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Application of Various Waste Material Used In Concrete Mix

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ABSTRACT: The emerging sustainable development movement in the construction industry requires the recycling of waste materials to reduce the day by day. The used of alternative or waste material is a partial replacement of coarse aggregate negative environmental impact of construction activities.the cost of building material is rising coarse aggregate in solving part of natural aggregate. The various waste materials are used such as, & glass chips & concrete structure demolished waste etc. Made up ofconcrete cube by adding of waste material in right proportion.

Keywords: - Waste glass chips, demolished concrete waste, recycling, and reusing, environmentally friendly, glass aggregate and demolished concrete strength development, durability, material test.

I. INTRODUCTION

The design of concrete mix is not a simple task on account of the widely varying properties of the constituent materials. Mix design is the process of determining the appropriate proportions of cement, fine aggregate, course aggregate, water and admixture if any which will satisfy the requirements of compressive strength, workability and durability. By using a demolished concrete pavement as recycled aggregate in stabilizing the base course for road construction the annual amount of construction demolition waste in India is 530 million tons while the current method of managing such waste is through disposal in landfills causing huge deposits of CDW becoming an environmental problem. In the other developing countries laws have been brought into practice to restrict CDW in the form of prohibitions or special taxes for creating waste. The heaviest material found in CDW. In India are concrete, bricks, sand and tiles residues in which concrete represent up to half of the total waste weight. This situation leads to a Question about the preservation of natural aggregate sources and environment. Glass is widely used in our lives through manufactured products such as sheet glass, bottles, glassware, and vacuum tubing. Glass is an ideal material for recycling. The use of recycled glass saves lot of energy and the increasing awareness of glass recycling speeds up focus on the use of waste glass with different forms in various fields. One of its significant contributions is the construction field where the waste glass was reused for concrete production. The application of glass in architectural concrete still needs improvement. Several study have shown that waste glass that is crushed and screened is a strong, safe and economical alternative to sand used in concrete. During the last decade, it has been recognized that sheet glass waste is of large volume and is increasing year by year in the shops, construction areas and factories.

II. MATERIALS AND METHOD

A) Materials

Cement: - OPC 43 cement shall confirm to IS:8112-1989 And the designed strength of 28 days shall be minimum 43 Mpa or 43kg/sqcm. Even though 43 grade cement early strength is less than as compare to that of 53 grade, with time it will attend the as consequently, The release of heat is moderate and therefore, occurrence of same ultimate strength as that of 53 grade cement in the case of 43 grade cement, the initial setting of cement is slower as compare to53 grade cement. The hydration process micro cracking is much less can be easily controlled by proper curing of the concrete.

Fine Aggregate:- Locally available sand with specific gravity of 2.67, falling under the zone-II, complying83-1970(4) was used. Fine aggregate is natural sand which has been washed and sieved to remove particles larger than 4.75 mm (passing the No. 4 sieve). The fine and coarse aggregate are delivered separately. Because they have to be

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sieved, a prepared mixture of fine and coarse aggregate is more expensive than natural all-in aggregate. The reason for using a mixture of fine and coarse aggregate is that by combining them in the correct proportions, a concrete with very few voids or spaces in it can be made and this reduces the quantity of comparatively expensive cement required to produce a strong concrete.

Coarse Aggregates: - Locally available coarse aggregate of 20 mm and down size having a specific gravity of 2.74, complying with IS:383-1970(4) was used. The mix design was carried out for m-20 grade concrete as per IS:10262-1982,IS:10262-2009,ACI and DOE method of mix design which yielded the following proportion. Single-size aggregate is based on a nominal size specification. It contains about 85 to 100 percent of the material which passes through that specified size of the sieve and zero to 25% of which is retained in the next lower sieve. A graded aggregate contains more than one single-size aggregate. Shape of three dimensional irregular bodies as coarse aggregate is difficult to describe; but is the vital property affecting the workability of fresh concrete and also its strength and durability. The characteristic of parent rock from which coarse aggregates have been produced and also the type of crusher used for crushing influence the shape of coarse aggregates. Rounded, Angular, Flaky, Elongated and Irregular are some types on shapes of coarse aggregates. Rounded particles are fully water-worn or completely shaped by attrition. Angular particles possess well-defined edges formed at the intersection of roughly planar faces. Flaky particles have thickness small relative to the other two dimensions. Elongated particles are usually angular of which the length is considerably larger than the other two dimensions. Irregular particles are naturally irregular, partly shaped by attrition and having rounded edges.

