Elongation index and flakiness index of coarse aggregate

(BS 812 Part:1)

Scope:

The particle is considered as elongated if its length is more than 1.8 times the mean sieve size of the size fraction to which the particle belongs. Similarly, the particle is considered as flaky if its thickness is less than 0.6 times the mean sieve size of the size fraction. Elongated and flaky particles have a large surface area relative to its small volume, hence it decreases the workability of concrete mix. The flaky particles can affect the durability of concrete as they tend to be oriented in one plane, with water and voids forming underneath.

The presence of flaky or elongated particles in excess of 10-15% of the weight of coarse aggregate is undesirable.

The test is carried on aggregate sizes between 63 mm and 6.3 mm.

Apparatus:

1- A balance of accuracy of 0.1% of the sample weight.
2- A set of sieves.
3- A special scale for elongation index.
4- A special scale for flakiness index.
Procedures:

1- Secure a representative sample of aggregate.

2- The weight of the sample ($W_{\text{total}}$) for each test shall be not less than that in the table below:

<table>
<thead>
<tr>
<th>Aggregate size (mm)</th>
<th>Sample weight (kg)</th>
<th>Distance between the bars of elongation scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passing from</td>
<td>Retained on</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>37.5</td>
<td>40</td>
</tr>
<tr>
<td>37.5</td>
<td>28</td>
<td>59 mm</td>
</tr>
<tr>
<td>28</td>
<td>20</td>
<td>43</td>
</tr>
<tr>
<td>20</td>
<td>14</td>
<td>30.6</td>
</tr>
<tr>
<td>14</td>
<td>10</td>
<td>21.6</td>
</tr>
<tr>
<td>10</td>
<td>6.3</td>
<td>14.7</td>
</tr>
</tbody>
</table>

3- Sieve analysis is carried using the above mentioned sieves.

4- The weight of each size is recorded. The sizes of less than 5% of the total weight are not considered in the test. Let ($M_2$) to be the total weight of the aggregate excluding the weight of the sizes of less 5% of weight.

5- Try to pass the particles of each size in the direction of its length (max. dimension) between the corresponding bars of the scale.

6- Separate the particles that do not pass in all sizes and weigh ($M_3$).

7- Try to pass the particle of each size in the corresponding opening of the scale.

8- Separate the particles that pass in all sizes and weigh ($M_4$).
Calculations:

Elongation Index = \( \frac{M_3}{M_2} \times 100 \)

Flakiness Index = \( \frac{M_4}{M_2} \times 100 \)

Figure 1: Elongation scale and flakiness scale