GEOTECHNICAL & SOILS LABORATORY
SIEVE ANALYSIS

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SIEVE ANALYSIS

Introduction

As its name implies, the apparent equipment of sieve analysis is the sieves. Sieves have equal-size and shape openings where these sieves allow soil particles of smaller sizes to pass through while retaining particles that are bigger. Various sizes of sieve are available and specified by standards i.e. BS 882: 1992

Objective

Obtain the grading curve for both fine and coarse aggregate where:
a) Fine size < 5mm
b) Coarse size > 5mm

Definitions

Maximum Size (of aggregate) – in specifications for, or description of aggregate, the smallest sieve opening through which the entire amount of aggregate is **required** to pass.
Nominal Maximum Size (of aggregate) – in specifications for, or description of aggregate, the smallest sieve opening through which the entire amount of aggregate is **permitted** to pass.

Theory

Sieve analysis is believed to be the oldest geotechnical engineering laboratory undertaken to classify the soil based on its grains. The soil classification will be able to determine the characteristics of soil when load is applied, the range of grain sizes in soil mass, the shape of grain in soil layers and the structure stability of the soil.

Equipments

a) Scale (or balance) – 0.1 g accuracy for fine sieve analysis, 0.5 g accuracy for coarse sieve analysis.
b) Sieve
c) Mechanical Sieve Shaker
d) Drying Oven (110+/-5 C)

Procedures

a) Dry sample to constant weight at a temperature of 110 +/- 5C (230 +/- (9 F)
b) Select suitable sieve sizes to obtain the required information as specified. The following sieves are applicable with reference to ASTM C33:

Coarse Aggregate (in.)	Fine Aggregate
1.5	
1	
¾	
No. 4	No. 4
No. 8	No. 8
No. 10	No. 10
	No. 20
	No. 40
	No. 100
	No. 200
PAN	PAN

d) Nest the sieve in order of decreasing size of opening from the top to bottom. Place the pan below the bottom sieve. Place the sample on the top sieve. Place lid over top sieve.
e) Agitate the sieve by hand or by mechanical apparatus for a sufficient period such that not more than 1% by weight of the residual of any individual sieve will pass that sieve during 1 minute of additional hand sieving. Ten minutes of original sieving will usually accomplish these criteria.
f) Determine the weight of material retained on each sieve. The total retained weights should closely match the original weight of the sample (within 0.3%)

Table

Mass of material : g

Sieve no. (mm)	Mass of sieve (mm)	Mass retained (g)	Mass passing (g)	Percentage cumulative (%)
5.000				
2.360				
2.000				
1.180				
0.600				
0.425				
0.300				
0.212				
0.150				
0.075				
Pan				

Calculation

a) Calculate percentages passing and total percentages retained to the nearest 0.1% of the initial dry weight of the sample.
b) Calculate the percentage of fineness as follows :
    1. Fine aggregate :
       F.M. = {$\sum$ (Cumulative % retained on # 4, 8, 16, 30, 50, and 100 Sieves) – 100}
    2. Coarse aggregate :
       F.M. = {$\sum$ (Cumulative % retained on 1-1/2", ¾", 3/8", Nos. 4, 8, 16, 30, 50, and 100 Sieves) / 100}.

Report

a) Total percentage of material passing each sieve (both tabulated and graphical presentations)
b) Total percentage of material retained on each sieve (tabulated)
c) Report the fineness percentage to the nearest 0.01
d) Report percentage of gravel, sand, silt and clay.

Question

Do these aggregates meet the ASTM specifications (ASTM C33)? What is the characteristic of this soil according to AASHTO and USCS system?