Waste material used in concrete

Glass Chips: - We have glass waste for our project. This waste w collected from public building where construction is going on and some glass pieces we collected from dumping yard and this waste we used in our project after collection. Glass is widely used in our lives through manufactured products such as sheet glass, bottles, glassware, and vacuum tubing. Glass is an ideal material for recycling. The use of recycled glass helps in energy saving. The increasing awareness of glass recycling speeds up inspections on the use of waste glass with different forms in various fields. One of its significant contributions is to the construction field where the waste glass was reused for concrete production. The application of glass in architectural concrete still needs improvement. Laboratory experiments were conducted to further explore the use of waste glass as coarse aggregates.

Demolished concrete waste: -The use of recycle aggregates in construction can be useful for environmental protection and economical terms; It's started since the end of World War II. By using a demolished concrete pavement as recycled aggregate in stabilizing the base course for road construction the annual amount of construction demolition waste in India is 530 million tons while the current method of managing such waste is through disposal in landfills causing huge deposits of CDW becoming an environmental problem. In the other developing countries laws have been brought into practice to restrict CDW in the form of prohibitions or special taxes for creating waste.

III. LITERATURE REVIEW

Topcu and Canbuz, 2004 (Glass Chips)

Waste glass in the concrete construction sector is advantageous, as the production cost of concrete will go down. The amount of waste glass is gradually increased over the years due to an ever- growing use of glass products. Most of the waste glasses have been dumped into landfill sites. The land filling of waste glasses is undesirable because they are not biodegradable, which makes them environmentally less friendly. There is huge potential for using waste glass in the concrete construction sector. When waste glasses are reused in making concrete products, the production cost of concrete will go down.

Khalaf and de -venny, 2004 (Demolished concrete waste)

A recent European survey showed that 25% of wastes come from the demolition of buildings and roads. 90% of it is recyclable, but only 30% is recycled. According to the U.S Environmental Protection Agency (EPA), 215 million tons of municipal solid waste is generated in the United States from C&D waste per year. This made up primarily of concrete, asphalt concrete, wood, gypsum, demolition material and asphalt shingles generated from road construction and high way maintenance, building renovation demolition of building and other structures.

D. Wilburn, t. Goonan, gilpin et al (2015) (aggregates from recycled sources)

Old concrete can be recycled into aggregates and used in many civil engineering applications, including road pavement materials, sub-basements, soil stabilization, and production of

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new concrete. However, progress toward concrete recycling varies in different countries for various reasons. These include the availability of technical specifications, recycling technologies, and the level of government support. Wilburn and Goonan revealed that up to 1998, more than half of cement concrete debris generated in the U.S. ended up in landfills. Of all recycled cement concrete debris, 85% was used as road base although RCA was being increasingly used to replace natural aggregate in such road construction applications as concrete mix and top- course asphalt. According to Gilpin et al. the lower transportation cost of processed waste concrete aggregates might have been the incentive that promoted the use of RCA in the U.S. However, most of the waste aggregates were only suitable as backfill or construction base.

B) Methods

Mix design and sample preparation:- Concrete mix adopted throughout this study was undertaken in accordance with the procedure specified in IS 10262:2009 with provision of IS: 456:2000 bureau of Indian Standard, New Delhi. India. All mixes were proportional in order achieve a design compressive strength of 20 Mpa after 28 days. Corresponding water cement ratio is calculated as 0.55. A control mix was produced containing only natural aggregate with a one resulting mixes incorporating waste glass chips and demolished concrete waste as a partial replacement of coarse aggregate in a proportion of 25%. As the crushed glass chips at 20mm size for the coarse aggregate so an minor adjustment was done to each mix design to ensure the strength and workability design parameters remained constant. The adjustment of was by increasing the bulk modulus of the fine aggregate to compensate for the reduced fineness modulus and therefore a subsequent reduction in coarse aggregate volume. These changes ensured a design compressive strength of 20 Mpa and above was achieved for all batches.

