

Experiment No. 6 Sieve Analysis of Aggregates

■ ASTM Designation

ASTM C136—Sieve Analysis of Fine and Coarse Aggregates

■ Purpose

To determine the particle size distribution of fine and coarse aggregate by dry sieving.

■ Significance and Use

This test is used to determine the grading of materials that are to be used as aggregates. It ensures that particle size distribution complies with applicable requirements and provides the data necessary to control the material of various aggregate products and mixtures containing aggregates. The data may also be useful in developing relationships concerning porosity and packing.

■ Apparatus

- Balances or scales with a minimum accuracy of 0.5 g for coarse aggregate or 0.1 g for fine aggregate
- Sieves
- Mechanical sieve shaker (Figures A.17, A.18, and 5.12)
- Oven capable of maintaining a uniform temperature of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$)
- Sample splitter to reduce the quantity of the material to the size required for sieve analysis (Figure 5.21)

■ Test Specimens

Thoroughly mix the aggregate sample and reduce it to an amount suitable for testing, using a sample splitter or by quartering. The minimum sample size should be as follows:

	Minimum Mass, kg
Fine aggregate with at least 95% passing 2.36-mm (No. 8) sieve	0.1
Fine aggregate with at least 85% passing 4.75-mm (No. 4) sieve	0.5
Coarse aggregate with a nominal maximum size of 9.5 mm (No. 3/8 in.)	1
Coarse aggregate of a nominal maximum size of 12.5 mm (1/2 in.)	2
Coarse aggregate of a nominal maximum size of 19.0 mm (3/4 in.)	5
Coarse aggregate of a nominal maximum size of 25.0 mm (1 in.)	10
Coarse aggregate of a nominal maximum size of 37.5 mm (1-1/2 in.)	15

■ Test Procedure

1. Dry the aggregate test sample to a constant weight at a temperature of $110 \pm 5^\circ\text{C}$, then cool to room temperature.
2. Select suitable sieve sizes to furnish the information required by the specifications covering the material to be tested. Common sieves in millimeters are 37.5, 25, 19, 12.5, 9.5,



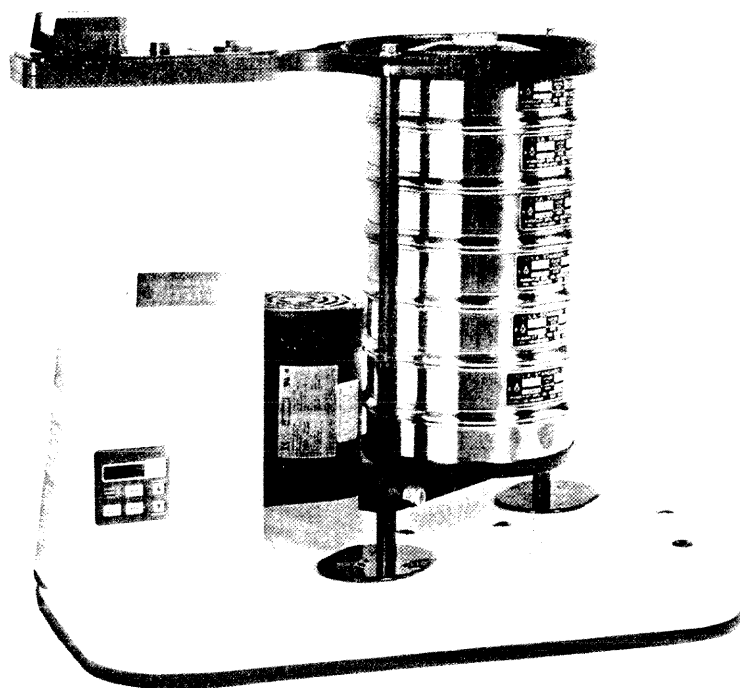


FIGURE A.17 Table-top sieve shaker and sieves. (Courtesy of Humboldt Mfg Co.)

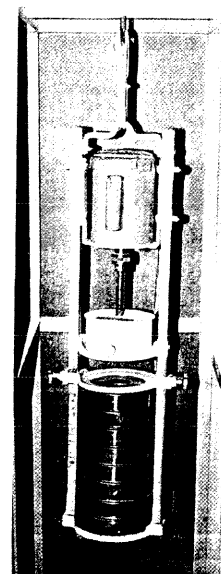


FIGURE A.18 Hanging-type sieve shaker and sieves for small samples of aggregates.

4.75, 2.36, 1.18, 0.6, 0.3, 0.15, and 0.075 mm ($1\frac{1}{2}$ in., 1 in., $\frac{3}{4}$ in., $\frac{1}{2}$ in., $\frac{3}{8}$ in., No. 4, No. 8, No. 16, No. 30, No. 50, No. 100, and No. 200).

3. Nest the sieves in order of decreasing size of opening, and place the aggregate sample on the top sieve (Figure A.19).
4. Agitate the sieves by hand or by mechanical apparatus for a sufficient period. The criterion for sieving time is that, after completion, not more than 1% of the residue on any individual sieve will pass that sieve during 1 minute of continuous hand sieving.
5. Determine the weight of each size increment (Figure A.20).
6. The total weight of the material after sieving should be compared with the original weight of the sample placed on the sieves. If the amounts differ by more than 0.3%, based on the original dry sample weight, the results should not be used for acceptance purposes.

Analysis and Results

1. Calculate percentages passing, total percentages retained, or percentages of various sizes of fractions to the nearest 0.1%, on the basis of the total weight of the initial dry sample.
2. Plot the grain size distribution on a semilog graph paper (Figure A.21).
3. Plot the grain size distribution on a 0.45 power graph paper (Figure A.22).
4. Calculate the fineness modulus.





