)			325 to 355g
Diameter of Tamping Face (mm)			22 to 28 mm

Equipment disposition: Acceptable Not Acceptable

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 19

Procedure ITD-D39

Liquid Limit Device and Grooving Tool Check

(AASHTO T 89, ASTM D 4318)

Purpose:

To provide instructions for checking the liquid limit device, grooving tool and cup.

Inspection Equipment Required:

1. Balance, 2000g, readable to 0.1g
2. 7" calipers, readable to 0.0001"
3. Stopwatch, readable to 0.1sec.

Tolerance:

As found in the test methods listed above.

Procedure:

1. Measure and record the thickness of the brass cup.
2. Weigh and record the weight of the brass cup.
3. Measure and record the dimensions of the L.L. base.
4. Measure the worn spot if any, where the cup contacts the base.
5. If electric, check the drop rate of two drops per minute.
6. With calipers, measure and record the dimensions of the grooving tool and gage end.

Worksheet 19Liquid Limit Device And Grooving Tool Check

Check Procedure: AASHTO T 89 (year)

Check Frequency: 12 (months)

Identification No.:		Date Checked:	
Manufacturer:	Model No:	Manufacturer Serial No.:	
Standard Used: Caliper Ident Number:		Balance Ident Number:	

Liquid Limit Device:

Essential Dimension	A	B	C	N	K	L	M
Reading (mm)	Per Manuf.						
ASTM Tolerance	54 ±5	2 ±0.1	27 ±1.0	47 ±1.5	50±2.0	150±2.0	125±2.0

Grooving Tool:

Essential Dimension	A	B	c	d	e
Reading (mm)					
ASTM Tolerance	10 ±0.1	2 ±0.1	13.5 ±0.1	10 ±0.2	15.9

Mass of Cup: g, (Range per ASTM - D4318: 185 to 215g)

Disposition of Equipment: Satisfactory Unsatisfactory

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 20

Standardization Procedure ITD-D37

Procedure For Soils Pycnometer Standardization

(AASHTO T 100)

Purpose:

1. To provide a temperature correction chart for the Pycnometer filled with distilled water.
2. To verify the Pycnometer's mass.

Inspection Equipment Required:

1. Standardized Thermometer.
2. Balance capable of weighing 2000 g. readable to 0.01 g.

Tolerance:

Tolerances shall meet AASTHO T 100 8.1 and 8.2

Procedure:

1. Determine and record the clean dry mass of the Pycnometer to the nearest 0.01 g.
2. Fill the Pycnometer with distilled water at or near room temperature. Fill to the mark on the neck of the Pycnometer with the center (bottom) of the meniscus just touching the line.
3. Determine and record the mass of the Pycnometer to the nearest 0.01 g.
4. Allow Pycnometer + water to stabilize. Use a rubber stopper with a hole in its center so as to allow the thermometer to read the temperature at the mid-point of the distilled water. Record the temperature.
5. Complete a chart for the different temperatures likely to occur while testing in the Lab. Use sections 8.1 and 8.2 to calculate each Pycnometer's temperature/mass.

Procedure 21

Check Procedure: ITD-DI

L.A Wear Abrasion Machine Check

(AASHTO T 96)

Purpose:

To check the critical dimensions and general operating condition of the L.A. machine and the mass of the spheres; used as test charges.

Tolerance:

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

Inspection Equipment Required:

1. Steel rule readable to 1 mm
2. Stopwatch readable to 0.1 sec.
3. Balance with a 5 kg capacity, readable to 1 g.

Procedure:

1. Measure and record the inside diameter of the drum to the nearest 1 mm.
2. Measure and record the inside Length to the nearest 1 mm.
3. Measure and record the wall thickness at the left and right edges to the nearest 1 mm
4. Is the cylinder horizontal?
5. Measure and record the 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. Record the RPM to the nearest number over a 5 minute period.
8. Check and record the number of revolutions.
9. Weigh and record the individual spheres to the nearest 1 g.
10. Record the total weight of spheres for a "B" wear to the nearest 1g.

