



DETERMINING THE ADEQUACY OF TEST SIEVES

GENERAL

This method is used to determine if sieves are adequate for testing purposes, and not necessarily for meeting all the requirements specified in AASHTO M92.

A. Apparatus

1. A set of flat "Go"-“No-Go" sieve gauges for checking the following sieves: 1 ½ - in. (37. ± mm) 1.0 – in (25.0 – mm), 3/4-in. (19.0-mm), 0.500-in. (12.5-mm), 3/8-in. (9.5-mm) and No. 4 (4.75-mm). The sieve gauge markings are the permissible variations of average openings from the standard sieve designations in AASHTO M92, Table 1 (4) applied to the standard sieve designations (1).
2. Complete set of standard fine sieves No. 4 (4.75-mm), 8 (2.36-mm), 16 (1.18-mm), 30 (600-µm), 50 (300-µm), 100 (150-µm), and 200 (75-µm) sieves.

NOTE: The standard sieves are calibrated by the Central Laboratory and issued to each District to be used only for calibrating test sieves.

3. Metric ruler approximately 150 millimeters in length. (These are available through Office Supply.).

B. Visual Inspection for Both Box & Round Sieves

1. The frames must be constructed in a manner as to be permanently rigid.
2. The wire cloth must be mounted on the frames without distortion, looseness, or waviness.
3. The joint between the wire cloth and frame must be constructed in such a manner that material will not be trapped.

C. Calibrating the Mesh Openings of Coarse Sieves

1. Place the flat side of the sieve gauge against the wire of the mesh opening and insert it without force as far as it will go into the opening. Repeat this procedure at least in every sieve mesh opening in a line across the sieve and also in a line of mesh openings perpendicular to those just checked.

-
2. Observe every opening measurement. If the wires of the mesh opening falls between the appropriate marks of the sieve gauge, the sieve is adequate for testing purposes. If the wires are below the marks of the sieve gauge, or if any of the wires are above the marks, the average mesh opening measurement must be determined to establish compliance with AASHTO M92. Non-conforming sieves should not be used. The mesh opening measurement may be done as follows:
 - a. With the ruler measure approximately 150 millimeters of mesh openings to the nearest millimeter, on the same line that was checked with the sieve gauge.
 - b. Count the number of wires and openings in the length of meshes measured.
 - c. Assume that all the sieve's wire diameters meet the specified requirement. Refer to Table 1, column 4 to determine the nominal wire diameter for the appropriate sieve size.
 - d. Multiply the number of wires counted in Step B by the nominal wire diameter. Subtract this result from the length of measured mesh openings. The remainder is the total mesh opening.
 - e. Divide the total mesh opening obtained in the previous step by the number of mesh openings counted in Step B to determine the average opening size.
 - f. Refer to Table 1, Column 3 and determine if the average sieve opening meets the permissible variation of the average opening.

Example:

- a. While checking a No. 4 (4.75-mm) sieve with the "Go"-“No-Go” gauge, it is found that the sieve has four suspect openings.
- b. 148 millimeters of the sieve's mesh openings is measured. This measurement included the four suspect openings.
- c. 24 wires and 23 openings are counted on the measured line.
- d. It is assumed that the nominal wire diameter of the sieve meets the specified requirement of 1.54 millimeters shown in Table 1, Column 4.
- e. $1.54 \text{ millimeters} \times 24 \text{ (wires)} = 37 \text{ millimeters}$ (total length of measured wires).
- f. $148 \text{ millimeters} - 37 \text{ millimeters} = 111 \text{ millimeters}$ (total length of measured openings).
- g. $111 \text{ millimeters} / 23 \text{ openings} = 4.826 \text{ millimeters}$ (average opening size).

- h. The permissible variation of average opening from the Standard No. 4 (4.75-mm) sieve designation, from Table 1, Column 3, is 0.15 millimeters.
- i. The standard sieve designation for the No. 4 (4.75-mm) sieve from Table 1, Column 2, is 4.75 millimeters.
- j. The acceptable range in millimeters for a No. 4 (4.75-mm) sieve is 4.60 to 4.90.
- k. The average sieve opening measurement from Step f (4.826 millimeters) is compared to the acceptable range from Step i (4.60 to 4.90 millimeters) and found to be satisfactory.
- l. Repeat the above steps (a to j) on a row of mesh openings that is perpendicular to those just measured.
- m. If the average sieve opening measurement of each row falls within the acceptable range the sieve is adequate for testing purposes. However, if the average sieve opening measurement falls outside of the acceptable range the sieve is rejected for testing purposes.

