

Investigation on Workability Of M20 Grade Concrete With Partial Replacement Of Crumb Rubber And M Sand For Fine Aggregates And Flyash For Cement

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Abstract: Concrete has a key role in construction. Study focus on workability of the concrete, Fine Aggregate is partially filled with crumb rubber and M sand, a part of cement is replaced with fly ash. In this investigation the crumb rubber is utilised in place of fine aggregate. The scrap tyre treatment is currently a serious issue against environmental pollution. India stand in forth position in the entire world for rubber tyre market world after china, Europe and the US. Fly ash and M sand is an industrial waste which is included in the concrete. In this investigation workability of concrete is conducted on M20 grade concrete by replacing river side sand with the M sand and crumb rubber at percentage of replacements 0 to 20% at an regular interval of 5%and Compare the results obtained by the modified concrete with the normal concrete.

1. INTRODUCTION

In construction industry, concrete is basic designing constituent. it is a mix of cement, fine aggregate , coarse aggregate and water in order to improve workability of the concrete along with supplementary materials like fly ash, manufactured sand is used in this investigation. With the development of the modern society aftermath of industrial revolution, the mobility with in automobile sector got momentum. Tyre rubber waste represents major environmental of increasing significance. The extent of present exploration is the study of rubber waste created from the left over tyres and probability of utilising waste tyre rubber as the partial substitution of the fine aggregate in order to generate rubberized concrete, and 3days compression strength of the concrete,[1] The coarse aggregate is replaced with chipped tyres with 5%, 7.5% and 10%. and likewise the same replacement ratios of powder tyre Crump is called as Crump Rubber(CR) with cement. the reduction in compressive strength[2]replacing of 10%and 30%RCA,5%and10%CR and 1%and2% fibre content, As RCA,CR and fibre content increased, workability in terms of slump is reduced[3]different percentages of crumb rubber as a partial replacement of both fine and coarse aggregate by (0,10,20,and 30%)up to 10% CR compressive strength is improved.[4]replacing of river sand with manufactured sand of geo polymer concrete (0 to 100%) increase in compression strength.[5]Use of crump rubber reduce the short term strength properties

whereas use of fly ash and high water reducing admixtures improved the long term strengths. [7] Workability of concrete with 10% crump rubber is reduced slightly when compared with conventional concrete. In this investigation,20 % of cement is replaced with fly ash and fine aggregate with manufactured sand and crumb rubber.

2. MATERIALS

2.1 Ordinary Portland cement

In this study, 53 grades ordinary Portland cement is used. The cement used in trail work is fresh and doesn't contain any lumps. Testing of cement is carried out as per IS:12269-1987.

Table1: Properties of cement used for the work

PROPERTY	TEST RESULT
Normal Consistency	32%
Specific Gravity	3.15
Initial Setting Time	56 Minutes
Final Setting Time	270 Minutes
Compressive strength for 28days	54 Mpa

2.2 Fly ash

In this experimental work class F fly ash is used. Which is extracted from the thermal power plant (Vijayawada).Class F fly ash has high alumina, silica and higher Loss of ignition. It is highly pozzolanic in

nature, reacts with excess lime generated in the hydration of cement.

2.3 Fine Aggregate

In this work manufactured sand IS: 383-1970, and crumb rubber is used

2.4 Crumb rubber

Waste rubber tyre are made into rubber sheet, sheet are sent to special mills to make them small particles. In a this process, particles generated are with more irregularity in the range of 4.75mm-425microns. where average size of 2mm, which is obtained from the Priyanka rubber industry Hyderabad.



Fig.1 Crumb Rubber

2.5 M Sand or Manufactured sand

Waste obtained from the crushing plants, particle size less than 4.75 mm to 150mm. As it is thrown as waste, can be used as a supplement, collected from the local plants.

2.6 Coarse aggregate

20mm crushed angular aggregate used in this experiment study. It is collected from crushing plants, local plants available nearby.

2.7 Super plasticizer

To improve workability of concrete, Sulphonated Naphthalene Formaldehyde SNF is used.

3. EXPERIMENTAL INVESTIGATION

3.1. Mix proportion

To carry out this experimental work, grade of concrete is M20. The mix proportion for M20 grade is grade is considered as 1:1.73:2.83, cement, fine aggregate and coarse aggregate respectively and 0.5 is water cement ratio. The mix proportion code is IS456-2000, IS10262-2006.

3.2. Casting and Demoulding

Weighing all the materials in the electronic meter. Batching is performed for each combinations. Mixing is

done by using mixture for 3-4 minutes. First the cube moulds are clean well and apply oil to the inner surface. Then fill moulds with concrete prepared in three layers and compact each layer with the tamping rod. The concrete is undisturbed for 24 hrs to set the mix's are identified by marking as M1, M2, M3, M4, M5, After 24 hrs. The moulds are demoulded and are cured with water.