Worksheet 21

L.A. Abrasion Check Record

Check Procedure: MTI-CAL-34, ASTM C131- (year) Check Frequency 24 (months)

ITD Identification No.	Manufacturer:
Model No.	Manufacturer Serial No
Check Standard used:	ITD Balance No
	ITD Caliper No

Drum horizontal within a tolerance of 1 in 100: Satisfactory Unsatisfactory

Shelf width measures 3.5 in. ± 0.1 in. Satisfactory Unsatisfactory

Shelf is firm, rigid and straight Satisfactory Unsatisfactory

Shelf surface is flat with no ridge greater than 0.1 in. Satisfactory Unsatisfactory

Machine has uniform peripheral speed Satisfactory Unsatisfactory

L.A. Rattler Charge (Steel Sphere),
see worksheet page 2 Satisfactory Unsatisfactory

Drum Dimensions:

	Measurements (Inches)			Average	ASTM Tolerance	Acceptable Yes/No
	1	2	3			
Inside Diameter					28" ± 0.2 "	
Inside Length					20" ± 0.2 "	

Revolutions:

Revolutions per minute				ASTM Tolerance	Acceptable Yes/No
1	2	3	Average		
				30 to 33 RPM	

Remarks:

Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Worksheet 21

L.A. Abrasion Charge (Steel Sphere) Check

Check Procedure: ASTM C131- (year)

Check Frequency: 24 (months)

Check Standard used: ITD Balance No. ITD Caliper No.	Date of Check:
--	----------------

Sphere Number	Diameter Readings (inches)				Weight Grams	Acceptable (390g - 445g) Yes/No
	1	2	3	Average		
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Charge Based on Grading:

Grading	Number of Spheres	Sphere No. in Group	Total Weight Grams	ASTM Tolerance Grams	Acceptable Yes/No
A	12			5000 ±25	
B	11			4584 ±25	
C	8			3330 ±20	
D	6			2500 ±15	

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 22

Standardization Procedure: ITD-D41

Mechanical Soil Compactor (Proctor Mechanical Rammer) Standardization

AASHTO T 99 Section 3.2.2 & 3.2.3, AASHTO T 180 Section 3.2.2 & 3.2.3, ASTM D2168

General Equipment Inspection:

Thoroughly inspect the mechanical and manual compactors for evidence of wear, malfunction, and need of servicing and adjustment. Clean, adjust, and lubricate the compactors so as to meet all requirements of the manufacturer, and the applicable method under which they will be used and for which the mechanical compactor is to be calibrated. Operate the compactor for a minimum of 25 drops to cause friction in the parts to become constant, allowing the rammer to fall on soil or other soft material.

Inspection Equipment Required:

1. Calipers readable to 0.01 mm
2. Tape measure readable to 1/16 in.
3. Straight edge, readable to 1/16 in.
4. Scale, capacity of 20,000 grams, readable to 0.1 grams.

Inspection Tolerance:

Equipment shall meet the dimensional tolerances specified in AASHTO T 99 sec. 3.2.2 for the 5.5 lb. Rammer. The 10 lb. Rammer shall meet the specifications found in AASHTO T 180, sec. 3.2.2.

Inspection Procedure for the 5.5 lb. Rammer:

1. Open the mechanical rammer housing and remove the rammer from its holder.
2. Using the calipers measure the diameter of the rammer face by taking 2 readings 90 degrees apart.
3. Weigh the rammer and then replace the rammer to its operating position.
4. Measure the drop height of the rammer by using the following method:
 - a. Remove the rammer resting plate and lower the rammer onto a pad that will not compact.

- b. Measure from the top of the rammer 12 inches and place a temporary mark on one of the guide rods.
- c. Set the unit to cycle for 1 drop. Take a straight edge and place it slightly above the temporary mark on the guide rod. Cycle the rammer once while observing where the ram stops at its high point. Move the position of the straight edge to correspond with this high point. Recycle the rammer and adjust your straight edge until you have an accurate releasing point of the rammer.
- d. Place a second temporary mark on the guide rod at this point.
- e. With the rammer setting on the cushioned pad, measure from the top of the rammer to the second mark to achieve the actual drop height.

Inspection Procedure for the 10 lb. Rammer:

The 10 lb. Rammer procedure is the same except section 4b, which should read 18 inches.