TABLE 1

<u>Sieve Designation</u>		<u>Permissible Variation of Average Opening from the Standard Sieve Designation</u>	<u>Nominal Wire Diameter</u>
<u>Inch</u>	<u>mm</u>	<u>mm</u>	<u>mm</u>
1 ½	37.5	1.10	4.50
1.0	25.0	0.8	3.55
¾	19.0	0.6	3.15
0.500	12.5	0.39	2.50
¾	9.5	0.30	2.24
No. 4	4.75	0.15	1.60
No. 8	2.36	0.08	1.00

D. Calibrating the Fine Test Sieves

1. Select a fine aggregate that is well graded and free of shale or other soft particles that would abrade during sieving. Well-graded materials are aggregate that has such a grading as to have material retained on each sieve of the nest, with the exception of the No. 4 (4.75-mm) sieve.

2. Obtain a normal size test sample by the routine method.
3. With the standard calibrating sieves perform three sieve analyses on the one test sample. Recombine the fractions after each determination. The sieve analysis shall be done in accordance with IM 302.

NOTE: Extreme care must be taken when recombining the sample so no aggregate will be lost.

NOTE: The results from the minus No. 200 (75- μ m) wash test may be omitted from the calculation of the sieve analysis.

4. After completing the three sieve analyses recombine the test sample and place it in a container and seal. This sample is now a reference sample to be used later in this method.
5. Determine the standard grading of the reference sample by averaging the three sieve analyses obtained in step D3.
6. Perform three sieve analysis on the reference aggregate sample with a nest of test sieves in the same manner as done in step D3, omitting the minus No. 200 (75- μ m) wash test.

NOTE: Different types of sieve shakers may require different amounts of time for sieving the sample to completion. It is recommended that after the sieving time, each sieve should be checked for sieving to completion by the hand-shaking method.

7. Refer to Table 2 and determine if the average gradation with the test sieves on the reference aggregate is within the allowable variation.

Example 1:

Following are two sieve analyses and the range of allowable variation between the tests: Test A is the average of three results obtained with the standard calibrated sieves. Test B is the average of three results obtained with the fine test sieves. The range of allowable variation is obtained from Table 2.

SIEVE ANALYSIS

TEST A

	(4.75-mm)	(2.36-mm)	(1.18-mm)	(600- μ m)	(300- μ m)	(150- μ m)	(75- μ m)
Sieve No.	#4	#8	#16	#30	#50	#100	#200
% Passing	100	90	72	43	14	2.8	0.6

TEST B

% Passing	100	88	70	44	15	3.0	0.7
Range of Allowable Variation Obtained	97 to	87 to	70 to	41 to	13 to	2.6 to	0.5 to
From TABLE 2	100	93	74	45	15	3.0	0.7

The sieve analysis of the reference aggregate, obtained with the fine test sieves, meets the allowable variation of the sieve analysis obtained with the standard calibrated sieves; therefore, this nest of test sieves is adequate for testing purposes.

Example 2:

If the sieve analysis in Example 1 for Test B would have been as follows:

TEST B

	(4.75-mm)	(2.36-mm)	(1.18-mm)	(600- μ m)	(300- μ m)	(150- μ m)	(75- μ m)
Sieve No.	#4	#8	#16	#30	#50	#100	#200
% Passing	100	88	70	46	15	3.0	0.7

The % passing the No. 30 sieve is outside of the range of allowable variation of 41% to 45% passing, so this sieve would be rejected.

An extremely bad sieve could possibly affect the grading produced by the sieves below it. Each suspect sieve must be checked independently.

TABLE 2

<u>Sieve No.</u>	<u>Allowable Variations</u>
4 (4.75-mm)	± 3% of % Passing No. 4 (4.75-mm)
8 (2.36-mm)	± 3% of % Passing No. 8 (2.36-mm)
16 (1.18-mm)	± 3% of % Passing No. 16 (1.18-mm)
30 (600-µm)	± 5% of % Passing No. 30 (600-µm)
50 (300-µm)	± 5% of % Passing No. 50 (300-µm)
100 (150-µm)	± 6% of % Passing No. 100 (150-µm)
200 (75-µm)	± 7% of % Passing No. 200 (75-µm)

or ± 0.1% whichever is greater.

E. Procedure for Each Set of Sieves or Individual Sieves

1. When fine sieves are received in a District Laboratory a visual inspection will first be made on each sieve. If it is necessary to clean or calibrate any sieve, Method D should be followed. Under normal circumstances, only cleaning is necessary for sieves that have been in service. Calibration is needed only for sieves that are suspect, or if there is a testing variation issue.

F. Cleaning & Checking Sieves

1. The costs for cleaning and checking sieves are in Office of Materials IM 104.
2. This charge should be sent to the Central Materials Laboratory; Attention: Field Equipment Section. The billing will then be made.