International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 06 | June-2016 www.irjet.net p-ISSN: 2395-0072

An Experimental Study On Partial Replacement Of Coarse Aggregate By crumb Rubber

T.Ishwariya[1]

[1]*Student, Structural Engineering of Agni college of Technology, Tamil adu, India*

Abstract - *This Waste - Tyre rubber is the significant environmental problems worldwide. With the increase in the automobile production, large amounts of waste tyre need to be disposed. Due the rapid depletion of available sites for waste disposal, many countries banned the disposal of waste tyre rubber in landfills. Research had been in progress for long time to find alternatives to the waste tyre disposal. Among these alternatives is the recycling of waste-tyre rubber. Recycled waste tyre rubber is a most widely used method. Recycle wasted Tyre Rubber is a promising material in the construction industry due to its light weight, elasticity energy absorption, sound and heat insulating properties. In this the density and compressive strength of concrete utilizing waste tyre rubber has been investigated. Recycled waste tyre rubber has been used in this study to replace the coarse aggregate by weight of 20%. The results shows that although, there was a significant reduction in the compressive strength of concrete utilizing waste tyre rubber than normal concrete, concrete utilizing waste tyre rubber demonstrated a ductile, plastic failure rather than brittle failure.*

In this study we use to find out the compressive strength of concrete by the replacement of coarse aggregate by crumb rubber in normal concrete in grade of M25 and M30.Finally a comparative study is made among the normal conventional beam over to the rubcrete beam.

***Key Words*: Rubcrete ,Crumb rubber, Compressive strength, Waste tyre rubber.**

1.INTRODUCTION

1.1 Waste Tyre rubber (CRUMB RUBBER)

Management of waste-tyre rubber is very difficult for municipalities to handle because the waste tyre rubber is not easily biodegradable even after long-period of landfill treatment. However, recycling of waste tyre rubber is an alternative.

Recycled waste-tyre rubber have been used in different application. It has been used as a fuel for cement kiln, as feedstock for making carbon black, and as artificial reefs in marine environment. It has also been used as a playground matt, erosion control, highway crash barriers, guard rail posts, noise barriers, and in asphalt pavement mixtures. In the last past two decades, research had been performed to study the availability of using waste tyre rubber in concrete mixes.

Recycled waste tyre rubber is a promising material in the construction industry due to its lightweight, elasticity, energy absorption, sound and heat insulating properties. In this paper the compressive strength of concrete utilizing waster tyre rubber has been investigated. Recycled waste tyre rubber has been used in this study to replace the fine and course aggregate by weight using different percentages. But in this project only course aggregate can be replace.

figure 1(Crumb Rubber)

1.2 RUBCRETE

Rubcrete is combination of concrete and rubber. In concrete replacement of material like fine aggregate and coarse aggregate. In replacing the fine aggregate maens crumb rubber may be powder form and replacing the coarse aggregate means it will in solid form depends on size we required.

2. MATERIAL USED

2.1.COARSE AGGREGATE: 20mm nominal size are used confirming to IS 383.

2.2.FINE AGGREGATE: Sand confirming with IS 383.

2.3.CEMENT: 53 Grade cement confirming with IS:8118 has been used.

2.4.WATER: Portable clean water has been used for concrete construction and curing confirming to IS : 10262.

2.5.CRUMB RUBBER: The crumb rubber normally used in the size of 4.75mm to0.075mm.

3. EXPERIMENTAL INVESTIGATION

There were two type of mixing can done in this project one is without crumb rubber according to the indian standard and one is with crumb rubber. the second concrete mix was replaced the coarse aggregate with 20% of crumb rubber for M25 and M30 grade of concrete. The mix proporsion of ingredients for $1m^3$ of concrete and big size beam are tabulated in table 1 and table 2 respectively.

3.1 PREPARATION AND TESTING OF SPECIMEN

In order to prepare the recycled crumb rubber concrete specimen, coarse aggregate can be replaced by 20% for M25and M30 grade of concrete. The sand used was cleaned from the impurities and use for mixing of concrete. For each mix, cubes 150mm*150mm*150mm, and large size beams of 1.2m*0.23m*0.23m were prepared. All the specimens was fabricated and cured in water for

7days and 28 days in according to the indian standard 10262.After the 24 hours of casting cubes and beams taken out from the mould and pored in the water tank for curing. All the tests were contact at the "AGNI COLLEGE OF TECHNOLOGY,CHENNAI". The load was applied until the failure and crushing load was noted.

Compressive strength=Crushing load/Effective area

Totally 10 cubes and 4 beams can be prepared M25 and M30 grade of concrete for this study with 20% replacement coarse aggregate by crumb rubber.

3.2 COMPRESSIVE STRENGTH

The compressive strength of specimens for M25 and M30 grade of concrete with replaced of coarse aggregate by crumb rubber. The casted cubes can cured for 7days and 28 days.Then the cubes can tested in the compression testing machine.

The compression test result can be list below in the table no 3.

The beams can be tested in the loading frame because of large in size(1.2*0.23*0.23m)and the beam result will be ploted in graph. The test result values can be listed in the table no 4

Table -1: Table for mix proportion of $1m^3$

Table for mix proportion of $1m^3$				
Constituent	M25		M30	
	Weight/Volume	Mix Proportion	Weight/Volume	Mix Proportion
Cement	426	1	518	1
Fine Aggregate	645.5	1.51	636.97	1.22
Coarse Aggregate	946.88	2.22	1001.68	1.44
Water	192	0.45	144	0.37
Crumb Rubber	236.72	0.55	250.72	0.48

Table -2: Table for mix proportion of beam

Table for mix proportion of beam					
Constituent		M25		M30	
		Weight/Volume	Mix Proportion	Weight/Volume	Mix Proportion
Cement		426	27.04	518	32.88
Fine Aggregate		645.5	40.97	636.97	40.43
Coarse Aggregate		1183.6	75.13	1251.68	79.45
Water		192	12.18	144	9.44
Crumb Rubber	-	-	-	-	-
	20%	236.72	15.02	250.72	15.91

Figure-2 compressive strength testing machine

Figure-3 loading frame

Table-3 Compressive Strength of cubes

Table for compressive strength of cubes				
S.NO	Result of M25 and M30 grade concrete average compressive strength(N/Mm²)			
	M25		M30	
	7 days	28days	7days	28days
1	12	22	18	26
2	12	26	16	30
3	13	28	17	26
4	14	23	15	28
5	16	25	14	22

4. RESULT

The test result shows the greater potential for using the crumb rubber in the concrete mix. the lower unit weight meets the criteria of light weight concrete. for M25and M30 grade of concrete when the replacement of coarse aggregate by crumb rubber up to 20% means the compressive strength of concrete can be increased.

5. CONCLUSIONS

In the above results concluded the following point

1.When the percentage of crumb rubber can be increase means compressive strength of the concrete will be decrease.

2.Rubcrete shows the ability of absorving the large amount energy and did not show the brittile failure under compression loads.

3.This type of rubcrete is used for light weight construction.

4.Finally replacement of crumb rubber in concrete is safety to the environment and also used to reduce the soil pollution because of dumbing the waste tyre in the dumbing site.

Table-4 Compressive Strength of beam

Compressive test result for beam				
Discription	Result of M25 and M30 grade concrete average compressive strength(N/Mm²)			
	M25		M30	
	ConvenTional	Rubcrete	Conventiona l	RubCrete
Load (tons)	21	21	26	28
	22	24	28	23
Deflection(m m)	10.2	7.6	9.3	8.9
	11.3	9.23	13.45	15.34

