

Determination of 10% Fines Value

Include your Laboratory Test Reference:

Include your Personal Reference

Was BS 812: Part 111: 1990

This Standard has being partially replaced by the following British Standard

BS EN 1097-2 2010
Tests for Mechanical and Physical Properties of Aggregates
Method of Determination of Resistance to Fragmentation

However, should this test be required to be performed BS 812: Part 111:1990 is the only reference. The existing test method has not, therefore, been changed until the standard has been fully replaced

Principal Apparatus as follows:-

It is suggested that each of the pieces of equipment should be given an Inventory Number

- (i) Open Ended Cylinder 150mm nominal internal diameter, base plate and plunger. As shown in Fig I of B5 812:1990 Part 111 Inventory No.198 (Part B) Harness B5 487.
- (ii) A cylinder metal measure of 115mm ~ 1mm internal diameter and 180mm ~ 1mm depth. Inventory No.xxx
- (iii) A Metal Tamping Rod circular cross section, 16mm ~ 1mm dia 600mm ~ 5mm long with one rounded end.
- (iv) A rubber mallet.
- (v) Testing Area.
- (vi) Electronic Balance to weigh at least 3 kg to 1 gm.
- (vii) BS Test Sieves 14.0mm, 10mm and 2.36mm. BS EN 933-2:1997 Tests for geometrical properties of aggregates Part 2: Determination of particle size distribution: Test sieves, nominal size of apertures
- (viii) Compression Testing Machine. (BS 1610 Part 1 – Grade A and BS EN 7500:2004) 2000kn Crushing Machine.
- (ix) Two 450mm clean square trays and a stiff bristle brush. General laboratory ware.
- (x) Oven (BS 2648:1955: Electrically Heated Laboratory Drying Ovens). Appears to be still current?
- (xi) Stop Watch.

1. Preliminaries
 - 1.1 A designated area will be used to perform this test and a clear area of bench must first be allotted before this test proceeds.
 - 1.2 All equipment to be used in this test must first be checked as follows:-
 - 1.3 Check that the ACV mould, baseplate and plunger are clean, smooth and undamaged and that the dimensions have recently been taken.
 - 1.4 Check that the measuring cylinders and rod are clean and in good order.
 - 1.5 Check that the Compression machine is set up ready for the test.
 - 1.6 Check the sieves as required on receipt if any marks, dents or splits are present on the mesh, the sieves will be taken out of service.
 - 1.7 Check the sample number and Test Schedule correspond and obtain a test worksheet No. 008 from the Cabinet.
2. Standard Test Method - Dry Condition
(for soaked test refer to BS page 5, Cl 6.3 and 7.2)
 - 2.0 Test Procedure. The test will be performed in duplicate on the material passing the 14mm sieve and retained on the 10.0mm sieve.
 - 2.1 The aggregate used in this test will have been obtained from a bulk sample that was initially taken and prepared in the manner described in both:

BS EN 932-1:1999. Tests for general properties of aggregates Part 1: Methods for sampling

BS EN 932-2:1997. Tests for general properties of aggregates Part 2: Methods for reducing laboratory Samples
 - 2.2 The aggregate to be tested must be in a surface dry condition.

NB When the bulk sample is fully saturated it will be dried to a surface dry condition by spreading the material on a large tray and leaving on top of one of the drying ovens to air dry.
 - 2.3 The bulk sample may then be passed through both the sieves retaining the portion passing the 14mm and retained on the 10mm, every effort being made to recover all the material of this grade, though care should be taken not to de-grade softer particles. Oversize and undersize are rejected.
 - 2.4 Slightly more than four times the amount that fills the metal measure should be obtained for the crushing test to give four test specimens.
 - 2.5 Fill the metal measure in three layers rodding each layer 25 times with the tamping rod, allowing the rod to fall from a height of approximately 50mm above each surface, and level the top using the tamping rod as a straight edge. The aggregate is then placed in a small tray, placed in an oven for not more

than 4 hours, then allowed to cool. This is repeated for a further specimen. The remaining two shall be retained for test if the repeatability of the first two results is unacceptable. Record the time taken out of oven.

