

Study of Concrete by Using Crown Caps as Partial Replacement of Coarse Aggregate

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Abstract :-Green building now days progressive in world concern because in green building we use more and more natural resources which is very important for environmental and we reuse the material in it. Large quantities of metal waste unit is generated from waste bottle caps of soft drinks and juices (crown caps). This is consider as an environmental issue because metal waste crown caps is non- biodegrade so it is important step to processes either to or utilize or recycle. Today in this world we would love of finding materials helps for increasing the strength of concrete structures with low price, which helps to decrease the environmental damage. This analysis will help us to gear in toward the scan of waste usage material throughout this analysis paper is based on aluminium caps of beverages bottles (crown caps). Unit of measurement chosen as partial replacement for the coarse aggregate in the concrete mix. The compressive strength properties are tested on the addition of WBC (crown caps) in coarse aggregate replaced by the different 0%, 10% and 15% of the waste bottle caps whereas using M30 grade.

Keywords:-Waste Bottle caps, Green building, Compressive strength,

I. INTRODUCTION

Concrete is the most widely used man made construction material in the world and its second only to water as the most utilized substance in the planet. Concrete is the most widely used construction material worldwide, this is due to its versatility, strength, durability and ease to place into forms and shapes. In the present study the bottle caps were used to prepare the coarse aggregate there by providing a sustainable option to deal with the bottle caps .To confirm that rapid increase in the construction activities lead to acute shortage on conventional building materials. The slump, compressive strength, properties at different percentages replacement of coarse aggregate with waste bottle caps were investigated in the laboratory. These aggregates are lighter in weight compared to stone aggregate. Today the construction industry is in need of finding effective materials for increasing the strength of concrete structures with low cost, and with less environmental damage. This research is aimed at addressing such issues by investigating the possibility of using bottle caps to partially substitute for coarse aggregate.

II. MATERIALS AND METHODOLOGY USED

Cement

The cement used during this study was 53 grade ordinary standard Portland cement (OPC) confirming to IS 8112-1989. Cement is used as a binder material that sets and hardens severally, and it bind the different kind of materials. The properties of cement were determined and results are given in the table.

Table-1 Physical Properties of cement

S.NO	PROPERTIES	TEST RESULTS
1	Fineness (%)	95
2	Soundness by: Le Chatelier (mm) Max.	15
3	Initial setting time (Min).	30
4	Final setting time (Min).	600

Coarse Aggregate

Coarse Aggregate mixture used was a combine of 10-20mm. Testing was done according to Indian normal Specification IS: 383-1970. Its specific gravity 2.70.

Table 2: Properties of Coarse Aggregate

S.NO	DESCRIPTION	TEST RESULTS
1.	Size (mm)	10-20
2.	Specific Gravity	2.70

Fine Aggregate

Local available sand confirming to zone II with specific gravity 2.275 was used. The testing of sand was done as per Indian customary Specification IS: 383-1970. The scale of the mixture lesser than 4.75 mm is taken into consideration as Fine aggregate.

Table 3: Properties of Fine Aggregate

S.NO	DESCRIPTION	TEST RESULT
1.	Sand Zone	Zone 2
2.	Specific Gravity	2.275

Water

Water is use for the mixing of all the materials combine, for this activity we need to have clean water which is free from any bacterium and wish matter confirming according to IS 3025-1964 is used.

Waste bottle caps

Waste Bottles Caps can be perfect material for employment. The use of recycled Waste Bottles Caps (aluminium caps) saves lot of energy and increasing awareness of Waste Bottles Caps are used in the totally different forms in numerous fields. The size of waste bottle caps is 3mm projection and diameter is 2.5cm.

Table 4: Show the Physical properties of waste bottle caps

SR. NO.	PROPERTIES	VALUES OBTAINED
1	Density	2.7 g/cm ²
2	Melting Point	660.31 0 C
3	Boiling Point	2499 0 C
4	Specific Gravity	2.56 g/cm ³



Fig. 1: Waste Bottle Caps

III. MIX PROPORTIONS

We are using M30 grade for mix design as per IS: 10262-2009. w/c ratio we used is 0.42 all test performed on specimens which are cured for 7, 14 & 28 days (including sea water). determine the maximum strength gain by the proportion of waste bottle caps (aluminium caps) which may be added into the concrete mix, percentage of waste bottle caps replaced by coarse aggregate is 0%, 10% and 15%.