Standardization Procedure:

1. Prepare two 5-point moisture density curves according to AASHTO T 99 using a 5.5 pound manual rammer for one curve and the mechanical 5.5 lb. rammer for the other curve. Record the maximum unit weight of each curve.
2. Obtain the percent of difference (W) in the two curves by dividing the mechanical (Y') maximum unit weight by the manual (Y) unit weight.
3. If the absolute value of W is equal to or less than 2.0, the mechanical compactor is satisfactory for immediate use.
 - a. If the absolute value of W is greater than 2.0, then obtain two additional sets of data. Use the same soil sample used previously. Determine W, the average percentage difference of maximum dry unit mass values for three sets of data. If the absolute value of W is equal to or less than 2.0, the mechanical compactor is satisfactory for immediate use.
 - b. If the absolute value of W is greater than 2.0, then adjust the rammer mass of the mechanical compactor according to ASTM D2168 and obtain sets of three new values and compute a new value for W until the value is within the tolerance.

Worksheet 22

Mechanical Soil Compactor Standardization

Standardization Procedure: ASTM D2168 _(year) Method A

Standardization Frequency: 12 months

Identification No:	Date Standardized
Manufacturer:	Model No:
Mfg. Serial No:	Shape of Rammer Face:
Weight of Rammer:	Accuracy Requirement: 2.0% maximum % difference in max. unit weight
Calibration Balance Number:	Standardization Data: <input type="checkbox"/> As found <input type="checkbox"/> As Adjusted

Trial Number	Max. Unit Weight Manual Method (Y max.)	Max. Unit Weight Mechanical Method (Y' max.)	% Difference in Max. Unit Weight, (g)
1			
2			
3			
AVERAGE			(W)*

*If first Trial is within tolerance enter NA in these spaces. If not in tolerance, run 2 more Trials and compute AVG. % difference of all 3. If AVG. is out of tolerance adjust and run 3 more Trials and determine AVG.

NOTE: Attach work sheet for ASTM D698 or D1557 data used in this Standardization procedure.

Compactor Disposition: Acceptable Not Acceptable

Remarks:	
Standardized by:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE-STANDARDIZATION DUE DATE:

Procedure 23

Procedure No. ITD-S 105

Concrete Slump Cone Check

AASHTO T 119

Inspection Equipment Required:

A measuring tape or ruler, 4500 mm (18") minimum length.

Procedure:

1. The mold shall be made clean and free of foreign material.
2. The thickness of the metal from which the mold is made shall not be less than 1.14 mm (0.045"), at any measured point.
3. Measure the top of the mold, it should read 102 mm (4") in diameter.
4. Measure the bottom of the mold, it should read 203 mm. (8") in diameter.
5. Measure the height of the mold, it should read 305 mm (12").

Tolerances:

Individual diameters and heights shall be within ± 3.2 mm (1/8") of the specified dimensions.

Worksheet 23Slump Cone Check Record

Check Procedure: ITD-S105

Check Frequency: 12 months

Identification No.:	Date Checked:
Equipment Description: <input type="checkbox"/> Seamless <input type="checkbox"/> With Seam	Slump Cone Manufacturer:
Standard Used:	Caliper Number
	Steel Rule: Gradations:
Check Results:	<input type="checkbox"/> As Found <input type="checkbox"/> As Adjusted

Dimensional Check Results

Thickness of Cone Walls	Reading #1	Reading #2	Reading #3	AASHTO Requirements
Top				0.045" min.
Bottom				0.045" min.

Inside Diameter	Reading #1	Reading #2	Reading #3	AASHTO Requirements
Top				3-7/8" to 4-1/8"
Bottom				7-7/8" to 8-1/8"

Cone Height	Reading #1	Reading #2	Reading #3	AASHTO Requirements
				11-7/8" to 12-1/8"

Disposition of Cone:	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Not Acceptable
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Remarks:	
Checked By:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 24

Procedure: ITD-S108

Constant Temperature Bath Concrete and Cement specimens StandardizationInspection Equipment Required:

1. A standardized thermometer that reads to 0.1°F. (0.06°C)

Tolerance:

Concrete and Cement Specimens (water), Baths shall be maintained at 73.5°F ± 3.5°F (23.0 ± 2.0°C).

Procedure:

1. Place the standardized thermometer or temperature probe next to the thermometer in the water bath.
2. Allow the thermometer to stabilize, and compare temperatures on thermometers.
3. This temperature should reflect the same reading. If they do not, make note of the difference on the work sheet.
4. Adjust thermo regulator as needed so that temperature fluctuates equal distances above and below the desired temperature.
5. Circulation device(s) must keep the water at the required temperature throughout the bath.
6. Record temperature range of bath.

