



Recycled Plastics as Coarse Aggregate for Structural Concrete

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Abstract

The plastic used is increasing day by day,. This creates substantial garbage every day which is much unhealthy. Although advantages. The suitability material of recycled plastics as coarse aggregate in concrete and its advantages are discussed in that. The initial questions arising of the bond strength and the heat of hydration related with plastic aggregate were solved. Tests were conducted determine the properties of plastic aggregate such as density, specific gravity and aggregate crushing value. As 100% replacement of natural coarse aggregate with plastic coarse aggregate is not feasible, partial replacement at various percentage were examined [8], [9]. The percentage substitution that gave higher compressive strength was used for determining the other properties such modulus of elasticity, split tensile strength and flexural strength. Higher compressive strength were natural coarse aggregate found with 20% replaced concrete. Heat resisting behavior of the plastic coarse aggregate.

Index Terms: Coarse aggregate, plastic coarse aggregate (PCA), partial replacement, volumetric substitution, grade substitution.

1. INTRODUCTION

Concrete is the most used man made construction material in the world and its second only to water as the utilize substance in the planet. Aggregate for concrete and dispose of waste from various commodities is present concern. Indian concrete industry is today consuming about 400 million tons concrete every year and it is expected. In the present study the recycled plastics were used to prepare the coarse aggregates thereby providing a option to deal with the plastic waste [10]. There were many recycling plants across the world, but as plastics are recycled they lose their strength with the number of recycling. So these plastics will end up as earth seal. In this instead of recycling it time after time if it is utilized to organize aggregates for concrete mainly of the failures in concrete structures occur due to the failure of concrete by crushing of aggregates. PCAs which have low crushing values will not be crushed as easily as the stone aggregates. These aggregates are also lighter in weight nature coarse aggregate to stone aggregates. A complete substitution for was not found feasible, a partial exchange with various percentage of PCA was done. Both all volumetric and grade substitution was employed in this investigation.

2. PLASTIC AGGREGATE

Plastics collected from the disposal area they were sorted to get the superior. They were crushed into small fraction and washed remove the strange particle. Then it was heated at a particular near about 275 degree temperature so that necessary brittleness was obtained. After extrusion the molten plastic where cooled down and collected in boulders of 100 mm size approximately. This plastic boulder was crushed down to the size of aggregates. The plastic is too much in our country and all over the word that's total decomposition is possible so the plastic can be minimizing by this method. In the above information the plastic is very useful in concrete and which is economical .And the use of concrete is eco-friendly The all properties can satisfied as near about like as normal concrete.

PROPERTIES

According to the I.S specifications the property of aggregates such as specific gravity, aggregate crushing value and density was indomitable 6, 7. From Table 1 comparing the properties of aggregate for both *plastic coarse aggregate* and *natural coarse aggregate* it is observed that the specific gravity and density for *plastic coarse aggregate* is much lesser than *natural coarse*

aggregate which offers a light weight concrete. A lower crushing value indicates the complexity with which a PCA concrete could be crushed under compressive stresses.

Table-1: Properties of Aggregate

Property	Plastic coarse aggregate	natural coarse aggregate
Specific gravity	2.14	0.9
Crushing value	28	2
Density	3.14	0.81



Fig-1: various type of plastic

3. EXPERIMENTAL INVESTIGATION

Tests were conducted to determine the fresh and hardened properties of both natural coarse aggregate and Plastic coarse aggregate concrete. Slump and Compaction factor were determined as per the Indian standards and the values are tabulated in Table 2. It shows that workability of 20% Plastic coarse aggregate concrete is superior to natural coarse aggregates concrete which is due to the less water absorption rate of plastic aggregates.

TABLE- 2: Fresh Properties of Concrete

Particular	Slum in mm	Compaction factor
NCA	33	0.9
20% replacement of PCA	36	0.95

A. Volumetric Substitution

In this method the volume occupied by natural coarse aggregate was substituted with plastic coarse aggregate for various percentage substitutions, knowing their Densities. The cube compressive strength that 20% exchange has shown a better strength even more than natural coarse aggregate concrete at the end of 28 day curing time. All the tests on concrete specimens for M20 mix to determine their hardened properties was conducted at the end 28 days.

B. Structural Behaviors

Tests were conducted to determine the container compressive strength, split tensile strength and modulus of elasticity on specimen of size 150 mm x 300mm .though the plastic coarse aggregate concrete material has shown a better compressive strength as compared to

predictable with an increment of 28%, its lower in opening tensile strength and modulus of stretch It can be that deficient bonding between plastic coarse aggregate concrete and the matrix must be a reason to have the lower values. This fear could be with the use of suitable admixtures to improve bond strength.

Table-3: structural properties of concrete

Particulars	Cylinder compressive strength of concrete	Splitting tensile strength in mpa	Modulus of elasticity in mpa
Natural Coarse Aggregate Concrete	11.81	2.44	16288
22 % Natural Coarse Aggregate Concrete	16.23	1.94	12680

Further to calculate the tensile strength, flexural strength test was conducted on specimen of size 100 mm x 100 mm x 500 mm. Strength of 4.4 for natural coarse aggregate concrete and 4.24 for plastic coarse aggregate concrete was observed. a slight reduction in strength be noted for plastic coarse aggregate concrete as compared with natural coarse aggregate concrete .With limited test on bond strength of plastic coarse aggregate concrete an admixture was added to the integration water 0.4% by weight of cement to improve bonding between plastic aggregate and the material. The limited test result shows that the compressive strength improved 14% when compared with plastic coarse aggregate concrete without admixture. Some tests also conducted to study the heat resistivity of plastic concrete. Concrete specimens were subjected to a mixture of temperatures and its compressive strength was noted. At a temperature of 400OC, the natural coarse aggregate concrete has shown a 33% reduction of strength while plastic coarse aggregate concrete show about 75% reduction. So that special fire proof coatings are necessary when plastic coarse aggregate concrete risks fire

4. CONCLUSION

A study was conducted to determine the suitability of Plastic coarse aggregate for structural concrete. A percentage replacement of 22% natural coarse aggregate with Plastic coarse aggregate was found to be of superior concrete compressive strength. With regard to its tensile behavior the bonding strength of PCA with matrix needs more attention, since natural coarse aggregate concrete has shown a substantial reduction in split tensile strength and elastic modulus.

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