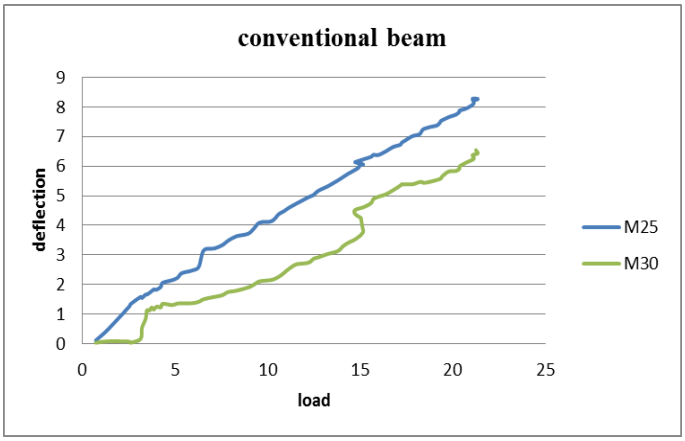

Chart-1 Graph of conventional beam

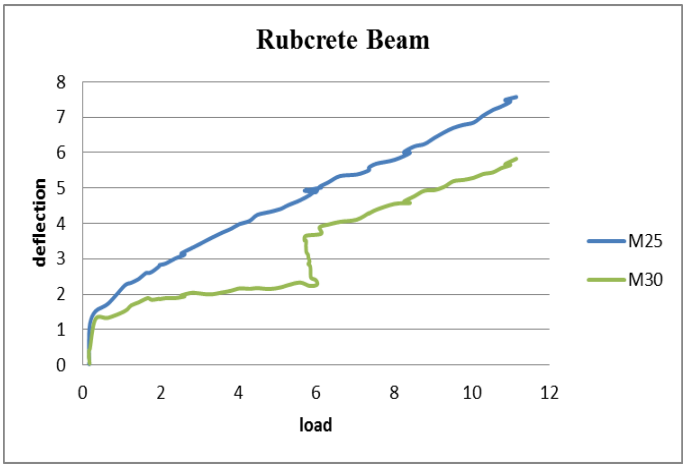

Chart-2 Graph of rubcrete beam

REFERENCE

1.Mohammed Reza Sahrabi, Mohammed karbalaie,(2004)' An Experimental Study on compressive strength of concrete containing crumb rubber' International Journal of Civil and Environmental Engineering, Vol. 11, No. 3, pp. 23 – 27.
2.Harpalsinh Raol. Abhijit Sinh Parmar, Dhaval Patel, Jitendra Jasswah,(2014)'Effect of the use of Crumb rubber in Conventional Bitumen on the marshall Stability value' International Journal of Research in Engineering and Technology, Vol. 3, Issue .1, pp. 209 – 212.
3.NNabin Rana Magar,(2014)'Study on the performance of Crumb rubber modified Bitumen by varying the size of Crumb rubber' International Journal of Engineering Trends and Technology, Vol. 14, No.2, pp. 50 – 56.
4.El-Gammel.A, A.K.Abdel-Gawad, Y.El Sharbini ,A.Shalaby,(2010)'Compressive Strength of Concrete utilizing Waste Tyre Rubber' International Journal of Engineering Trends and Technology,1 (1), pp. 96 – 99.
5.Yogender Antil, Er. Vivek Verma, Er.Bhupinder Singh, (2014)'Rubberized Concrete made with Crumb Rubber' International Journal of Science and Research, Vol. 3, Issue 5, pp. 1481 – 1483.
6.Bradley J. Putman, Serji N. Amirshanian, (2006)'Crumb Rubber modification of Binders Interaction and Practice Effect'Road materials and Pavement Design, Vol. 10, No. 10, pp. 1 – 23.
7.Nithya .P , Portchejianl,(2014)'Behaviour of Partial Replacement of Fine Aggregate with Crumb Rubber'International Journal for Structural and Civil Engineering Research, Vol. 3, No. 3, pp. 63 – 72.
8. Shandelle Hosein, Chris Maharaja, Rean MaharajaDimpleSingh-Adebarali,(2013)'Effect of Particle Size & Concentration of Crumb Rubber on the Rutting and Fatigue Cracking Resistance of Trinided Lake Asphalt and Petrotem Bitumen' International Journal of Arts & Science, 6(4), pp.321 – 335.
9.Nuha S. Mashaan, Mohammed Rehan Karim,(2012) 'Using Tyre Rubber as a modifier in Asphalt to improve again Resistance' International Journal of Nano and Material Science,1(2) , pp. 68 – 73.
10.Bradley J. Putman, Jesse U. Thomson, Serjin,(2002)'High Temperature Properties of Crumb Rubber Modified Binder'Asphalt Rubber Technology, pp. 1 – 9.
11.Alan Richard Son, Kathryn Coventry, Eli Dias,(2015)'Rubber Crumb used in Concrete to provide Freeze Thaw Protection'Proceeding of EURO ELECS, pp. 1 - 12.
12.Shetty. M. S.'Concrete Technology', S. Chand & Company Ltd., New Delhi.
13.IS: 456:2000 "Code of practice for plain and reinforcement concrete", Bureau of Indian Standards, New Delhi.
14.IS: 10262:2009 'concrete mix proportioning', Bureau of Indian Standards, New Delhi.