Testing of specimen: - Compressive strength test was conducted at the age of 28 days accordance with IS 1881: part of 116 using a loading rate of 140kg/cm^2 per minute till the specimen fails. The test was conducted using universal compression testing machine (UCTM) of capacity 2000KN. In this mix with the proper proportion are batched. Then the concrete was thoroughly mixed until it achieves the homogeneous and uniform consistency. Then the fresh concrete was casted and it was completed by manually tempered with 16 mm dai. Rod. All freshly cast specimen were left in the mould for 24 hours before being de moulded. The cube was de moulded after 24 hours and were cured with water for 28days

Result: - Compressive strength: - The result of compressive strength of concrete at the age of 7 days,14 days &28 days are shown in table 1 & 2. The compression of the compressive strength of the concrete is fig 1&2.

Sr. No	Concrete grade	Day of curing	Compressive load in (KN)		Compressive strength in (Mpa)	Expected strength (Mpa)
1	M-20	7	428.3 571.9	500.1	22.22	13
2	M-20	14	720.3 745.8	733.05	32.58	18
3	M-s20	28	850.3 778.9	814.45	36.19	20

Table. No 1 Compressive Strength of Glass Chips

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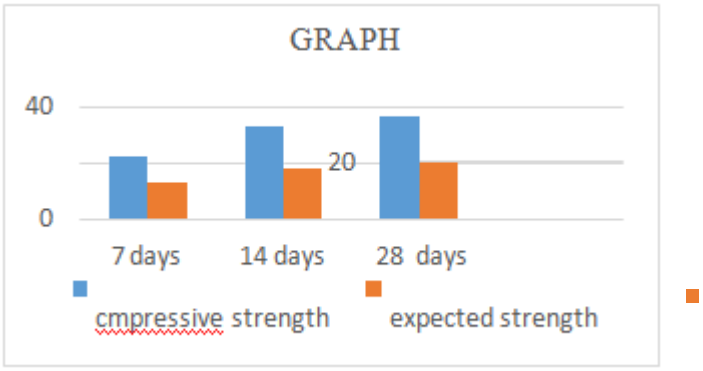
GLASS CHIPS REPLACE BY COARSEAGGREGATE 25%

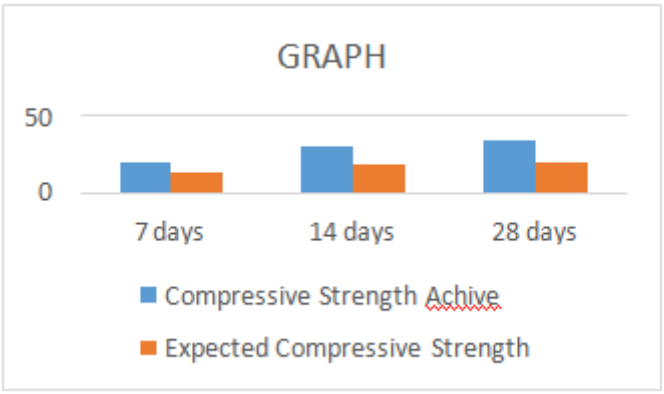


Graph: 1 Glass Chips Replacing with Coarse Aggregate

Sr. No	Grade of concrete	Days of curing	Compressive load in (KN)		Compressive strength (Mpa)	Expected strength (Mpa)
1	M-20	7	486.90 383.70	435.3	19.34	13
2	M-20	14	625.30 695.60	660.4	32.58	18
3	M-20	28	713.4 795.6	754.5	33.53	20

Table. No 2 Compressive Strength ofDemolished Concrete Waste

Demolished Concrete Waste Replace byCoarse Aggregate 25%



Graph: -2 Demolished Concrete Waste Replacing with Coarse Aggregate

IV. CONCLUSION

Based on the limited study carried out on the strength behaviour of waste material, the following conclusions are drawn.

1. The experimental result shows that the increase in the strength of concrete with use of glass chips, demolished concrete waste. Therefore, with the use of glass chips, demolished concrete waste in partially replacement of coarse aggregate in concrete, we can increase the strength of concrete with reducing the consumption of coarse aggregate.

2. The survey revealed that in the U.S., waste concrete (mainly from the demolition of old buildings/structures) had been largely recycled into aggregates and widely applied in backfill and road base.
3. The paper presents the necessity of sustainable construction in present world and the possible of waste glass recycling and using into concrete production.

4. The study focuses on practical use of glass as coarse aggregate in concrete instead.

5. It is recommended that a detailed and regular study on availability and quantity of demolished concrete waste through the whole country should be done so that an eventual recycling industry is developed and supported accordingly. Also, the checking of other mix ratios is encouraged.

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