Sieve analysis

The process of dividing a sample of aggregate into fractions of same particle size is known as a sieve analysis, and its purpose is to determine the grading or size distribution of the aggregate.

The sieve number denotes the number of holes present in the sieve within one-inch length of the sieve mesh. For example, consider the Number 4 sieve which have a mesh opening of 4.76 mm. There will be 4 numbers of 4.76 mm opening present within the one-inch length of mesh.

Fineness modulus

This is the fineness modulus (FM), defined as the sum of the cumulative percentages *retained* on the sieves of the standard series, and divided by 100.

Usually, the fineness modulus is calculated for the fine aggregate rather than for coarse aggregate. Typical values range from 2.3 and 3.0, a higher value indicating a coarser grading.

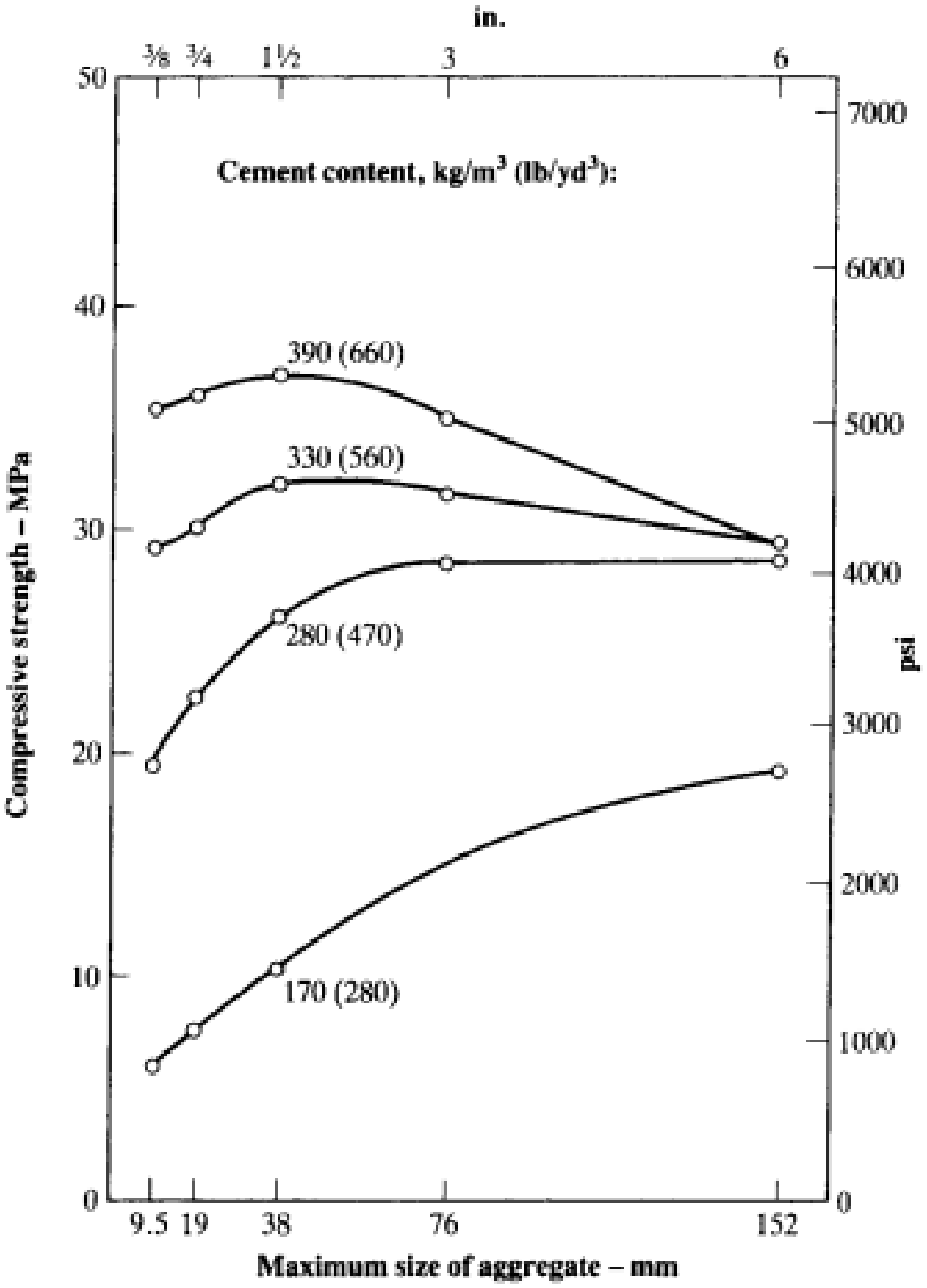
The usefulness of the fineness modulus lies in detecting slight variations in the aggregate from the same source, which could affect the workability of the fresh concrete

Maximum Size of Aggregate

Maximum size of aggregate is the largest size particles present in aggregate significantly affect properties of concrete.
The larger the aggregate particle the smaller the surface area to be wetted per unit mass (i.e. specific surface). Thus, extending the grading of aggregate to a larger maximum size lowers the water requirement of the mix so that, for specified workability and richness of mix, the water/cement ratio can be reduced with a consequent increase in strength. However, there is a limit of maximum aggregate size above otherwise, concrete becomes heterogeneous, with a resulting lowering of strength.

- **Maximum size**. The smallest sieve through which 100 percent of the aggregate sample particles pass.

- **Nominal maximum size**. The largest sieve that retains some of the aggregate particles but generally not more than 10 percent by weight.



Influence of maximum size of aggregate on the 28-day compressive strength of concretes of different richness

Dense Graded and Gap Graded Aggregate

Dense graded Aggregate that has a particle size distribution such that, when compacted, the voids are relatively small. Whereas gap graded the voids are relatively large.

Homework:

1. Calculate the fineness modulus for each sample
2. According to ASTM specifications check the grading of these samples
3. Plot a graph between sieve size and % accumulative passing and plot the upper bound and lower bound for each sieve.
4. What are the nominal maximum and the maximum sieve size for each sample?
5. In which zone are each of the two sand samples according to ASTM.

	Sample 1	Sample 2
Sieve size	Wt. Retained	Wt. retained
10mm	0	0
No.4	21	2
No.8	55	33
No.16	230	190
No.30	350	400
No.50	70	100
No.100	14	10
Pan	10	15
Total		

Sieve Size (mm)	Grading zone 1	Grading zone 2	Grading zone 3	Grading zone 4
10 mm	100	100	100	100
4.75 mm (No.4)	90-100	90-100	90-100	95-100
2.36 mm (No.8)	60-95	75-100	85-100	95-100
1.18 mm (No.16)	30-70	55-90	75-100	90-100
600 µm (No.30)	15-34	35-59	60-79	80-100
300 µm (No. 50)	5-20	8-30	12-40	15-50
150 µm (No.100)	0-10	0-10	0-10	0-15

ASTM Grading for fine agg.