INTRODUCTION

Toughness is the property of a material to resist impact. Due to traffic loads, the road stones are subjected to the pounding action or impact and there is possibility of stones breaking into smaller pieces. The road stones should therefore be tough enough to resist fracture under impact. A test designed to evaluate the toughness of stones i.e., the resistance of the stones to fracture under repeated impacts may be called an impact test for road stones impact test may either be carried out on cylindrical stone specimens as in Page Impact test or on stone aggregates as in aggregate impact test.

The Page Impact test is not carried out now-a-days and has also been omitted from the revised British Standards for testing mineral aggregates. The aggregate impact test has been standardized by the British standards institution and the Indian Standards Institution. The aggregate impact value indicates a relative measure of the resistance of an aggregate to a sudden shock or an impact, which in some aggregates differs from its resistance to a slow compressive load. The method of test covers the procedure for determining the aggregate impact value of coarse aggregates.

OBJECTIVE

Determination of aggregate impact value of given aggregate, which passes 12.5 mm sieve and retained on 10 mm IS sieve. Indian Standard (IS) sieve.

EQUIPMENT & APPARATUS

The apparatus consists of an impact testing machine, a cylindrical measure, tamping rod, IS sieves, balance and oven.

a) **Impact testing machine**: The machine consists of a metal base with a plane lower surface supported well on a firm floor, without rocking. A detachable cylindrical steel cup of internal diameter 10cm and depth of 5cm is rigidly fastened centrally to the base plate. A metal hammer of weight between 13.5 and 14.0kg having the lower end cylindrical in shape, 10cm in diameter and 5 cm long, with 2 mm chamber at the lower edge can slide freely between vertical guide and fall concentric over the cup. There is an arrangement for raising the hammer and allowing it to fall freely between vertical guides froma height of 38 cm on the test sample in the cup, the height of fall being adjustable up to 0.5cm. A key is provided for supporting the hammer while fastening or removing the cup. Refer Figure 2.1.

b) **Measure**: A cylindrical metal measure having internal diameter 7.5 cm and depth 5cm for measuring at one end.

c) **Tamping rod**: A straight metal tamping rod of circular cross section, 1cm in diameter and 23cm long, rounded at one end.

d) **Sieve**: IS sieve of sizes 12.5mm, 10 mm and 2.36 mm for sieving the aggregates.

e) **Balance:** A balance of capacity not less than 500 g to weigh accurate up to 0.1 gm.

f) **Oven**: A thermostatically controlled drying oven capable of maintaining constant temperature between 100℃ and 110℃.

Figure 2.1: Impact Testing Machine

REFERENCE STANDARD

IS: 2386 (Part IV) - 1963. Methods of test for aggregate for concrete Part IV Mechanical Properties.

PROCEDURE

i) The test sample consists of aggregates passing 12.5mm sieve and retained on 10 mm sieve and dried in **an oven for four hours** at a temperature **100°C to ll0oC** and cooled.

ii) Test aggregates are **filled up to about one-third full** in the cylindrical measure and **tamped 25 times**. The surplus aggregates are struck off using the tamping rod as straight edge.

iii) The net weight of the aggregates in the measure is determined to the nearest gram and **this weight of the aggregates is used for carrying out duplicate test on the same material.**

iv) The impact machine is placed with its bottom plate fiat on the floor so that the hammer guide columns are vertical. The cup is fixed firmly in position on the base of the machine and the whole of the test sample from the cylindrical measure is transferred to the cup and compacted by tamping with 25 strokes.

v) The hammer is raised until its lower face **is 38cm above** the upper surface of the aggregates in the cup and allowed to fall freely on the aggregates.

vi) The test sample is subjected to a total of **15 such blows**, each being delivered at **an interval of not less than one second**.

vii) The crushed aggregate is then removed from the cup and the whole of it sieved on the **2.36 mm sieve** until no further significant amount passes. The fraction passing the sieve is weighed accurate to 0.1g.

viii) The fraction retained on the sieve is also weighed and if the total weight of the fractions passing and retained on the sieve is added it should not be less than the original weight of the specimen by more than one gram, if the total weight is less than the original by over one gram, the result should be-have discarded and a fresh test made. The above test is repeated on fresh aggregate sample.

CALCULATION

The aggregate impact value is expressed as the percentage of the fines formed in terms of the total weight of the sample.

Let the original weight of the oven dry sample be W_A and the weight of fraction passing 2.36 mm IS sieve be W_B

Aggregate impact value = $W_B/W_A \times 100\%$

This is recorded correct to the first decimal place.

OBSERVATION TABLE FOR AGGREGATE IMPACT VALUE TEST:

Name of the Student: _____ Student No. _____

Type of Material : Brick Chips/Stone chips/Gravels/Boulder/Rock
Sample Size : _____mm to _____ mm
Test Method :

Details	Test 1	Test 2
Weight of surface-dry sample, W_A (gm)		
Wt. of materials retained on 2.36 mm sieve, W_C (gm)		
Wt. of materials passing 2.36 mm sieve, W_B (gm)		
Aggregate Crushing Value (%) = $W_B/W_A \times 100\%$ (to the first decimal place)		
Average Aggregate Crushing Value (ACV) = (to the nearest whole number)		

REPORTING OF RESULTS

The mean of the two results shall be reported to the nearest whole number as the aggregate crushing value.

Aggregate impact value is to classify the stones in respect of their toughness property as indicated below:

Aggregate impact values	Classification of stones
< 10%	Exceptionally strong
10-20%	Strong
10-30%	Satisfactorily for road surfacing
> 35%	Weak for road surfacing

SAFETY & PRECAUTIONS:

- Use hand gloves while removing containers from oven after switching off the oven.
- To wear safety shoes & helmet during the time of test.
- Before testing, machine should be checked.
- After test electric supply should be off.
- After test clean the sieve by brush.
- Keep all the exposed metal parts greased.
- Keep the guide rods firmly fixed to the base & top plate.
- Equipment should be cleaned thoroughly before testing & after testing.

DISCUSSION:

Institute for Research in Construction (IRC) recommend that coarse aggregates having impact value less than 30% can be used at the surface for pavement.