

Experiment #11 Determination of Aggregate Impact Value – Impact Test on Aggregates

Determination of Aggregate Impact Value – Impact Test on Aggregates is done to carry out to:

- Determine the impact value of the road aggregates,
- Assess their suitability in road construction on the basis of impact value.

Apparatus for Aggregate Impact Test

The apparatus as per IS: 2386 (Part IV) – 1963 consists of:

- (i) A testing machine weighing 45 to 60 kg and having a metal base with a painted lower surface of not less than 30 cm in diameter. It is supported on level and plane concrete floor of minimum 45 cm thickness. The machine should also have provisions for fixing its base.
- (ii) A cylindrical steel cup of internal diameter 102 mm, depth 50 mm and minimum thickness 6.3 mm. .
- (iii) A metal hammer or tup weighing 13.5 to 14.0 kg the lower end being cylindrical in shape, 50 mm long, 100.0 mm in diameter, with a 2 mm chamfer at the lower edge and case hardened. The hammer should slide freely between vertical guides and be concentric with the cup. Free fall of hammer should be within 380 ± 5 mm.
- (iv) A cylindrical metal measure having internal diameter 75 mm and depth 50 mm for measuring aggregates.
- (v) Tamping rod 10 mm in diameter and 230 mm long, rounded at one end.
- (vi) A balance of capacity not less than 500g, readable and accurate up to 0.1 g.

Theory of Aggregate Impact Test

The property of a material to resist impact is known as toughness. Due to movement of vehicles on the road the aggregates are subjected to impact resulting in their breaking down into smaller pieces.

The aggregates should therefore have sufficient toughness to resist their disintegration due to impact. This characteristic is measured by impact value test.

The aggregate impact value is a measure of resistance to sudden impact or shock, which may differ from its resistance to gradually applied compressive load.

Procedure of Aggregate Impact Test

The test sample consists of aggregates sized 10.0 mm 12.5 mm. Aggregates may be dried by heating at 100-110° C for a period of 4 hours and cooled.

- (i) Sieve the material through 12.5 mm and 10.0mm IS sieves. The aggregates passing through 12.5mm sieve and retained on 10.0mm sieve comprises the test material.
- (ii) Pour the aggregates to fill about just 1/3 rd depth of measuring cylinder.
- (iii) Compact the material by giving 25 gentle blows with the rounded end of the tamping rod.
- (iv) Add two more layers in similar manner, so that cylinder is full.
- (v) Strike off the surplus aggregates.
- (vi) Determine the net weight of the aggregates to the nearest gram (W).
- (vii) Bring the impact machine to rest without wedging or packing up on the level plate, block or floor, so that it is rigid and the hammer guide columns are vertical.
- (viii) Fix the cup firmly in position on the base of machine and place whole of the test sample in it and compact by giving 25 gentle strokes with tamping rod.
- (ix) Raise the hammer until its lower face is 380 mm above the surface of aggregate sample in the cup and allow it to fall freely on the aggregate sample. Give 15 such blows at an interval of not less than one second between successive falls.
- (x) Remove the crushed aggregate from the cup and sieve it through 2.36 mm IS sieves until no further significant amount passes in one minute. Weigh the fraction passing the sieve to an accuracy of 1 gm. Also, weigh the fraction retained in the sieve.

Compute the aggregate impact value. The mean of two observations, rounded to nearest whole number is reported as the Aggregate Impact Value.

Observations of Impact Test

Observations	Sample 1	Sample 2
Total weight of dry sample (W_1 gm)		
Weight of portion passing 2.36 mm sieve (W_2 gm)		
Aggregate Impact Value (percent) = $W_2 / W_1 \times 100$		

Mean =

Result of Impact Test

Aggregate Impact Value =

Recommended Aggregate Impact Test Values

Classification of aggregates using Aggregate Impact Value is as given below:

Aggregate Impact Value	Classification
<20%	Exceptionally Strong
10 – 20%	Strong
20-30%	Satisfactory for road surfacing
>35%	Weak for road surfacing

Specified limits of percent aggregate impact value for different types of road construction by Indian Roads Congress is given below.

SI No	Type of pavement	Aggregate impact value not more than
1.	Wearing Course	30
a)	Bituminous surface dressing	
b)	Penetration macadam	
c)	Bituminous carpet concrete	

d)	Cement concrete	
2.	Bitumen bound macadam base course	35
3.	WBM base course with bitumen surfacing	40
4	Cement concrete base course	45