Worksheet 24Constant Temperature Bath Concrete and Cement Specimen Calibration

Calibration Reference: ITD-S-108

Calibration Frequency: 6 months

Identification Number:	Date Calibrated:
Bath Type (water, air, oil):	Calibration Standard: Thermometer Number:
ASTM (test method determined by type of bath):	Required temperature range:
Is the bath of the proper size and type as required by the specification? :	<input type="checkbox"/> Yes <input type="checkbox"/> No

After the bath is brought to the desired temperature, take successive readings at equally spaced intervals over the immersion time specified by the test method. Record readings in the following table.

Bath Temperature Readings				Specified Test Temperature	Acceptable Yes/No
1	2	3	4		

Bath Disposition:	<input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable
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Remarks:	
Calibrated By:	Signature:
WAQTC NO.	
PREVIOUS CALIBRATION DATE:	RE-CALIBRATION DUE DATE:

Procedure 25

Standardization Procedure: ITD-D10

Unit Weight Bucket Standardization

AASHTO T 19

Inspection Equipment Required:

1. A standardized thermometer.
2. A calibrated balance readable to 5 grams (0.01 lbs)
3. A glass plate of at least 6 mm thick and 25 mm larger than the diameter of the measure.
4. A feeler gage of 0.25 mm.

Tolerance:

Measure shall comply within the standards set in AASHTO T 19

Procedure:

1. Record the serial number of the equipment to be tested.
2. Determine if the top of the rim is satisfactorily plane by using a 0.25mm feeler gage and the glass plate placed on top of the measure. The feeler gage must not be capable of being inserted between the rim of the measure and the glass plate.
3. Determine the mass of the dry measure and the glass plate. (W_1)
4. Fill the measure with water at a temperature between 60°F – 85°F and cover with the glass plate in such a way as to eliminate bubbles and excess water.
5. Wipe the outside of the measure and glass plate dry being careful not to lose any water from the measure.
6. Determine the mass of the measure, glass plate and water. (W_2)
7. Determine the mass of the water in the measure by subtracting the mass in Step 3 from the mass in Step 6.
8. Perform steps 3 through 6 a minimum of two times with the mass difference between any two determinations being 0.3 grams.
9. Measure and record the temperature of the water.
10. Determine and record water density (D) from Table 2 in WAQTC FOP for AASHTO T 121, interpolating as necessary.
11. Calculate and record the volume (V) of the measure by dividing the mass of the water by the density of the water at the measured temperature.

Worksheet 25

Unit Weight Measure (Bucket) Standardization Record

Standardization Procedure: ITD-D10

Standardization Frequency: 12 months

Identification Number:	Date Standardized:
Nominal Capacity of Measure (ft.3)	Standardization Data: <input type="checkbox"/> As Found <input type="checkbox"/> As Adjusted
Standards Used:	
Balance ITD Number:	Thermometer ITD Number:
<u>1.Top Rim Planeness</u> (0.01" or 0.25mm): <input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable	
<u>2.Volumetric Calibration</u>	
1. Mass of Measure + Glass Plate: W ₁ =	2. Mass of Measure + Glass Plate + Water: W ₂ =
3. Temperature of Water: T= <input type="checkbox"/> °F <input type="checkbox"/> °C	4. Density of Water from Table 2 @ T: D=
5. Mass of Measure + Glass Plate: W ₁ =	6. Mass of Measure + Glass Plate + Water: W ₂ =
7. Temperature of Water: T= <input type="checkbox"/> °F <input type="checkbox"/> °C	8. Density of Water from Table 2 @ T: D=
9. Volume Calculations:	$V = \left[\frac{(W_2 - W_1)}{D} \right] \quad V =$

Remarks:	
Standardized By:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE-STANDARDIZATION DUE DATE:

Procedure 26

Standardization Procedure: ITD-B-22

Thermometer StandardizationPurpose:

To provide instructions for standardization of thermometers.

Inspection Equipment Required:

1. A Certified Thermometer for specific temperature.
2. Temperature Bath.
3. Ice Bath.
4. Magnifying glass with light.

Tolerance:

Tolerances can be found in ASTM E1 Table 2.

