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A Study on Rubbercrete Blocks

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Abstract:

The growing need of building materials has resulted in innovation in finding the new materials. The costs of building materials constitute about 60%-65% of the total cost. This study investigated reuse potential of tyre chips as fine aggregate in rubber concrete bricks. An attempt has been made in finding out load carrying capacity of rubbercrete blocks. The rubberized concrete reduces the cost by8% to 10% and even reduces the environmental impact of concrete itself by eliminating the waste tyre stockpiles and reducing the potential threats of the stockpiles to the environment.

Keywords —Rubbercrete, Compressive strength, Tyre chip, Environmental impact

I. INTRODUCTION

Engineering judgement and judicious use of available material can reduce the cost of construction. Efforts are needed in this regard to bring about economy in cost and also proper utilisation of limited resources. The concrete blocks are manufactured with partial replacement of cement by Coal ash waste powder and partial replacement of fine aggregate by Tyre waste. Nowadays use of precast concrete blocks prove to be advantageous when there are many identical members to be cast resulting in use of same formwork many times, thereby reducing the cost of formwork. Concrete blocks are cost effective and better alternative to burnt clay bricks by virtue of their good durability, fire resistance, partial resistance to sound, thermal insulation, small dead load and high speed of construction. Concrete blocks being comparatively larger require less mortar and consumes less time for construction.

II. MATERIALS

Following materials are used for this experimental study.

- ZUARI Cement PPC 43 grade having specific gravity 3.15 (confirming to BIS)
- Coal Ash having specific gravity 2.10
- Locally available river sand of zone II having specific gravity 2.60 (conforming to IS 383-1970)
- Coarse aggregates of crushed granite stones of size 10 mm having specific gravity 2.61 (conforming to IS 383-1970)
- Potable water
- Tyre waste chips of specific gravity 0.80

III. METHODOLOGY

The methodology adopted in this study is as below.

i. Determination of basic properties of constituents of concrete and new concrete mix.
ii. Casting and curing of cement concrete and Rubbercrete blocks
iii. Determination of the compressive strength of various mixes at 28th day.
iv. Tabulation of results and their analysis.

IV. EXPERIMENTAL PROGRAM

EVALUATION OF CONTENT OF COAL ASH AND TYRE WASTE

To begin with, 15 mortar cubes were prepared with different % of coal ash replacing cement varying from 0% to 40% with 10% increment. The cubes were cured for 7 days and tested for compressive strength. The % coal ash (20%) beyond which the compressive strength reduced drastically was considered for the concrete mix to decide the optimum tyre waste content for partial replacement of fine aggregate.

In the second stage a total of 15, M10 grade concrete cubes of size 150mm with W/C ratio of 0.6 were cast for 0% (control specimen), 5%, 10%, 15% and 20% tyre waste and tested for 28 days compressive strength and results are tabulated in Table I. In each mix 20 % of cement was replaced by coal ash.

V. RESULTS, DISCUSSIONS AND CONCLUSIONS

TABLE I- Compressive strength results of rubbercrete blocks

% of tyre chips	Compressive strength (N/mm^2) 28 days
0	18.6
5%	13.80
10%	7.81
15%	7.59
20%	5.80

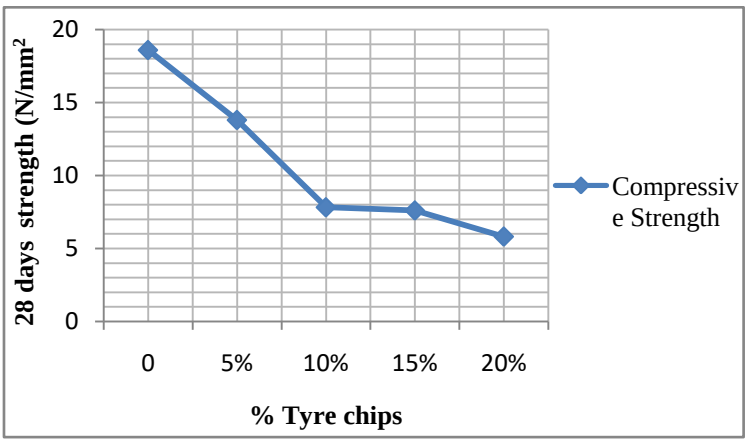

Fig.1Variation of compressive strength with different % of tyre chips

With the partial replacement of cement (20% with coal ash) and partial replacement of fine aggregates (5%with tyre chips), the compressive strength achieved was 13.80 N/mm^2 where as the minimum desirable compressive strength is 10.0 N/mm^2. It was also observed that as the % content of tyre chips increased there was a more dip in the compressive strength

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