- 2.6 The aggregate will be weighed to the nearest g and recorded on the work test sheet (Mass W). This is repeated for a further two test specimens.
- 2.7 Place the test cylinder on the clean base plate.
- 2.8 The aggregate will be added in three layers, each layer being subjected to 25 strokes of the tamping rod evenly distributed over the surface, dropping the tamping rod from a height of approximately 50mm above the aggregate surface. Some aggregates may break down under tamping and this fact should be noted on the worksheet if it occurs under notes.
- 2.9 The final surface will be carefully leveled off and the plunger placed into the cylinder so that it rests horizontally on the surface and is not trapped by the sides of the cylinder.
- 2.10 The apparatus will be placed between the platens of the compression testing machine and the load applied at as uniform a rate as possible for 10 mm ~ 30 secs until the full penetration for that sample has been achieved. Guidance on the penetration level to be expected. Ticket the material on the sheet either a, b, or c.
 - (a) 15mm for crushed gravel or other partly rounded aggregate
 - (b) 20mm for normal angular crushed aggregate
 - (c) 25mm for slags and other honeycombed aggregate.
- 2.11 Record the maximum force applied to produce the required penetration on the work test sheet, release the force from the apparatus and remove from the compression machine.
- 2.12 The crushed aggregate will be carefully removed from the cylinder over a clean tray placed on the floor by tapping the sides of the cylinder with a rubber mallet until the aggregate become loose and falls freely into the tray.
- 2.13 Any particles adhering to the surfaces of the cylinder, baseplate or plunger will be removed with a stiff brush and added to the aggregate in the tray. The weight of the crushed material is recorded as A. To the nearest gram.
- 2.14 The whole of the aggregate will be sieved through the 2.36mm sieve until no significant amount passes in i mm.
- 2.15 The fraction passing the 2.36mm sieve is weighed to the nearest gram and the weight recorded on the work test sheet as (Mass B). Weigh also the fraction Retained on the 2.36mm (Mass C).
- 2.16 Care will be taken to ensure that there are no loss of fines throughout these procedures. If B ~ C differs from A by more than 1 grm discard the result and test a further specimen.
- 2.17 Calculations. The Percentage Fines is the ratio of the mass of fines formed by the crushing process to the total mass of the sample expressed as a percentage.

Percentage fines = $B/A \times 100$ (To the first decimal place)

where

A = The mass of the surface dry sample.

B = The mass of the fraction passing the 2.36mm sieve after crushing.

2.18 Under normal test conditions this figure should fall between 7.5 and 12.5 per cent.

2.19 If it does not fall between this range, then a second test will be performed making an adjustment to the maximum test load applied with the following formula:-

$$X = \frac{\text{Force to produce 10\% Fines} \times (y - 4)}{14}$$

where X is the maximum force (kN)

and Y is the percentage fine produced from the test at load x kN.

2.20 Once a figure has been obtained that falls between the required range, a further test will be performed at the maximum load thereby determined.

2.21 The percentage fines from these two tests at the maximum load will be used in the following formula to calculate the load required to produce 10% fines.

$$\text{Force required to produce 10\% fines} = \frac{14 \times X}{y + 4}$$

where X and y are as above.

3. Reporting of Results

3.1 Calculate the mean of the two results to the nearest 10kN for forces of 100kN or more, or to the nearest 5kN for forces of less than 100kN. Report the mean as the 10% Fines Value, unless the individual results differ by more than 10kN and by more than 0.1 times the mean value. In this case repeat the test on two further specimens, calculate the median of the four results to the nearest 10kN for forces of 100kN or more or to the nearest 5kN for forces of less than 100kN, and report the median as the 10% Fines Value.

3.2 The median of four results is calculated by excluding the highest and the lowest result and calculating the mean of the two middle results.

3.3 The report shall affirm whether a certificate of sampling was available, whether the sample was dry or soaked and the sample identification.