Procedure for Single Point Operation Thermometer:

1. Visually examine thermometer to be verified for separation, glass faults, etc.
2. Properly immerse both the certified thermometer and the thermometer being verified in a temperature bath maintained at test temperature. Thermometers should be placed within approximately one inch of each other and allowed time enough to stabilize (Approximately 5 minutes).
3. Read and record temperature of both thermometers.
4. Calculate difference between the two thermometers. Compare the difference to the scale error value as noted in ASTM E1 Table 2.
5. If the difference is outside the scale error maximum, repeat this procedure two more times and reject thermometer if difference remains outside of scale error maximum.

Procedure for Multi-Point Thermometer:

1. Visually examine thermometer to be verified for separation, glass faults, etc.
2. Thermometer will be verified at two temperature points, the Ice Point and the Maximum Operation Temperature Point. (The Maximum Operation Temperature Point is defined as the highest temperature the thermometer will be used at to conduct testing.)

- (a) Perform Ice Point test as provided in ASTM E77 to obtain first testing point.
 - (b) Maximum Operation Temperature Point. Place both the certified thermometer and the thermometer being verified into the appropriate temperature bath. Adjust the bath temperature to the testing point. The thermometers shall be placed within one inch of each other, immersed to the specified level in the bath, and allowed to stabilize. (Approximately 5 minutes)
3. Read and record temperature of both thermometers.
 4. Calculate difference between the two thermometers. Compare the difference to the scale error value as noted in ASTM E1 Table 2.
 5. If the difference is outside the scale error maximum, repeat this procedure two more times and reject thermometer if difference remains out of scale error maximum.

Procedure for Standardized Thermometers:

1. Visually examine thermometer to be verified for separation, glass faults, etc.
2. Perform Ice Point test as provided in ASTM E77.
3. Standardized thermometer temperature reading should equal temperature recorded on the "Certificate of Calibration" (If Ice Point reading varies more than one division with the certified reading, thermometer should be replaced.

Worksheet 26

Thermometer or Temperature Recorder Standardization Record

Standardization Procedure: ASTM-E77- (year)

Standardization Frequency: 12-6 months

Identification Number:	Date Standardized:
Equipment Description:	
Thermometer Type:	Temperature Recorder Type:
Manufacturer:	Model No:
Mfg. Serial No:	
Full Range of Equipment: to ,	Graduations:
Accuracy Requirement:	Standard Used: Type: ITD Number:
<input type="checkbox"/> Full Range (identify):	<input type="checkbox"/> Working Range Calibration Data: <input type="checkbox"/> As Found <input type="checkbox"/> As Adjusted

Section I

(1) Standard	(2) Equipment	(3) Standard*	(4) Equipment	(5) Standard*	Equipment Avg.	Standard Avg.	Error

* Avg. of (1) & (5) must agree with (3), if not repeat until agreement is obtained.

Section II

Ice Point: Equipment: Error=	Not Applicable
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Section III

Single Point Liquid-in-Glass Thermometer Calibrations Only	
Date of Initial Complete Range Calibration: Applicable	Not Applicable Equipment Disposition: <input type="checkbox"/> Acceptable <input type="checkbox"/> Not Acceptable

Remarks:	
Standardized by:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE-STANDARDIZATION DUE DATE:

Procedure 27

Standardization Procedure No. ITD-S102

Pressure Type Concrete Air Meter Standardization

References: AASHTO T 152,

Inspection Equipment Required:

1. General purpose scale
2. Glass plate
3. Grease
4. Small flat screwdriver

Procedure:

1. Determine and record the mass of the base of the pressure meter and the glass plate together (W_1)
2. Apply a small amount of grease on the lip of the base and fill to the top with water. Carefully place the glass plate on top of the base removing excess water and being careful not to trap air under the plate. Slide as necessary. Wipe excess water from base and plate.
3. Determine and record the mass of the base, water, and glass plate together (W_2)
4. Subtract the mass of step I from the mass of step 3. This figure is the mass of water of the base (M)
5. Determine and record the mass of the 5% vessel, which comes with the pressure meter (m_1)
6. Fill the vessel to the top with water, determine and record mass on worksheet. (m_2)
7. Subtract the mass of Step 5 from the mass of Step 6 (m)
8. Determine R by dividing m by M times 100. R should equal 5%.
9. Next, screw the short piece of straight tubing into the threaded petcock hole on the underside of the cover. Clamp cover on the base with the tube extending down into the water.
10. With petcocks open, use the squeeze bulb and add water through the petcock with the pipe extension attached below, until all air is forced out of the opposite petcock.

