Experiment No. 5: AGGREGATE SHAPE TEST

Aim: To determine the combined flakiness and elongation Index of the given coarse aggregate sample IS Standards used: IS: 2386(Part-I)-1963 (Reaffirmed 2007)

Theory and Scope:

Definition of Combined Flakiness and Elongation Index: It is the sum of the flakiness index of a given aggregate sample and the elongation index of the non-flaky particles of the sample

1. *Flakiness Index:* The flakiness index of an aggregate sample is the percentage by weight of particles in it with least dimension (thickness) less than three-fifth of their mean dimension. The flakiness index of an aggregate sample is determined by sieving the sample of aggregates through specified sieves to separate the aggregates into fractions of different sizes. Sizes of the sieves used for this purpose are: - 63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm and 6.3 mm. The test is not applicable to material passing a 6.30 mm test sieve and also for aggregates retained on 63 mm sieve.

2. *Elongation Index:* The Elongation Index of aggregate is the percentage by weight of particles, whose greatest dimension (length) is greater than one and four-fifth times (1.8) their mean dimension. The elongation index of an aggregate sample is determined by sieving the sample of aggregates through specified sieves to separate the aggregates into fractions of different sizes. Sizes of the sieves used for this purpose are: - 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm and 6.3 mm. The test is not applicable to material passing a 6.30 mm test sieve and for aggregates retained on 50 mm sieve.

It may be noted that for determining the combined flakiness and elongation index, elongation test is conducted after removing the flaky particles. For regular elongation test, the complete sample will be evaluated.

Apparatus:

- Weighing balance (accuracy 0.1g)
- Elongation and Flakiness index gauges
- Test Sieves: IS Sieves of the sizes and apertures appropriate to the specification of the material to be tested with square holes with appropriate sizes of lids and receivers.

Procedure:

1. For obtaining the combined flakiness and elongation index, flakiness test is conducted first and the non-flaky particles of the sample will be used for conducting elongation index.
2. Sieve analysis is carried out on the sample of aggregate using sieves listed above (1)
3. A minimum of 200 pieces is taken for each fraction and weighed.
4. Weigh each of the individual size fractions retained on the test sieves, other than the 63.0 mm test sieve, and store them in separate trays with their sizes marked on the trays.
5. The sum of the weights of each fraction of aggregates gives the weight of the aggregate sample. (Say, W1).
6. The particles belonging to a particular size group (ex: passing through 50 mm and retained on 40 mm) are passed through the corresponding slot (for 50 mm – 40 mm fraction, the width of the slot is 27 mm) of the thickness gauge (flakiness index gauge)

shown in figure.

7. The particles passing through the specified slot of the thickness gauge are “flaky” and will be weighed to an accuracy of at least 0.1% of the weight of the test sample.
8. The sum of the weights of aggregates passing through different slots of the gauge is W2.
9. Flakiness index (%) = 100*(W2/W1) For the purpose of determining combined flakiness and elongation index value, Elongation index test will be conducted on the non-flaky aggregates identified in flakiness test. Aggregates retained on 50 mm sieve will be discarded for this test. Let the total weight of aggregates considered for elongation test be W3.
10. Effort will be made to pass the particles belonging to a particular size group (ex: passing through 50 mm and retained on 40 mm), when held length-wise through appropriate gaps (for 50 mm – 40 mm fraction, the gap is 81 mm) as shown in Figure 2. The aggregates that do not pass are elongated. These particles are weighed.
11. The sum of the weights of aggregates not passing through different gaps of the gauge is W4. Elongation index (%) = 100*(W4/W3)
12. Combined flakiness and elongation index will be the sum of the two indices (determined as described in the preceding steps).

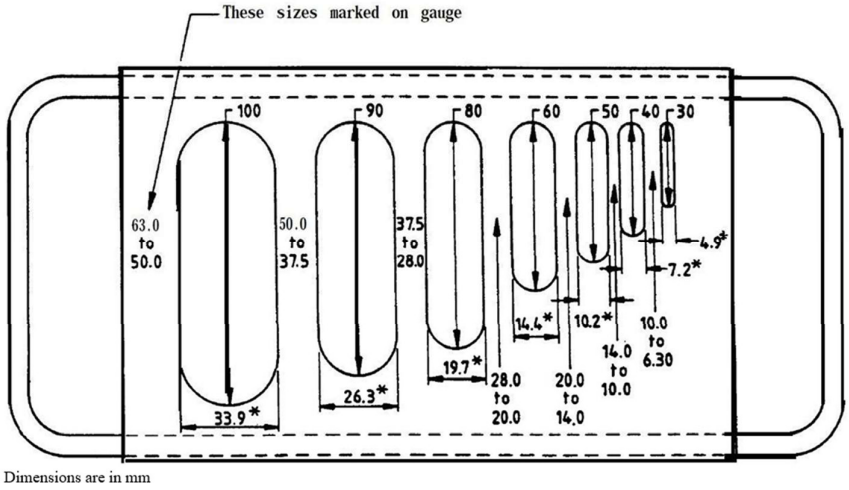

Figure 1: Thickness Gauge

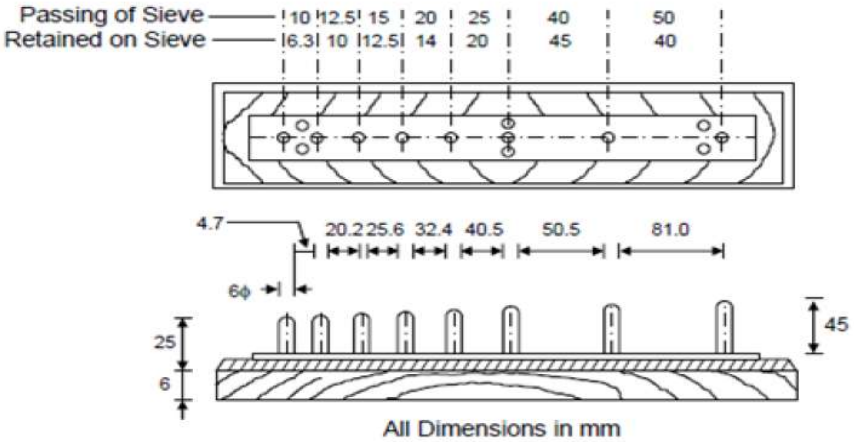

Figure 2: Length Gauge

Observations:

Table 1: **Flakiness Index**

Size Of Aggregate		Thickness Gauge (0.6 times the mean sieve) mm	Weight of the fraction consisting of at least 200 pieces in gm. (W1)	Weight of aggregates in each fraction passing thickness gauge in gm. (W2)
Passing through I.S. sieve in mm	Retained on I.S. sieve in mm			
63	50	33.90		
50	40	27.00		
40	25	19.50		
31.5	25	16.95		
25	20	13.50		
20	16	10.80		
16	12.5	8.55		
12.5	10.0	6.75		
10	6.3	4.89		

Table 2: **Elongation Index**

Size Of Aggregate		Length Gauge (1.8 times the mean sieve) mm	Weight of the fraction consisting of at least 200 pieces in mm. (W3)	Weight of Aggregates in each fraction passing thickness gauge, gm. (W4)
Passing through I.S. sieve mm	Retained on I.S. sieve mm			
50	40	81.00		
40	25	58.50		
25	20	40.50		
20	16	32.40		
16	12.5	25.60		
12.5	10.0	20.20		
10	6.3	14.70		

Calculations:

Flakiness index (%) = 100*(W2/W1) =

Elongation index of non-flaky particles = 100*(W4/W3) =