



**INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS AND TESTS**

**VERIFYING SOIL TEST MOLDS
ITM No. 914-24**

1.0 SCOPE.

- 1.1** This test method covers the procedures for verifying the critical dimensions, including mold volume, of 4 in. molds used in ITM 512 and 6 in. molds used in AASHTO T 99 and AASHTO T 180.
- 1.2** This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 AASHTO Standards.

- T 19 Standard Method of Test for Bulk Density (Unit Weight) and Voids in Aggregate
- T 99 Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
- T 134 Moisture-Density Relations of Soil-Cement Mixtures
- T 180 Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

2.2 ITM Standards.

- ITM 512 Field Determination of Maximum Dry Density and Optimum Moisture Content of Soil

3.0 APPARATUS.

- 3.1** Calipers, readable to 0.001 in.
- 3.2** Feeler gauge, 0.005 in.
- 3.3** Straight edge, 4 in. long
- 3.4** Proctor mold, 4 in. and 6 in.

- 3.5** Thermometer
- 3.6** Molds having a volume of $0.0333 \pm 0.0005 \text{ ft}^3$ ($0.000943 \pm 0.000014 \text{ m}^3$) shall have an inside diameter of $4.000 \pm 0.016 \text{ in.}$ ($101.60 \pm 0.40 \text{ mm}$) and a height of $4.584 \pm 0.018 \text{ in.}$ ($116.40 \pm 0.50 \text{ mm}$).
- 3.7** Molds having a volume of $0.07500 \pm 0.0009 \text{ ft}^3$ ($0.002124 \pm 0.000025 \text{ m}^3$) shall have an inside diameter of $6.000 \pm 0.026 \text{ in.}$ ($152.40 \pm 0.70 \text{ mm}$) and a height of $4.584 \pm 0.018 \text{ in.}$ ($116.40 \pm 0.50 \text{ mm}$).
- 4.0** **TERMINOLOGY.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101.
- 5.0** **SIGNIFICANCE AND USE.** This ITM is used to verify the critical dimensions and volumes of 4 in. and 6 in. soil test molds.
- 6.0** **PROCEDURE.**
- 6.1** **Dimension Verification of the Mold**
- 6.1.1** Measure the inside diameter of the mold with the calipers to the nearest 0.001 in. Rotate the mold 90° and measure the inside diameter again. Record the average.
- 6.1.2** Measure the height of the mold with the calipers to the nearest 0.001 in. Rotate the mold 180° and measure the height again. Record the average.
- 6.1.3** Place the straightedge firmly on the base plate of the mold. Attempt to pass the feeler gauge between the base and the straightedge. The base plate is considered plane if the gauge does not pass under the straight edge.
- 6.2** **Volume Verification of the Plate Glass and Mold**
- 6.2.1** Apply a thin layer of grease on the rim to prevent leakage of water from the mold.
- 6.2.2** Determine the mass of the plate and mold to the nearest 0.1 lb (0.05 kg).
- 6.2.3** Fill the mold with water to eliminate the bubble and overflow and cover with the glass plate.
- 6.2.4** Determine the mass of the water, mold, and glass plate to nearest 0.1lb (0.05 kg).

6.2.5 Water shall be at 20°C. If not, density shall be adjusted.

7.0 TOLERANCES.

Mold	Internal Diameter	Internal Height	Volume
4 in.	4.000 ± 0.016 in.	4.584 ± 0.005 in.	0.0333 ± 0.0005 ft ³
	(101.60 ± 0.41mm)	(116.43 ± 0.13 mm)	(0.000943 ± 0.000014 m ³)
6 in.	6.000 ± 0.026 in.	4.584 ± 0.005 in.	0.07500 ± 0.0009 ft ³
	(152.40 ± 0.66 mm)	(116.43 ± 0.13 mm)	(0.002124 ± 0.000025 m ³)

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SOIL TEST MOLDS VERIFICATION

Equipment:

Calipers: _____

Feeler Gauge: _____

4 in. Molds			
Mold No.	Is Base Plane? (Y/N)	Internal Height	Internal Diameter

6 in. Molds			
Mold No.	Is Base Plane? (Y/N)	Internal Height	Internal Diameter

Do measurements comply with requirements of AASHTO T 99, T 180, or ITM 512? (Y/N) _____

Remarks: _____

Verified by: _____

Date: _____

Next Due Date: _____

VOLUME DETERMINATION OF COMPACTION MOLDS

AASHTO T 99, T180, & ITM 512

Procedure used: AASHTO T19, section 8

Date:

Verification Frequency: 12 months

Equipment used: **Thermometer:**
Balance:
Proctor Mold (4 in.)

Calibrated by:

Mold ID:

Remarks:

Tare Wt. of MOLD & GLASS PLATE:	<input type="text"/>	gms
Total Wt. of WATER, MOLD, & GLASS PLATE:	<input type="text"/>	gms
Weight of water:	<input type="text"/>	gms
Temperature of water:	<input type="text"/>	°C
Density of Water:	<input type="text"/>	kg/m ³ x 1000 = <input type="text"/> g/m ³
Mold Volume: =	<input type="text"/>	m ³ x 35.315 ft ³ /m ³ = <input type="text"/> ft ³

Volume Range: 0.0328 to 0.0338 ft³

Procedure used: AASHTO T19, section 8

Date:

Verification Frequency: 12 months

Equipment used: **Thermometer:**
Balance:
Proctor Mold (6 in.)