11. Leaving both petcocks open, pump up air pressure to a point just beyond the pre-determined initial pressure line (IP). Wait a few seconds for the compressed air to cool to normal temperature and then stabilize the gauge needle at the proper initial pressure line by pumping or bleeding off as needed.
12. Close both petcocks and immediately press down on the thumb lever exhausting air into the base. Wait a few seconds until the needle is fully stabilized. At this point, if all the air was eliminated, and the initial pressure line was correctly selected, the gauge should read 0%. If two or more consecutive tests show a consistent result that differs from the 0%, then change the initial pressure to compensate for the variation. Use the newly established initial pressure for subsequent tests.
13. Once the initial pressure is established and 0% air is achieved, then screw the curved tube into the outer end of the petcock which has the pipe extension attached below. Turn the nozzle in the downward position. Take the 5% calibrating vessel, (354 ml), which comes with the gauge and hold it under the nozzle of the tube, carefully press down on the thumb lever and control water flow with the petcock. Fill the vessel with water from the base. Do not overflow the vessel.
14. Open the free petcock and release the air. Open the other petcock and allow the water to run back into the base from the curved tube. There is now 5% air in the base.
15. With petcocks open, pump the air pressure up again in the exact same manner as described in step 12. Close petcocks and immediately press the 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% (A).
16. If two or more tests show consistent readings that differ from the 5% in excess of 0.2%, then remove gauge glass and reset the dial needle to 5% by turning the calibration screw located just below and to the right of the dial center.
17. When the gauge needle reads correctly at 5%, then additional water may be removed in the same manner as in step 15, to check results at 10%, 15%, and 20%, etc.

Worksheet 27

Pressure Type Concrete Air Meter Standardization Record

Standardization Procedure: ITD-S102

Standardization Frequency: 3 months

Meter Identification Number:		Date Standardized:	
Manufacturer:		Type:	
Mfg. Serial No:	Model No:	Size:	
Calibration Balance Number:		Calibration Vessel Number:	
Standardization Data: <input type="checkbox"/> As Found <input type="checkbox"/> As Adjusted			
STANDARDIZATION VESSEL			
Mass of Measure + Glass Plate: $W_1 =$		Mass of Measure + Glass Plate + Water: $W_2 =$	
Mass of Water in Vessel (m) $m_1 =$ mass Vessel = $m_2 =$ mass Vessel + Water = $m = m_2 - m_1 =$		Mass. of Water in Measure (M) $M = (W_2) - (W_1) =$	
Calculation of R:		$R = \frac{m}{(M \times 100)}$ R=	
TYPE B METERS			
Air Content Standard (R) = %		Initial Pressure (IP) per manufacturer or as determined =	
Air Content Reading of Meter (A) = %		Meter Error (A-R) = %	

Disposition of Meter: Acceptable Maintenance Required

Remarks:	
Standardized by:	Signature:
WAQTC NO.	
PREVIOUS STANDARDIZATION DATE:	RE-STANDARDIZATION DUE DATE:

Procedure 28

Procedure No. ITD-S104

CAPPING COMPOUND CHECK

AASHTO T 231, ASTM C617

Purpose:

To check / verify the strength of sulphur capping compound. Sulphur compounds shall have a minimum compressive strength of 34 MPa, (5,000 psi).

