

Determination of Aggregate Crushing Value

Include your Laboratory Test Reference:

Include your Personal Reference

Was BS 812: Part 110: 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 110:1990 is currently 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 Steel Cylinder 150mm nominal internal diameter, base plate and plunger. As shown in Fig. 1 of BS 812: Part 110:1990. Hardness to comply with BS 487: 2009.
- (ii) A cylindrical metal measure of 115mm + 1mm internal diameter and 180mm + 1mm depth. Inventory No.
- (iii) A Metal Tamping Rod circular cross section, 16mm + 1mm diameter. 600mm + 5mm long with one rounded end.
- (iv) A rubber mallet.
- (v) Electronic Balance to weigh at least 30 kg to 0.1 grms and an Electronic Balance 30 kg to 1 grms.
- (vi) BS Test Sieves 14.0mm, 10mm and 2.36mm. BS EN 933:2 : 1996 Tests for geometrical properties of aggregates Part 2: Determination of particle size distribution Test sieves, nominal size of apertures
- (vii) Compression Testing Machine. (BS 1610 Part 1 – Grade A and BS EN 7500:2004) 2000kn Crushing Machine.
- (viii) Two 450mm clean square trays and a stiff bristle brush.
- (ix) Oven (BS 2648:1955: Electrically Heated Laboratory Drying Ovens). Appear to be still current?

1. Preliminaries

- 1.0 A designated area will be used to perform this test and a clear area of bench must first be allotted before this test proceeds.
- 1.1 All equipment to be used in this test must first be checked.
- 1.2 Check that the ACV mould, base plate and plunger are clean, smooth and undamaged and that the calibration label is current.
- 1.3 Check that the measuring cylinders and rod are clean and in good order.

- 1.4 Check that the Compression machine is set up ready for the test.
- 1.5 Check the sieves as required on receipt for damage to the mesh. If any excessive marks and stretches, splits and dents are present, the sieves will be taken out of service.
- 1 Check that the sample number and Test Schedule correspond and obtain the test worksheet no. xxx.
- 2 Standard Test Method
- 2.0 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 **BS EN 932-1:1999. Tests for general properties of aggregates Part 1: Methods for sampling**. THIS MUST BE CHECKED TO ENSURE THE TEST PORTION IS A STANDARD SIZE. If not, the non-standard test procedure or sample preparation must be carried out in accordance with Appendix A of the Standard. This involves either testing aggregate larger than 14mm in the standard mould or for aggregates retained 2.36mm, the standard or modified smaller mould.
- 2.2 The aggregate to be tested must be in a surface dry condition.

N.B. 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 further degrade the aggregate. 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 The measure is filled 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 the top levelled using the tamping rod as a straight edge. The aggregate is now emptied into a small tray and dried in an oven at $105 \pm 5^{\circ}\text{C}$ for not more than 4 hours. The material is allowed to cool and weighed (W gm). 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.
- 2.6 Place the test cylinder on the clean base plate.
- 2.7 The aggregate will be added in three layers each being subjected to 25 strokes of the tamping rod evenly distributed over the surface, dropping tamping rod from a height of approximately 50mm above the aggregate surface.
- 2.8 The final surface will be carefully levelled 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.
- 2.9 The apparatus will be placed between the platens of the compression testing machine and the load of 400Kn applied in 10 min + 30 seconds at as uniform rate as possible. The load will be released and the apparatus removed from the compression machine.

- 2.10 Place a clean tray on the balance and zero the balance. The crushed aggregate will be carefully removed from the cylinder over the tray by tapping the side of the cylinder with a rubber mallet until the aggregate becomes loose and falls freely into the tray.
 - 2.11 Any particles adhering to the surfaces of the cylinder, base plate 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(g).
 - 2.12 The whole of the aggregate will be hand sieved through the 2.36mm sieve until no significant amount passes in 1 min.
 - 2.13 The fraction passing the 2.36mm sieve will then be weighed to the nearest gram and the weight recorded on the work test sheet as (Mass B). The fraction Retained on the 2.36mm sieve is also weighed and recorded as Mass C.
 - 2.14 Care will be taken to ensure that there is no loss of fines throughout these procedures. If when the % Retained and % Passing the 2.36mm are added together, the combined weight varies from the initial test weight A(g) by more than 10g, discard the result and start again.
 - 2.15 The procedure will then be repeated on the second sample.
 - 2.16 The aggregate crushing value 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.
 - 2.17 The mean result of the two tests will be reported to the nearest whole number. Report the mean as the ACV unless the individual results differ by more than 0.07 times the mean value. In this case repeat the test on two further specimens, calculate the median of the four results to the nearest whole number and report the median as the ACV. (Note: The median is the mean of the middle two results)
3. Reporting
 - 3.1 The report shall state whether a certificate of sampling is available.