Calibrated by:

Mold ID:

Remarks:

Tare Wt. of MOLD & GLASS PLATE:	<input type="text"/>	gms
Total Wt. of WATER, MOLD, & GLASS PLATE:	<input type="text"/>	gms
Weight of water:	<input type="text"/>	gms
Temperature of water:	<input type="text"/>	°C
Density of Water:	<input type="text"/>	kg/m ³ x 1000 = <input type="text"/> g/m ³
Mold Volume: =	<input type="text"/>	m ³ x 35.315 ft ³ /m ³ = <input type="text"/> ft ³

Volume Range: 0.0741 to 0.0759 ft³

Density Variation with Temperature

Temp		Density		Temp		Density		Temp		Density		Temp		Density	
°C	°F	kg/m ³	lb/ft ³	°C	°F	kg/m ³	lb/ft ³	°C	°F	kg/m ³	lb/ft ³	°C	°F	kg/m ³	lb/ft ³
15.6	60.0	999.010	62.366	18.6	65.5	998.479	62.333	21.6	70.9	997.857	62.294	24.6	76.3	997.138	62.249
15.7	60.3	998.993	62.364	18.7	65.7	998.459	62.332	21.7	71.1	997.834	62.293	24.7	76.5	997.111	62.248
15.8	60.4	998.975	62.363	18.8	65.8	998.438	62.330	21.8	71.2	997.812	62.291	24.8	76.6	997.085	62.247
15.9	60.6	998.958	62.362	18.9	66.0	998.418	62.329	21.9	71.4	997.790	62.290	24.9	76.8	997.059	62.245
16.0	60.8	998.940	62.361	19.0	66.2	998.398	62.328	22.0	71.6	997.766	62.289	25.0	77.0	997.033	62.243
16.1	61.0	998.923	62.360	19.1	66.4	998.377	62.327	22.1	71.8	997.744	62.287	25.1	77.2	997.007	62.241
16.2	61.2	998.906	62.359	19.2	66.6	998.357	62.325	22.2	72.0	997.721	62.286	25.2	77.4	996.981	62.239
16.3	61.3	998.888	62.358	19.3	66.7	998.336	62.324	22.3	72.1	997.698	62.284	25.3	77.5	996.955	62.238
16.4	61.5	998.871	62.357	19.4	66.9	998.316	62.323	22.4	72.3	997.676	62.283	25.4	77.7	996.929	62.237
16.5	61.7	998.853	62.356	19.5	67.1	998.296	62.322	22.5	72.5	997.653	62.281	25.5	77.9	996.903	62.235
16.6	61.9	998.836	62.355	19.6	67.3	998.275	62.320	22.6	72.7	997.630	62.280	25.6	78.1	996.877	62.233
16.7	62.1	998.818	62.353	19.7	67.5	998.255	62.319	22.7	72.9	997.608	62.279	25.7	78.3	996.851	62.231
16.8	62.2	998.801	62.352	19.8	67.6	998.235	62.318	22.8	73.0	997.585	62.277	25.8	78.4	996.825	62.230
16.9	62.4	998.784	62.351	19.9	67.8	998.214	62.316	22.9	73.2	997.563	62.276	25.9	78.6	996.799	62.229
17.0	62.6	998.766	62.350	20.0	68.0	998.194	62.315	23.0	73.4	997.540	62.274	26.0	78.8	996.773	62.227
17.1	62.8	998.749	62.349	20.1	68.2	998.174	62.314	23.1	73.6	997.516	62.273	26.1	79.0	996.746	62.225
17.2	63.0	998.731	62.348	20.2	68.4	998.153	62.313	23.2	73.8	997.491	62.271	26.2	79.2	996.720	62.223
17.3	63.1	998.714	62.347	20.3	68.5	998.133	62.311	23.3	73.9	997.467	62.270	26.3	79.3	996.694	62.222
17.4	63.3	998.697	62.346	20.4	68.7	998.112	62.310	23.4	74.1	997.442	62.268	26.4	79.5	996.668	62.221
17.5	63.5	998.679	62.345	20.5	68.9	998.092	62.309	23.5	74.3	997.418	62.267	26.5	79.7	996.642	62.219
17.6	63.7	998.662	62.344	20.6	69.1	998.072	62.308	23.6	74.5	997.393	62.265	26.6	79.9	996.616	62.217
17.7	63.9	998.645	62.343	20.7	69.3	998.051	62.306	23.7	74.7	997.369	62.264	26.7	80.1	996.590	62.215
17.8	64.0	998.627	62.342	20.8	69.4	998.031	62.305	23.8	74.8	997.344	62.262	26.8	80.2	996.562	62.214
17.9	64.2	998.610	62.341	20.9	69.6	998.011	62.304	23.9	75.0	997.320	62.261	26.9	80.4	996.534	62.212
18.0	64.4	998.592	62.340	21.0	69.8	997.990	62.302	24.0	75.2	997.294	62.259	27.0	80.6	996.506	62.210
18.1	64.6	998.575	62.339	21.1	70.0	997.970	62.301	24.1	75.4	997.268	62.257	27.1	80.8	996.477	62.208
18.2	64.8	998.557	62.338	21.2	70.2	997.947	62.300	24.2	75.6	997.242	62.256	27.2	81.0	996.449	62.206
18.3	64.9	998.540	62.337	21.3	70.3	997.925	62.298	24.3	75.7	997.216	62.255	27.3	81.1	996.421	62.205
18.4	65.1	998.520	62.336	21.4	70.5	997.902	62.297	24.4	75.9	997.190	62.253	27.4	81.3	996.393	62.203
18.5	65.3	998.499	62.334	21.5	70.7	997.879	62.296	24.5	76.1	997.164	62.251	27.5	81.5	996.365	62.201