Inspection Equipment Required:

1. Cube mold and base plate conforming to AASHTO T 106
2. Metal cover plate conforming in principal to the design shown in Fig. 1, of AASHTO T 231
3. Mineral oil
4. Brush
5. Sulphur capping compound
6. Sulphur capping compound heating pot
7. Metal ladle
8. Meal spoon
9. Medium size flat blade screwdriver
10. Medium slip joint pliers

Procedure:

1. With the brush, put a light coat of mineral oil on the mold surfaces which will be in contact with the capping material. Put the mold assembly together and let it come to room temperature, 20°C to 30°C, (68°F to 86°F).
2. Using a sulphur heating pot, bring the temperature of the capping material to within a range of 129°C to 143°C, (265°C to 290°F). At this temperature molten sulphur compound readily segregates, so using the metal spoon, stir the pot thoroughly before each use.
3. With the metal ladle, quickly fill each of the three mold compartments until the molten material reaches the top of the filling hole. Allow sufficient time for maximum shrinkage due to cooling and solidification, approximately 15 minutes, then refill each hole with molten material
4. After solidification is complete, remove the cubes from the mold without breaking off the knob formed by the filling hole. Remove oil, fins, and sharp edges which may have formed during the casting process.
5. Check the planeness of the bearing surfaces in the manner described in AASHTO T 106. After storage at room temperature for two (2) hours, test cubes in compression following the procedure described in AASHTO T 106 and calculate the compressive strength in megapascals, (pounds per square inch).

Worksheet 28Capping Compound Check Record

Check Procedure: ITD-S104

Check Frequency: 12 months

Reference: AASHTO T 231, Section 4

Equipment Ident No.	Check Date:
Check Equipment	
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.

Size of Cubes			
	Cube #1	Cube#2	Cube#3
Width, inches			
Depth, inches			
Area, square inches			
Max Load, lbs			
Compressive Str, psi			
Average, psi		5,000 psi minimum	
Temperature of material		265° F to 290° F	

Name and Type of Capping Compound:

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 29

Procedure No. ITD-S107

CYLINDER CAPPING MOLDS CHECK

AASHTO T 231, ASTM C617

Purpose:

To check the planeness of cylinder capping molds.

Inspection Equipment Needed:

1. Straight Edge
2. Feeler Gauge 0.002" (0.05 mm)
3. Calipers readable to 0.0001"

Procedure:

1. Lay the straight edge across the face of the capping mold.
2. Try to fit the 0.002" (0.05 mm) feeler gauge between the straight edge and the face of the capping mold.
3. The feeler gauge should not slide in. If the gauge goes in, the mold will have to be machined until a planeness of less than 0.002" (0.05 mm) is achieved.
4. Repeat this procedure for the other plate.
5. Measure the diameter of the plate with the calipers. It should be 1" greater in diameter than the specimen. The plate should be at least 1/2" thick.
6. Report the results on the report form.

Tolerances:

All capping plates, when new, shall not depart from plane by more than 0.002" (0.05mm) in any 6" of diameter. Used plates should be free of gouges and groves greater than 0.010" deep or 0.05 sq. in. in surface area.

Worksheet 29

CYLINDER CAPPING MOLDS CHECK

Check Procedure: ITD-S107

Check Frequency: 12 months

Reference: AASHTO T 231, ASTM C617

Equipment Ident No.	Check Date:
Check Equipment	
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.

	Machined metal plate is at least ½ in. thick	Plate is 1 in. greater in diameter than specimen	Surface does not depart from plane more than 0.002 in. in 6 in.	Surface is free of grooves or indentations
2 in				
2 in				
2 in				
3 in				
4 in				
4 in				
4 in				
6 in				
6 in				

Action Recommended: Repair Replace No Action

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Procedure 30

Procedure No. ITD-S 103

BEARING BLOCKS CHECK

AASHTO T 106, ASTM C 109

Purpose:

To check the planeness of bearing blocks.

Inspection Equipment Needed:

1. Straight Edge
2. Feeler Gauge 0.001" (0.025 mm)

Procedure:

1. Lay straight edge across the face of upper bearing block.
2. Try to fit the 0.001" (0.025 mm) feeler gauge between the straight edge and the face of the bearing block.
3. The feeler gauge should not slide in. If the gauge goes in, the block will have to be machined until a planeness of less than 0.001" (0.025 mm) is achieved.
4. Repeat this procedure for the bottom block.
5. Report the results on the report form.

Tolerances:

All bearing blocks, when new, shall not depart from plane by more than 0.0005" (0.013 mm) and they shall be maintained at 0.001" (0.025 mm). If the bearing block is larger than 6" in diameter, they shall be maintained at 0.001" (0.025 mm) in any 6" of diameter.