Cement	Fine aggregate	Coarse aggregate
383.2kg/m ³	800.94kg/m ³	1087.75kg/m ³

IV. TEST PERFORMED ON SPECIMENS

Compressive Strength Test

Test is done as per IS 516:1959. Cubes specimens are used of size 150mmx150mmx150mm to determine the compressive strength of mix design concrete. No of cubes casted for compressive strength is 4 cubes without addition of wbc (0%) for 7, 14 & 28 days under normal water curing and 9 cubes with the addition of wbc (10% and 15%) for 7, 14 & 28 day under normal water. The maximum load on compressive strength was noted and the strength is calculated. Cube compressive strength (f_{ck}) in MPa = P/A where, P = cube compressive load in Newton (N) A = Area of the side of cube.

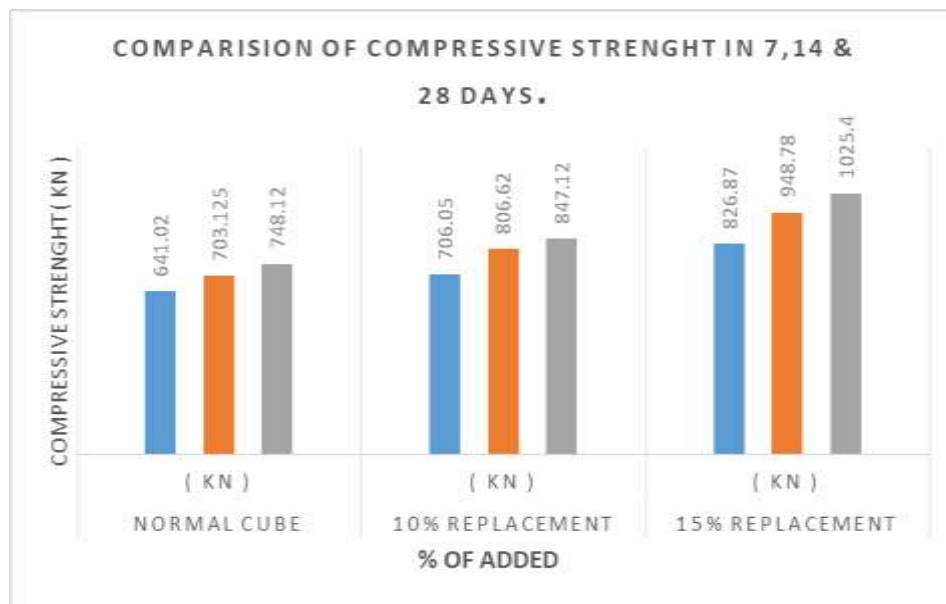


Fig. 2 Compressive Testing Machine

S.NO	DAYS	NORMAL CUBES(KN)	10%REPLACE(KN)	15% REPLACE(KN)
1	7	641.125	703.175	748.135
2	14	706.06	806.625	847.125
3	28	826.875	948.780	1025

V. RESULT

From compressive strength test for 7, 14 & 28 days we obtain strength increase by 8% and 11% for 10% and 15% replacement by crown caps as compare to normal cubes.



VI. CONCLUSION

- Waste bottle caps play the vital role in producing extra strength in concrete at very low cost.
- From the experimental work it is been conducting that maximum percentage of waste bottle caps can be used in concrete as reinforcing material is 10% for positive results.
- Waste reduction, conservation of energy and increase green construction.
- The inclusion of these crown caps is a positive effect which means that disposing the waste bottle caps is not a problem now and the environmental impact of the bottle crown caps has been reduced.

- Waste bottle caps play the vital role in producing extra strength in concrete at very low cost. The possibilities of using waste bottle caps (WBC) as partial replacement of gravel have been explored.
- In compression tension and flexure the specimen with soft drink bottle caps as waste material was found to be good.
- Concrete is strong in compression and weak in tension but, percentage increase in tensile strength of soft drink bottle concrete is more as compared to normal concrete.
- The weight of concrete have been reduced considerably
- Since, bottle caps of soft drinks are easily available, they can be easily collected and cut into fibers and the compressive strength can be increased to it some extent.
- Waste reduction, conservation of energy and increase green construction.

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