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PARTIAL REPLACEMENT OF PARTIAL REPLACEMENT OF FINE AGGREGATE BY CRUMB RUBBER IN CONCRETE

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ABSTRACT: The increase of about three crores discarded tyre each year poses a potential threat to the environment. The best way to overcome this problem is to find alternate aggregates for construction Crumb rubber usually consists of particles ranging in size from 4.75 mm to less than 0.075 mm. Most processes that incorporate crumb rubber as an asphalt modifier use particles ranging in size from 0.6 mm to 0.15 mm, 20% and 30 % replacement of fine aggregate

Keywords: Cement, Fine Aggregate, Coarse Aggregate, Crumb Rubber, Concrete

I. INTRODUCTION

The management of worn tyre poses a major problem for all the countries.

Worldwide, the production of rubber increases every year. Different countries of the world has different rate of producing rubber, for instance

1. United States produces 3.6 million tons of rubber per year.
2. Iran produces 100,000 tons of rubber per year.

1.1 CRUMB RUBBER

Crumb rubber are used to replace the fine aggregate and having the dimension about 0.5mm. crumb rubber made by shredding process of used waste automobile tyres in tyre remoulding plant also crumb rubber is generated. The size range from 0.5mm -0.075mm. The specific gravity of crumb rubber is 0.8.



Fig 1.1 Crumb Rubber

II. POTENTIAL MATERIALS FOR CONCRETE

The following materials are used in concrete:

- a) Cement (43 grade ordinary Portland cement)
- b) Fine aggregate (not greater than 4.75mm)
- c) Coarse aggregate (20mm size)
- d) Crumb rubber (0.6mm size for 20%, 30% of replacement)

III OBJECTIVES OF REPLACEMENT

- To investigate the structural behaviour of such replaced concrete components
- As partial substitute for the fine aggregate (sand) in concrete composites
- To investigate the mechanical behaviour of the components by using crumb powder.

IV. PREPERATION OF TEST SPECIMENS

The specimen were cast in steel mould and compacted by a tamping rod. The specimens of 150mm ×150mm ×150mm size of cubes and 150mm diameter 300mm high cylinder specimens were casted for the determination of compressive strength and split tensile strength at different ages respectively.



Fig 4.1 Specimen preperation

V. RESULTS AND DISCUSSION

5.1 WORKABILITY TEST

Slump test is used to determine the workability of fresh concrete. The test was followed as per IS 1199-1959. The result of the slump test was represented in table.

Dimension of slump cone

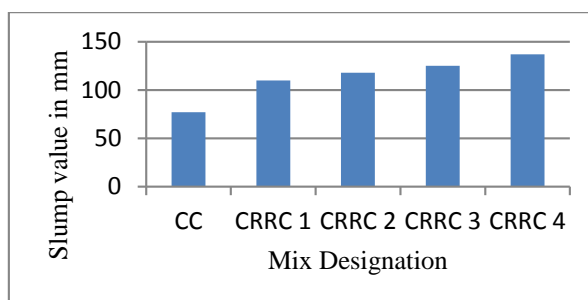
- Top diameter - 100mm
 Bottom diameter - 200mm
 Height - 300mm

Table 5.1 Slump value

S.NO	Type of concrete	SLUMP VALUE (mm)
1.	CC	77
2.	CRRC 1	110
3.	CRRC 2	118
4.	CRRC 3	125
5.	CRRC 4	137



Figure 5.1 Slump value



DISCUSSION

Workability of the 35 % crumb rubber replaced concrete is higher than conventional Concrete and the other dosages.

5.2 COMPRESSIVE STRENGTH TEST

Average compressive strength for 28 days obtained by taking average of specimens for each day are compiled below.

5.2.1 COMPRESSIVE STRENGTH

Table-5.2 Compressive strength

S.NO	Type of concrete	Compressive strength (N/mm ²)
1.	CC	20.92
2.	CRR C 1	23.14
3.	CRR C 2	18.43
4.	CRR C 3	15.11
5.	CRR C 4	13.13

Where,

CC- Conventional concrete

CRR C 1 - Crumb rubber replaced concrete with 20% of fine aggregate

CRR C 2 - Crumb rubber replaced concrete with 25% of fine aggregate

CRR C 3 - Crumb rubber replaced concrete with 30% of fine aggregate

CRR C 4 - Crumb rubber replaced concrete with 35% of fine aggregate

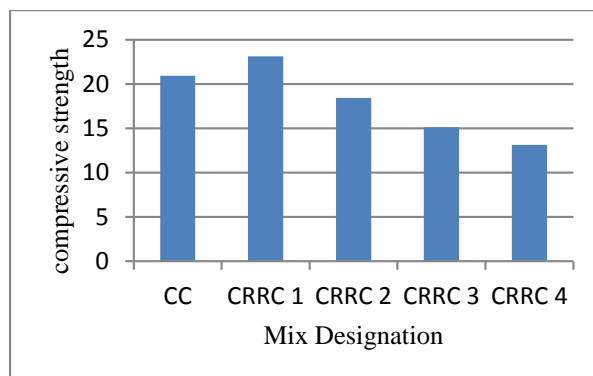


Figure 5.3 Compressive strength

DISCUSSION

From the 28 days compressive strength test results, conventional concrete has strength of 20.92 N/mm² and 20% replaced concrete has 23.14 N/mm² which was higher than conventional concrete and 4% higher than the other dosages.

VI. CONCLUSION

From the results and discussion it was concluded that,

- Higher content of crumb rubber particle replaced in concrete increases workability of concrete.
- Using crumb rubber with 20% of replacement of fine aggregate gives higher strength than normal concrete mix.
- Rubberized concrete shows reduction in density of concrete when compared with ordinary concrete specimen.
- It is recommended to use rubberized concrete small structures like road curbs and non-bearing walls etc.
- Higher content of crumb rubber produces the light weight concrete.

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