Worksheet 30

BEARING BLOCKS CHECK

Check Procedure: ITD-S103

Check Frequency: 12 months

Reference: AASHTO T 106 & ASTM C39

Equipment Ident No.	Check Date:
Check Equipment	
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.

Machine Capacity	Top Readings	No. 1	No. 2	No. 3	No. 4	No.5	Action		
							Repair	Replace	None
Test Machine Size:	Pass						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Bottom Readings	No. 1	No. 2	No. 3	No. 4	No.5			
	Pass						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Fail						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Worksheet 31

CUBE MOLD (2" X 2") CHECK RECORD

Check Procedure: ASTM C109- (year)

Check Frequency: 12 month

Mold Identification Number:	Check Date:
Check Standard: Type:	Serial No:
Accuracy Requirements for Molds:	(a) Planeness: 0.002" maximum deviation
	(b) Opposite Face Dimension: 1.98" to 2.02"
	(c) Height: 1.985" to 2.01"
Condition of Molds: <input type="checkbox"/> Acceptable <input type="checkbox"/> Unacceptable	

Compartment Number	Planeness*	Opposite Face Dimension		Height Avg.
		Position #1	Position #2	
1	<input type="checkbox"/> S <input type="checkbox"/> U			
2	<input type="checkbox"/> S <input type="checkbox"/> U			
3	<input type="checkbox"/> S <input type="checkbox"/> U			

* S - Satisfactory

U = Unsatisfactory

NOTE: Assure that each cube mold half is matched with the corresponding half (i.e., by serial number) before performing verification check.

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Worksheet 32

CONCRETE CAPPING STAND CHECK RECORD

Check Procedure: ASTM C617- (year)

Check Frequency: 12 (Months)

Equipment Ident No.	Check Date:
Check Equipment	
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.

VERIFICATION ITEMS	Results *
1. General Condition	<input type="checkbox"/> S <input type="checkbox"/> U
2. Perpendicularity of alignment bars (1/8" in 12", max.)	<input type="checkbox"/> S <input type="checkbox"/> U
3. Bottom Plate Thickness (1/2" min.)	<input type="checkbox"/> S <input type="checkbox"/> U
4. Cap To Specimen Center (1/16" max. deviation)	<input type="checkbox"/> S <input type="checkbox"/> U

* Indicate: S - For Satisfactory; U - For Unsatisfactory

Capping Stand Disposition: Acceptable Not Acceptable

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Worksheet 33

UNBONDED CAP RETAINING RING CHECK RECORD

Check Requirements: ASTM C1231- year)

Check Frequency: 12 Months

Equipment Ident No.	Check Date:
Check Equipment	
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.

VERIFICATION ITEMS	Results *
1. General Condition	<input type="checkbox"/> S <input type="checkbox"/> U
2. Inside diameter measures between 102% and 107% of the diameter of the cylinder.	<input type="checkbox"/> S <input type="checkbox"/> U
3. Planeness of surfaces (within ± 0.002 ") that contact Bearing Blocks	<input type="checkbox"/> S <input type="checkbox"/> U
4. Bearing surfaces of the retainers shall have no gouges, grooves or indentations > 0.010 in. deep or > 0.05 in. ² in surface area	<input type="checkbox"/> S <input type="checkbox"/> U

* Indicate: S - For Satisfactory; U - For Unsatisfactory

Retainer Ring Disposition: Acceptable Not Acceptable

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE:

Worksheet 34

UNBONDED CAP CHECK RECORD

Check Requirements: ASTM C1231- () year)

Check Frequency: 12 Months

Equipment Ident No.	Check Date:
Check Equipment	
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.
Type:	Ident No. or Serial No.

CHECK ITEMS	Results *
1. Unbonded Cap(s) indicate Manufactures / Suppliers name, Shore hardness, applicable concrete compressive strength data	<input type="checkbox"/> S <input type="checkbox"/> U
2. Documentation / records indicating the date caps were put into service, cap hardness / durometer, number of tests(1).	<input type="checkbox"/> S <input type="checkbox"/> U

(1) Maximum number of tests per set of caps: 100.

* Indicate: S - For Satisfactory; U - For Unsatisfactory

Unbonded cap Disposition: Acceptable Not Acceptable

Remarks:	
Checked by:	Signature:
WAQTC NO.	
PREVIOUS CHECK DATE:	RE-CHECK DUE DATE: