EXPERIMENTAL STUDIES ON PERVIOUS CONCRETE BY USING WASTE TIRES RUBBER AS PARTIAL REPLACEMENT OF COARSE AGGREGATE

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***Abstract*: Every year enormous quantity of waste rubber tires generated in our world due to the increasing of motorcycle user. Therefore, recycling of the waste rubber tire is become mandatory. The aim of the present study is evaluating the "Experimental Studies on Pervious Concrete by Partial Replacement of Coarse Aggregates with Waste Rubber" The primary variables were considered for the pre-treated (sand coated) rubber shreds as replacement for coarse aggregates. Physical properties test was carried out for coarse aggregate, fine aggregate, rubber shreds and cement. Inclusion of rubber content in to the concrete such as 3%, 6% and 9%. Slump test and compaction factor test has conducted for controlled pervious concrete and various mix of pervious concrete. Casting of cubes specimens for controlled concrete and different ratio of rubberized pervious concrete specimens. Size of the cubes specimens is (150x150x150mm). 10 number of cube specimens were cast in pervious rubberized concrete, from that cast 3 no's in control rubberized pervious concrete ,3 no's in 3% of rubberized concrete specimens, 3no's in 6% of rubberized concrete specimens and 3no's in 9% of rubberized concrete specimens of the present research work. Compression test has been conducted for pervious rubberized concrete cubes. Finally compare the compressive strength results of 2.5%,5%&7.5% in its control pervious rubberized concrete.**

***Keywords*: pervious concrete, waste tire rubber chips, compressive strength and spilt tensile strength.**

I. INTRODUCTION

Pervious concrete which is also known as no fines, porous, gap graded, and permeable concrete and enhance porosity concrete has been found to be a reliable storm water management tool. By definition, pervious concrete is a mixture of gravel or granite stone, cement, water, little to no sand (fine aggregate). When pervious concrete is used for paving, the open cell structures allow storm water to filter through the pavement and into the underlying soils. In other words, pervious concrete helps in protecting the surface of the pavement and its environment. Pervious concrete has the same basic constituents as conventional concrete that is 15% -30% of its volume consists of interconnected void network, which allows water to pass through the concrete. High range water reducer and thickening agent are introduced in the concrete to improve its strength and workability. Pervious concrete can be used in a wide range of applications, although its primary use in pavements which are in: residual roads, alleys and driveways, low volume pavements, low water crossings, sidewalks and pathways, parking areas, tennis courts, slope stabilization, sub-base for conventional concrete pavements etc. Permeability to water depicted by pervious concrete tends to range from 1.4mm/s to 12.2mm/s while compressive strength ranges between 2.8 MPa to 28 MPa. Pervious concrete referred to as enhanced porosity concrete, no fine concrete and porous concrete is a novel type of concrete which is rapidly becoming popular in majority of the countries due to its use in sustainable construction. This is attributed to its capability of infiltrating large water volume with a short time. The known porosity of pervious concrete ranges from 15% to 30%. Even though pervious concrete is high permeable and less strong than Pervious concrete is a special type of concrete which is also known as porous, no fines or permeable concrete.

II. OBJECTIVES

The objectives of this study are as follows

I. To optimize the usage with pervious concrete.
II. To optimize the usage of coarse aggregate with waste tire rubber.
III. To evaluate the compressive and spilt tensile strength of concrete.

III. MATERIALS

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.14
2	Fineness	9.85%

3.1waste Tyres Rubber:

Scarp types are being generated and accumulated in large volumes causing an increasing threat to the environment. In order to eliminate the negative effect of these depositions and in terms of sustainable development there is great interest in the recycling of

these non-hazardous solid wastes. The potential of using rubber from worn tyres in many civil engineering works has been studied for more than 30 years. Applications where tyres can be used and where the addition of tyre rubber has proven to be effective in protecting the environment and conserving natural resources include the production of cement mixtures, road construction and geotechnical works. Recycling of tyres in the applications mentioned above represents a suitable means of disposal for both environmental and economic reasons.

3.2 Pervious Concrete:

Pervious concrete consists of cement, coarse aggregate (size should be 9.5 mm to 12.5 mm) and water with little to no fine aggregates. The addition of a small amount of sand will increase the strength. The mixture has a water-to-cement ratio of 0.28 to 0.40 with a void content of 15 to 25 percent. The correct quantity of water in the concrete is critical. A low water to cement ratio will increase the strength of the concrete, but too little water may cause surface failure. Proper water content gives the mixture a wet-metallic appearance. As this concrete is sensitive to water content, the mixture should be field checked. Entrained air may be measured by a Rapid Air system, where the concrete is stained black and sections are analysed.

IV. EXPERIMENTAL INVESTIGATIONS

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2.

Table2: Compressive strength of concrete replacement of coarse aggregate with waste tire rubber in pervious concrete

Sl.no	REPLACEMENT OF C.A WITH RUBBER TYRE IN PERVIOUS CONCRETE	28 days N/mm^2	56days N/mm^2	90 days N/mm^2
1	NPC	23.24	25.32	27.16
2	3%	25.75	28.04	30.12
3	6%	27.80	30.29	2.49
4	**9%**	**31.03**	**33.82**	**36.39**

4.2 Split Tensile strength results

At the age of 7 and 28days, the cylindrical specimens (150mm diameter x 300mm height) were tested for evaluating the split tensile strength. The experiment is performed by putting a cylindrical sample horizontally between a compression testing machine loading surface and the load is applied until the cylinder fails along the vertical diameter.

Table5:Split Tensile strength of concrete replacement of coarse aggregate with waste tire rubber in pervious concrete

Sl.no	REPLACEMENT OF C.A WITH RUBBER TYRE IN PERVIOUS CONCRETE	28days N/mm^2	56days(N/mm^2)	90days(N/mm^2)
1	NPC	2.29	2.49	2.67
2	3%	2.56	2.78	2.99
3	6%	2.72	2.95	3.17
4	**9%**	**3.09**	**3.36**	**3.61**

V. CONCLUSION

In this study, pervious concrete waste tire rubber as replacement of coarse aggregate. Rubber tires varied different percentages of NPC3%,6%9%

i. At 9% replacement of coarse aggregate by waste tire rubbers the achieved compressive strength of concrete is 31.03N/mm^{2}for28days,33.82 N/mm^2 for 56 days &36.39 N/mm^2 for 90 days.

ii. At 9% replacement of coarse aggregate by waste tire rubbers the achieved split tensile strength of concrete is 3.09N/mm^{2}for28days ,3.36 N/mm2 for 56 days &3.61 N/mm2 for 90 days.

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