EXPERIMENTAL INVESTIGATION ON PARTIALLY REPLACEMENT OF FLUORESCENT LAMP POWDER WITH FINE AGGREGATE AND RUBBER WITH COARSE AGGREGATE

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Abstract:*At prescent paver block is used in outdoor versatility application and also it is used in street road and other construction places. Paver block has low cost maintenance and easily replace with a newer one at the time of breakage. The quality of concrete used to make paver block may be the major issue, so that the durability of paver block depends measuredly on quality of concrete, thus an attempt is made by partial replacement of fluorescent lamp powder & rubber chips as fine aggregate and coarse aggregate respectively affect the properties of paver blocks. This research study presents the information about the development of the paver blocks by fluorescent lamp powder & rubber chips.*

Keywords:pavement block , fluorescent lamp powder , rubber chips ,compressive strength ,economical**.**

1. INTRODUCTION

Pavement blocks are the modern day solution for low cost outdoor application. Paver block is solid, unreinforced pre-cast cement concrete paving units used in the surface course of pavement. They are high strength concrete precast elements in various shapes, sizes& colours to suit the imagination of landscape architects and nature's essence. By improving its compressive strength it can be used in heavy traffic area also. Paver blocks are manufactured concrete product that is individually placed in a variety of patterns and shapes as per the requirement. They do not absorb water and can be placed so that excess water is taken away from the garden and patio area rather than over-saturating it. This type of pavement will absorb stress, such as small earthquakes, freezes and thaws, and slight ground erosion by flexing. So that, they do not easily crack, break or buckle like pouring asphalt or poured concrete. Fluorescent lamp powder & rubber chips are used in the concrete paver block increases resistance to impact/abrasion and greatly improve quality of construction.

Paver block is being adopted extensively in different uses where the conventional construction of pavement using a hot bituminous mix.cement concrete technology is not feasible or desirable. Interlocking concrete block has been extensively used in many countries for quite some time specialized problem solving techniques for providing pavement in areas where conventional types of construction are less durable to many.

Presently all the structures are constructed using concrete as a major construction material. Now we are using river sand for concrete structures which

leads to the unavailability and hence an increase in cost of the river sand than in olden days. In developing countries like India where abundant solidwastes are discharged, these wastes can be used as potential materials or replacement materials in the construction industry. This will have the double advantage of reduction in the cost of construction material and also a means of disposal of waste. It is at this time the above approach is logical, worthy and attributable. The new and alternative building construction materials developed using solid wastes have sample scope for introducing new building components that will reduce to an extent the cost of building materials. Our ultimate aim of the project is: To introduce Fluorescent lamp powder as fine

•aggregate as one of the new material into the concrete.To find out the mix ratio by using Fluorescent lamp

•powder as fine aggregate in concrete to achieve the target mean strength. To solve the environmental problem of disposal.

•huge amount of Waste Fluorescent lamp.

Chemical composition of Portland cement: The raw material in the manufacture of Portland cement consists of lime, silica, alumina and iron oxide. These compounds interact with one another in the kiln to form a series of more complex products. The relative proportions of these compounds for influencing the various properties of cement, rate of cooling and fineness of grinding of compounds are usually regarded as a major constituent of cement. They are listed in table together with their abbreviated symbols.

TABLE 1

COMPOSITION OF PORTLAND CEMENT COMPOUNDS

Name of compound	Normal Percentage of OPC	Average Percentage of OPC
Alumina of clay	5%	3-8%
Slica	22%	17-25%
Lime	62%	60-67%
Iron Oxide	3%	0.5-6%
Magnesia	2%	0.1-4%
Sulpher Trioxide	1%	1-3%
Alkalies	1%	0.2-1%
CalciamSulphate	4%	3-5%

