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An experimental investigation on flexural behaviour of concrete beam with composite reinforcement using ms pipe infilled with crumb rubber

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***Abstract*— In today developing construction field several alternates are being introduced for natural resources used in reinforced concrete. This project focuses on the alternate reinforcement for the structural members. The conventional reinforcement is replaced by the composite reinforcement.**

The composite reinforcement is in-filled with mild steel pipe which includes the cement slurry and sieved crumb rubber . This crumb rubber constitutes to the solid waste management. Hence these composite reinforcements will reduce weight of steel in reinforced concrete along with the reduction in cost of construction. The hollow steel pipe is madeup of mild steel and the local buckling of the steel pipe is delayed by the restraint of the concrete, and the strength of concrete is increased by the confining effect of the steel tube and crumb rubber.The rubber is collected from scrap tires. The scrap tires are made into crumb rubber and mixed with water – cement in a ratio to attain the colloidal consistency. The present experimental investigation is about the comparison of the flexural strength of concrete beam with conventional and composite reinforcement.

***Index Terms*— Composite reinforcement, crumb rubber, conventional reinforcement.**

I. INTRODUCTION

General

The main theme of this project is the use of composite reinforcement. The conventional reinforcement used for construction purposes is replaced by this composite reinforcement. This is aiming to check how effectively this composite reinforcement will behave and the areas this can be adopted to obtain the advantages of this composite reinforcement.

The use of composites in the form of concrete-in-filled tubes for the construction of new high-performance structural members will receive significant attention, with large numbers of studies reporting on the flexural behavior of beam and a few studies have reported on the flexural behavior of beams reinforced with steel bars. This composite system consists of an outer steel tube with cement mortar in-filled with the sieved crumb rubber mixture. The resulting beam combines the advantages of to achieve a high-performance structural member.

Composite Reinforcement

The composite reinforcement to be implemented in this project is composed of hollow steel pipe in filled with rubber cement slurry. The hollow steel pipe is made up of mild steel pipe. Thicker pipes are going to be used as they should not fail during bending. The dimensions of steel pipes are equal to the steel reinforcing bars normally used in the structures.

II. MATERIAL PROPERTIES

Cement

Physical properties of OPC Cement (53 grade)

S.No	Properties	Result
1.	Specific gravity	3.15
2.	Initial setting time	33min
3.	Final setting time	7 hr 5 min

Fine aggregate

The River sand conforming to the code IS 383-1970 .physical properties of fine aggregate are shown in table.

Physical properties of Fine aggregate

S.No	Properties	Result
1.	Specific gravity	2.7
2.	Fineness modulus	3.087

Coarse aggregate

The Physical properties of coarse aggregate are shown in table.

Physical properties of Coarse aggregate.

S.No	Properties	Result

1.	Specific gravity	2.75
2.	Fineness modulus	6.4
3.	Bulk density	2886kg/m^3

Crumb rubber

Crumb rubber is the name given to any material derived by reducing scrap tires or other rubber into uniform granules with the inherent reinforcing materials such as steel and fibre removed along with any other type of inert contaminants such as dust, glass, or rock. Generally, crumb rubber is produced by reducing scrap tires down to sizes ranging from 3/8" to 40 mesh particles and removing 99 % or more of the steel and fabric from the scrap tires. There are several processes for manufacturing crumb rubber. Two of the most common are ambient grinding and cryogenic processing.

Specific gravity of Crumb rubber

S.No	Properties	Result
1.	Specific gravity	1.79

Mix proportion

A mix design for M30 grade of concrete as per IS 456-2000.The water to cement ratio in the production of concrete is taken as 0.45 weight % of cement. The value of mix proportion shown in table.

III. EXPERIMENTAL INVESTIGATION

Mix Proportion Value

From the mix design, the ratio 1:1.86:2.55 were used to cast the concrete cubes with moulds. Here hand mixing was done with the coarse aggregate, fine aggregate and cement. The cubes of dimension 150mm x150mm x150mm were cast for mix design. The water cement ratio was fixed to 0.45.The specimen was left in the mould for 24 hours and then it is de-moulded. . Identification marks were made on the exposed face of specimen and immersed in curing tank. The specimen were taken out from the curing after 28 days of curing and tested for compressive strength test.

Cement (Kg/M^3)	Fine Aggregate(Kg/M^3)	Coarse Aggregate(Kg/M^3)	Water (Kg/M^3)
413.33	770.089	1054.024	186
1	1.86	2.55	0.45

Compressive strength of concrete

The purpose of compression test is to determine the crushing strength of hardened.

Ultimate Load (KN)	Compressive Strength (N/mm^2)	Average Value (N/mm^2)
744	33.07	33.05
723	32.13	
764	33.96	

concrete. The average reading of 3 specimens was recorded as the strength at respective age of concrete. The compressive strength test is carried out in compression testing machine of 3000 KN capacity. The test measures concrete strength in the hardened state. The compressive strength is a measure of the concrete's ability to resist loads which tend to crush it. Compressive strength was calculated using the following formula. fck = Ultimate load (N) / Area Of the specimen(mm^2).

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VI. CONCLUSION

The experimental work is done till the casting and testing of a cube. The beam is cast and kept for a curing at 28 days.After that the beam has to be tested to determine the flexural strength of a beam.

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