FIGURE A.19 Placing aggregate sample in the sieves before sieving.

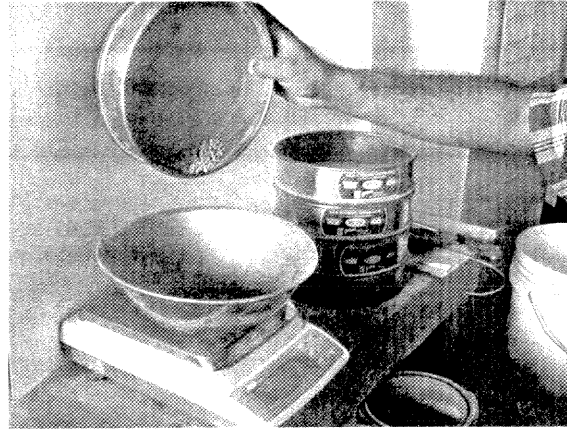


FIGURE A.20 Weighing aggregate retained in sieves.

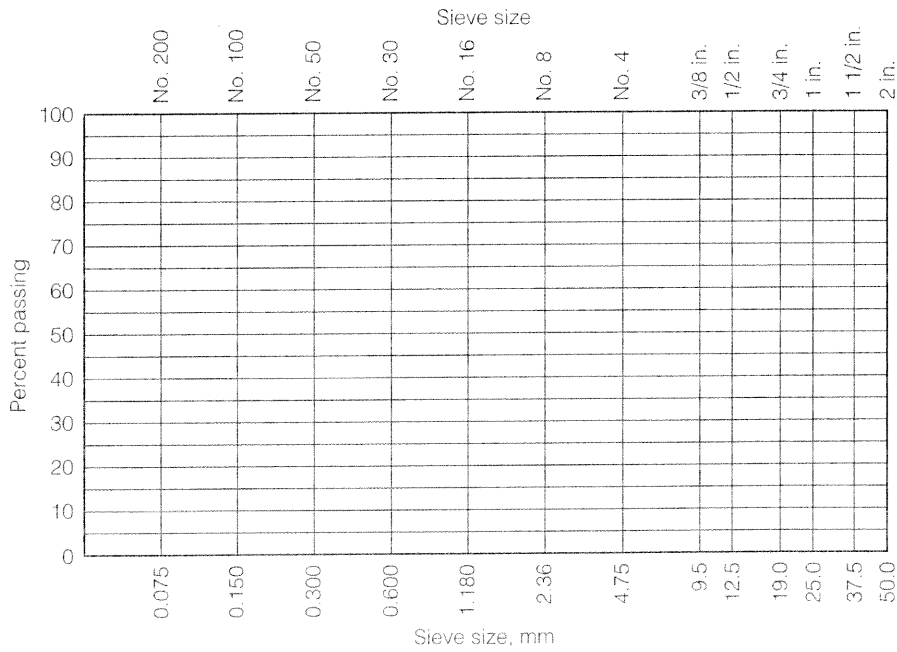


FIGURE A.21 Semi-log aggregate gradation chart.



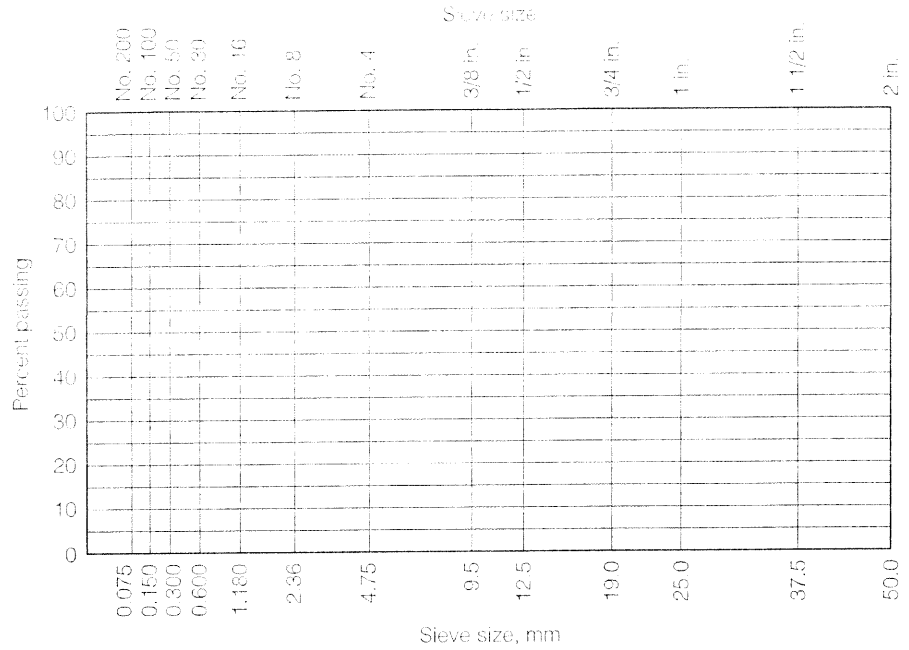


FIGURE A.22 0.45 power gradation chart.

Report

- Percentage of material retained between consecutive sieves, cumulative percentage of material retained on each sieve, or percentage of material passing each sieve. Report percentages to the nearest whole number; except if percentage passing 0.075 mm (No. 200) sieve is less than 10%, it should be reported to the nearest 0.1%.
- Grain size distribution plots using both semilog and 0.45 power gradation charts.
- Fineness modulus to the nearest 0.01.