Disposal of waste tyre rubber is one of the major concerns for all over the world. With the increase of automobiles in India from past few years the demand of tyres has gone up very high. As we know light weight concrete is widely used on various architectural works. In India more than 33 million vehicles use roads from 2007 to 2010, about 80 million tyres have hit the roads - these include two, three, four and six wheelers. A typical tyre contains 24-28% of carbon black, 40-48% of natural rubber and 24-36% of synthetic rubber including styrene butadiene rubbers (SBR) and butyl rubber (BR), which all are ingredient used for tyremanufacturing. Worldwide more than 981 million tires are thrown away each and every year and even less than 7% are recycled, 11% are burned for fuel, and 5% are exported. The remaining 77% are sent to landfills, stockpiled, or illegally dumped. That's almost 765 million old tires are wasted every year across the world. Investigations carried out so far reveal that waste tyre rubber chips in concrete is specially suggested for concrete structures located in areas of severe earthquake risk and also for applications submitted to severe forceful actions like railways sleepers. This material can also be used for non-load bearing purposes such as noise diminution barriers. Over 5 billion tons of toxic solid waste materials are produced in US every year. Out of which more than 273 million scrap tyres (around 3.6 million tons) are produced every year. In accumulation to this, about 3 billion tires are stockpiled . The retained automobile tires create fire and health problems. As a solution to the problem of scrap tire disposal, an investigational study was conducted to examine the prospective of using tire chips and crumb rubber as an aggregate in Portland cement concrete . It is assumed that cement acting as a binder mixed with crumb rubber make concrete blocks more flexible and thus, provides smoothness to the surface. At the same time it also provides sufficient strength or minimum required strength to the concrete . The recycle prospective of tire chips as coarse aggregates in pavement concrete by investigating the effects of low and high-volume tire chips on fresh and hardened concrete properties indicated that tire chips can be used replacement of coarse aggregate in concrete pavement mixtures . The use of scrap tyre rubber in the preparation of concrete has been thought as an alternative disposal of such waste to protect the environment.

Existing or commercial concrete is characterized as a composite material with high compressive strength, moderate tensile strength and with a low toughness (Li et al., 2004). It is anticipated that an ideal concrete block for pavement construction should have high tensile strength and high toughness. Therefore, high strength and high toughness concrete has to be developed for block paving. For concrete, it is found that the

higher the strength, the lower the toughness. It is difficult to develop high strength and high toughness concrete without modifications. Owing to the very high toughness of rubber, it is expected that adding rubber aggregate into concrete mixture can increase the toughness of concrete considerably (Toutanji, 1996; Siddique and Naik, 2004; Li et al., 2004). Laboratory tests have shown that the introduction of rubber considerably increase toughness, impact resistance, and plastic deformation of concrete, offering a great potential for it to be used in sound/crash barriers, retaining structures and pavement structures (Eldinet al., 1993; Khatib and Bayomy, 1999; Goulias and Ali, 1998).

2. MATERIAL & MIXES

2.1 MATERIAL USED

A. Cement Portland Cement -53 grade was used for the investigation. It was tested for its physical properties in accordance with Indian Standard specifications.

B. Aggregate Locally available fine and coarse aggregates are used in the investigation. and coarse aggregate sieved to the required quantity of volume to the maximum nominal size of 6mm. Care is taken to arrive the size of coarse aggregate ranging from 4.75 mm to the maximum nominal size of 6mm.

C. Water Potable water available in Concrete and highway laboratory of department of civil engineering is used for mixing the concrete and curing the specimens.

D. Fluorescent Light Tube It is crushed into powder by using single hand tool powder.

E. Rubber is shredded by mechanically and a size about the same as coarse aggregate (6mm).

Preliminary tests are carried as per IS standard on the material used for concrete like specific gravity, fineness, consistency, and initial setting time for cement. For fine and coarse aggregates tests such as sieve analysis, specific gravity, impact value, crushing value and abrasion value (Los Angeles) are conducted as per standards and results are tabulated. The ingredients of concrete such as cement, fine aggregate, coarse aggregate of maximum nominal size of 6mm are weighed accurately using the platform weighing machine. The ingredients are mixed manually and adequate amount of water is added to the constituents of concrete .The mixing is done till to get uniform mix of concrete is obtained.

2.2 MIX PROPORTION

- Grade M25 was suggested by Indian standards for control structure for concrete mix design. The ratio of water cement used was 0.40 . The weight ratio of coarse to fine aggregate of all paving blocks was kept to about 1 :1: 2 throughout the whole experimental works.

