MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE

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Gwalior, Madhya Pradesh - 474005

A MINI-PROJECT REPORT

ON

"Optimizing the proportion of recycled concrete aggregates in conventional aggregates based on the impact value criteria"

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Introduction:

Toughness of a material is its ability to sustain impact loading. The aggregates on an in-service road are also subjected to impact loading and it should be tough enough to resist impact under traffic wheel load. Toughness of aggregates is measured by the impact test.

Aggregates Impact value gives relative measure of resistance of aggregates to sudden shock or impact, which in some aggregates differs from its resistance to slow compression load.

The strong aggregates will have low impact value and weak aggregates have high impact value. Impact Value should not be less than 45% for aggregates used for concrete other than wearing surface and 30% for concrete used in wearing surface.

Conventional aggregates used in building and civil engineering applications require compaction to achieve strength and durability.

Recycled aggregates are formed from construction waste in treatment plants that can be stationary or mobile with the help of crushers and magnetic separators. The composition of recycled aggregate and its grading have a great effect on recycled concrete properties.

Recycled aggregate is mainly derived from used materials in construction applications but the primary environment concern about recycled aggregate related to its chemical constituents and their leaching behaviour.

Objective of Study:

The objective of this experiment is optimizing the proportion of recycled concrete aggregates in conventional aggregates based on the impact value criteria.

Procedure Followed:

1. Take a sample of conventional aggregate and recycled aggregate.
2. Let (W_1) be the weight of conventional aggregates and (W_2) be weight of recycled aggregates.
3. Take $W_1+W_2=350g$ of both aggregate weight.
4. Take 350 g of oven dried conventional aggregates (W_1) and 0 g recycled aggregates(W_2) (100-105°C) which passes through 12.5 mm sieve and retained on 10 mm sieve.
5. Fill the measuring cylinder with aggregates in 3 layers, tamping each layer 25 times. After filling the cylinder use the tamping road as straight edge to remove excess aggregates.
6. Place measuring cylinder cup on the solid base plate of the impact test machine.

7. Release the hammer in order to apply impact load, 15 blows are given at the interval of not less than 1 second.
8. After 15 blows, remove the cylindrical cup and transfer the aggregates over the 2.36mm sieve.
9. Sieve the aggregates through 2.36 mm sieve for 10 minutes and note the weight of aggregates passing through 2.36 mm sieve (which retain on the pan) (W_3).
10. Record the observations and calculate the aggregate impact value as per the formula given below:

$$100 \times W_3 / (W_1 + W_2)$$

11. Now take 280 g of oven dried conventional aggregates (W_1) and 70 g of recycled aggregate (W_2) (100-105°C) which passes through 12.5 mm sieve and retained on 10 mm sieve. Repeat the procedure from step 4 to 10.
12. Similarly for next reading increase recycled by 20% and decrease conventional by 20% (i.e. increase 70 g of recycled and decrease 70g of conventional). Take readings on 40%, 60%, 80% and 100% of W_2 and 60%, 40%, 20%, 0% of W_1. And repeat the procedure from the step 4 to 10.

Observation Table:

S. No.	Weight of conventional aggregate W_1 (g)	Weight of recycled aggregate W_2 (g)	Weight of aggregate passing through 2.36 mm sieve. W_3 (g)	Impact Value (%)
1.	350	0	45	12.85
2.	280	70	50	14.28
3.	210	140	55	15.71
4.	140	210	60	17.14
5.	70	280	65	18.57
6.	0	350	70	20.00

Result:

Impact value for 100% conventional aggregate = 12.85%

Impact value for 100% recycled aggregate = 20%

Since the impact value is increasing gradually with the increase in quantity of recycled aggregate and so the crushed particles will be more in recycled aggregate as compared to conventional aggregate. Therefore the conventional aggregate is better than recycled aggregate.

CONCLUSION:

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. The aggregate should therefore have sufficient toughness to resist their disintegrating due to impact. From the experiment it is clear that recycled aggregate has more impact value as compared to conventional aggregate and it can bear higher load.