3.3. Workability Test

The workability test of the concrete is done as per (IS-1199-1959) by preparing the required concrete according to the mix, the slump cone is oiled the inner surface of the cone and arranged on the flat surface, then slump cone is filled with concrete in three layers and slowly remove the cone, observed slump as true, shear, collapse slumps.



Fig.2 slump cone test for 20% crumb rubber

3.4. Compressive Strength of Concrete:

100mm cube are prepared, to find the compressive strength of M 20 grade of concrete. Three cubes are casted to find strength concrete after 3 days.



Fig.3 Different cubes with different % of crumb rubber



Fig.4 Testing of Compressive strength for 20% crumb rubber



Fig.5 cubes after compressive strength test, 15% Crumb rubber

3.5. Mix Proportion of Concrete

The mix Proportion used for M20 grade concrete with the ratio of 1:1.73:2.83. The mix is designed as per IS10262-2006, IS456-2000.

Table.2 MIX PERCENTAGES

MIX	OPC CEMENT Percentage	FLYASH Percentage	MSAND Percentage	CRUMB RUBBER Percentage
Mix1	80	20	100	0
Mix2	80	20	95	5
Mix3	80	20	90	10
Mix4	80	20	85	15
Mix5	80	20	80	20

4. TEST RESULTS

4.1 Workability test: The workability of M20 fresh concrete for varies mixes is done by slump cone is shown in the table below.

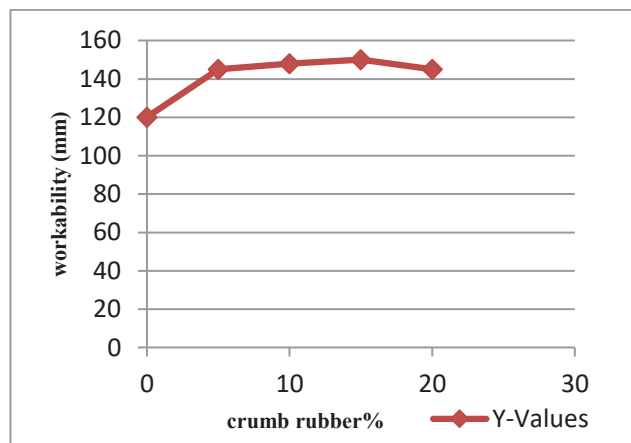


Fig.6 The graph for crumb rubber percentage and workability

4.2 Compressive strength test

The compression test is done in this investigation is for 3 days, which is shown in the table

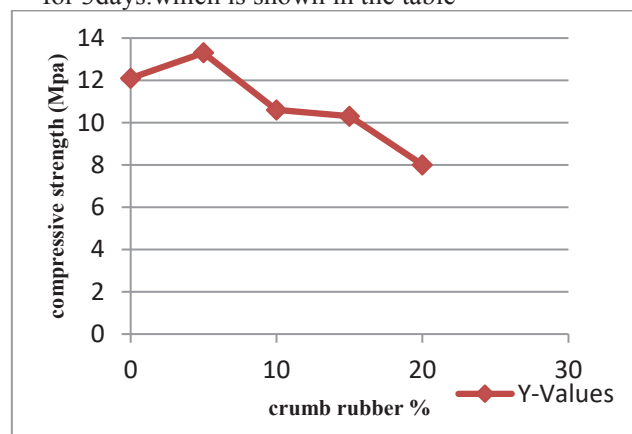


Fig.7 The graph for crumb rubber percentage and compressive strength

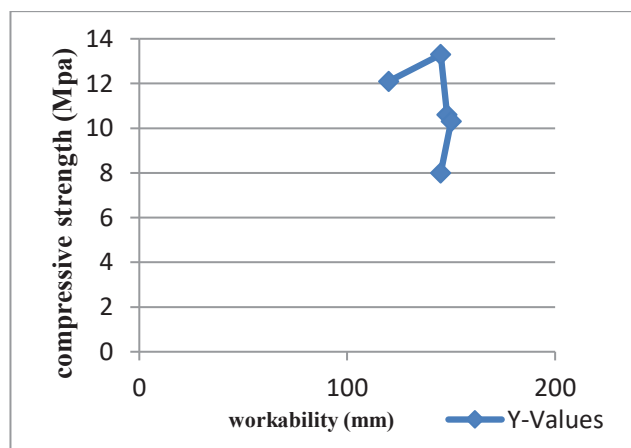


Fig.8 The graph between workability and compressive strength

5. CONCLUSION

The conclusions of the experimental investigation are mentioned below:

1. The workability of the concrete(M20) increased up to 15% replacement of crumb rubber, is slightly reduces for the 20% replacement of the CR.

2. The compressive strength of the above mixes increased for 3days strength for M20 grade concrete 45-50%, the compressive strength for this mixes increases up to 15% then after it is observed a minor down fall in compressive strength.

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