



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

**VERIFYING MECHANICAL SHAKERS  
ITM No. 906-24**

**1.0 SCOPE.**

- 1.1 This test method covers the procedure for verifying the sieving sufficiency of mechanical shakers and the accuracy of timers used in the sieve analysis of aggregates.
- 1.2 This ITM may involve hazardous materials, operations, 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 ITM Standards.**

902 Verifying Sieves

**3.0 TERMINOLOGY.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101.

**4.0 SIGNIFICANCE AND USE.** This ITM is used by laboratory personnel to verify the sieving sufficiency of mechanical shakers and the accuracy of timers used in the sieve analysis of aggregates.

**5.0 APPARATUS.**

- 5.1 Balance, readable to 0.1 g
- 5.2 Timing Device consisting of either: NIST Traceable Timer, or Android/iPhone with a stopwatch function/app, readable to 1 s
- 5.3 Sieves, verified in accordance with ITM 902
- 5.4 Sieve pan and lid

## **6.0 PROCEDURE.**

### **6.1 Timer.**

- 6.1.1** Operate the mechanical shaker with the timer set at 5 min, and measure the time using a Timing Device in accordance with 5.2.
- 6.1.2** Repeat 6.1.1 with the timer set at 10 min and 15 min.
- 6.1.3** If the timer is not within the allowable tolerance of 8.1, the manufacturers markings shall not be used, and accurate settings on the shaker shall be established by trial and error determination.

### **6.2 Shakers using 8 in. and 12 in. diameter sieves.**

- 6.2.1** Determine and record an initial sample weight.
- 6.2.2** Insert sieves No. 4 through No. 200 for fine aggregates or 1 in. through No. 200 for coarse or dense graded aggregates into the shaker.
- 6.2.3** Shake sample mechanically for 15 min for sands or 10 min for blended aggregates.
- 6.2.4** Place the first sieve retaining material on a pan and cover the sieve with the lid.
- 6.2.5** Hand shake the first sieve for 1 min by holding the sieve in a slightly inclined position in one hand and striking the side of the sieve sharply and with an upward motion against the heel of the other hand at approximately 150 times per min. The sieve should be turned about 1/6 of a revolution at intervals of about 25 strokes. For sieves larger than the No. 4 sieve, the material on the sieve should be limited to a single layer of particles.
- 6.2.6** Weigh the material passing the sieve and retained in the pan.
- 6.2.7** Weigh the material retained on the sieve.
- 6.2.8** Add the weight retained on the sieve and weight passing the sieve, and verify the sieve was not overloaded in accordance with Table 1. If the sieve was overloaded, verification is void, and a new sample shall be obtained.

Screen Size	Standard 15 in. x 23 in.	Standard 14 in. x 14 in.	12 in. Diameter	8 in. Diameter
3 in.	40.5 kg	23.0 kg	12.6 kg	-----
2 in.	27.0 kg	15.3 kg	8.4 kg	3.6 kg
1 1/2 in.	20.2 kg	11.5 kg	6.3 kg	2.7 kg
1 in.	13.5 kg	7.7 kg	4.2 kg	1.8 kg
3/4 in.	10.2 kg	5.8 kg	3.2 kg	1.4 kg
1/2 in.	6.7 kg	3.8 kg	2.1 kg	890 g
3/8 in.	5.1 kg	2.9 kg	1.6 kg	670 g
No. 4	2.6 kg	1.5 kg	800 g	330 g
8 in. diameter sieves: No. 8 to No. 200 shall not exceed 200 g/sieve				
12 in. diameter sieves: No. 8 to No. 200 shall not exceed 450 g/sieve				

**APPROXIMATED SIEVE OVERLOAD  
TABLE 1**

**6.2.9** Repeat 6.2.5 through 6.2.8 on all remaining sieves.

**6.2.10** If a sieve does not meet the allowable tolerance of 8.2, the shaking time shall be increased to determine an adequate time.

**6.3 Shakers using 15 in. x 23 in., 14 in. x 14 in., or other size sieves.**

**6.3.1** Determine and record an initial sample weight of an aggregate having a nominal maximum aggregate size of 1 in.

**6.3.2** Insert sieves 1 in. through No. 8 into the shaker.

**6.3.3** Shake sample mechanically for 5 min.

**6.3.4** Remove the first sieve retaining material, determine the weight of material retained, and verify that the sieve was not overloaded in accordance with Table 1. If the sieve was overloaded, verification is void, and a new sample shall be obtained.

**6.3.5** Place the material on a 8 in. or 12 in. diameter sieve of equivalent opening size in increments that will not overload the sieve in accordance with Table 1. Place the sieve on a pan and cover the sieve with the lid.

- 6.3.6 Handshake for one min as described in 6.2.5. Continue until all material has been introduced onto the 8 in. or 12 in. sieve.
- 6.3.7 Weigh the accumulated material passing the sieve and retained in the pan.
- 6.3.8 Repeat 6.3.4 through 6.3.7 for all remaining sieves.
- 6.3.9 If a sieve does not meet the allowable tolerance of 8.2, the shaking time shall be increased to determine an adequate time.

**7.0 CALCULATIONS.** The percent passing a sieve by hand shaking after mechanical shaking is calculated by the following formula:

$$\% \text{ Passing} = \frac{W_1}{W_2} \times 100$$

where:

- $W_1$  = weight (mass) of sample passing a sieve by hand shaking, g
- $W_2$  = initial sample weight (mass), g

**8.0 TOLERANCE.**

- 8.1 The timer of the mechanical shaker shall be within  $\pm 5$  s at 5 min,  $\pm 10$  s at 10 min, and  $\pm 15$  s at 15 min of the stopwatch reading.
- 8.2 After mechanical shaking, no more than 0.5 percent by weight of the total sample shall pass any sieve after 1 min of hand sieving.

**9.0 REPORT.** The timing and sieving sufficiency verification shall be reported on the form in Appendix A.

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**MECHANICAL SHAKER AND TIMER  
VERIFICATION  
ITM 906**

**SHAKER IDENTIFICATION**

Manufacturer: \_\_\_\_\_

Model No.: \_\_\_\_\_ Serial No.: \_\_\_\_\_

**VERIFICATION EQUIPMENT USED**

Balance: \_\_\_\_\_ Have sieves been verified using ITM 902? \_\_\_\_\_

Timer ID (if NIST): \_\_\_\_\_ or Android / iPhone used (circle one)

**TIMER VERIFICATION**

Setting on Shaker Timer	Timing Device Reading	Corrective Adjustment Made
5		
10		
15		

**SIEVING SUFFICIENCY VERIFICATION**

Frame Dimensions: \_\_\_\_\_ Mechanical Sieving Time: \_\_\_\_\_

Total Sample Weight: \_\_\_\_\_

Sieve Size	Weight Retained by Mechanical Sieving	Weight Passing After Hand Sieving	% Passing After Hand Sieving
1 in.			
3/4 in.			
1/2 in.			
3/8 in.			
No. 4			
No. 8			
No. 16			
No. 30			
No. 50			
No. 100			
No. 200			

Remarks: \_\_\_\_\_

Verified by: \_\_\_\_\_

Date: \_\_\_\_\_

Next Due Date: \_\_\_\_\_