Rubber is a fine material with the gradation close to that of the coarse aggregate (Figure1) is produced by mechanical shredding. In this study, one particle sizes of rubber were
used:6 mm as a partial substitute for coarse aggregate in the production of concrete paving block.

(Fig1)

Fluorescent lamp powder is a material which is used as a partial replacement of fine aggregate in ratio 1:1:2 and it is crushed and sieved . It is good enough to replace the fine by fluorescent lamp powder (fig2).

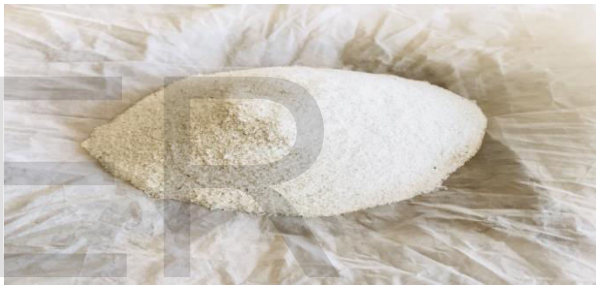

Fig2

3. EXPERIMENTAL TEST RESULTS

3.1 MATERIAL TEST

3.1.1 TEST FOR SPECIFIC GRAVITY AND WATER ABSORPTION:

Using the pyconometer the test for specific gravity and water absorption is done. Observation and calculation C.A&F.A . The specific gravity of coarse aggregate is2.55 and the specific gravity of fine aggregate is 2.279l.

TABLE 2

PROPERTIES OF COARSE AGGREGATE

Sl. No	Properties	Coarse Aggregate
1	Specific Gravity	2.71
2	Crushing Value	21
3	Impact Value	18
4	Abrasion Value	23

TABLE 3
PROPERTIES OF FINE AGGREGATE

Sl. No	Properties	Sand
1.	SPECIFIC GRAVITY	2.59
2.	BULKING EFFECT	36.8%
3.	WATER ABSORPTION	0.5
4.	BULKAGE AT A WATER CONTENT OF	4%

3.1.2 TEST FOR CEMENT:
Standard consistency of cement is defined as that consistency which will permit plunger to penetrate at 33.34from the top of the mould. Standard consistency (%) = (Weight of water added/ Weight of cement) x 100 table for consistency test. Thus the consistency of cement is found to be 40%. percentage of solution added height of penetration(mm) 25 14 30 21 35 27 40 33

3.1.3 INITIAL SETTING TIME:
Place the test block confined in the mould and resting on the non- porous plate, under the rod bearing the needle. Lower the needle gently until it comes in contact with the surface of test block and quick release, allowing it to penetrate into the test block. In the beginning the needle completely pierces the test block. The initial setting time of cement is found to be 38 mints.

3.1.4 SLUMP TEST:
Slump test is the most commonly used method of measuring consistency of concrete which can be employed either in laboratory or at site of work. It does not measure all factors contributing to workability, nor is it always representative of the place ability of the concrete.

3.1.5COMPRESSIVE STRENGTH:
The test results for compressive strength of concrete on 5days with rubber chips4%-8% & Fluorescent lamp powder 14%-16% are added with tabulated as follows. From the 5 days compressive strength tests results, it is observed that the variation in compressive strength is from Fluorescen38.5%-47.2%t lamp powder has achieved a compressive strength which is more than conventional pavement block.

TABLE 4
COMPRESSIVE STRENGTH FOR 5 DAYS

SI. No	Block Size	Average Compressive Strength at 7days ,
1.	0.48Sq,feet	32Mpa

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4. CONCLUSIONS

1. Compressive strength of concrete paving block is affected differently depending on the size and content of crumb rubber.

2. For the effect of crumb rubber content, the test results shown that there was a systematic reduction in the compressive and dry density with the increase in rubber content from 0 % to 30 %.

3. Concrete paving block containing rubber particles seem to provide better skid resistance.

4.It is possible to fabricate block containing rubber and tubelight powder up to 30 %and 14% by coarse aggregate volume using chemical and mineral admixtures, which gives better bonding characteristics to rubber and significantly improves the performance of crumb rubber concrete paving block.

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