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EXPERIMENTAL INVESTIGATION ON RUBBERIZED ASPHALT AGGREGATE CONCRETE

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Abstract - *Nowadays only a small percentage of waste tyres are being land-filled. The recycled tyre rubber is being used in new tyres, in tyre derived fuel, in civil engineering applications and products, in moulded rubber products, in agricultural uses, recreational and sports applications and in rubber modified asphalt applications. The benefits of using rubber modified asphalts are being more widely experienced and recognized, and the incorporation of tyres into asphalt is likely to increase. The technology with much different evidence of success demonstrated by roads built in the last 40 days in the rubberized asphalt mixture obtained through the wet process. By using the rubberized asphalt in concrete as small percentage of replacement of fine aggregate and make it as economical one. It shows several applications in light weight constructions, mainly application for less weight of load carrying structures like pavements, walls, road surfaces and can reduce noise from the structure.*

Key Words: (concrete, rubber, asphalt, fine aggregate, recycled rubbers, less weight.

1. INTRODUCTION

Rubberized asphalt concrete also known as asphalt rubber or just rubberized asphalt is noise reducing pavement material that consists of regular asphalt concrete mixed with crumb rubber made from recycled tires, asphalt rubber is the largest single market for ground rubber in the United States. Over these years, disposal of waste tires has become one of the most serious environmental issues. To alleviate this problem, new green materials are being developed using recycled tire rubber, with one example being rubberised concrete in which rubber crumb replace some of the fine aggregate in concrete.

Fig -1: Rubberized asphalt

2. METHODOLOGY

- Collection of materials
- Testing of materials
- Mix design
- Casting and curing of specimen over 7,14,28 days
- Testing of specimen
- Result

3. MATERIAL COLLECTION

- Concrete - OPC grade 53
- Coarse aggregate - Nominal 20 mm
- Fine aggregate - Rubberized asphalt (50%) and m-sand (50%)
- Mould - cube(150X150X150),
- Cylinder (150 Φ and 300 length) in mm.

Fig -2: Materials

4. TESTING OF MATERIALS

Testing of materials is the important criteria which shows the nature of the material and also summarize that how the material can act into various atmospheric condition. Now we taken the cement with grade of OPC 53 and fine aggregate should be partially taken m-sand, rubberized asphalt with nominal coarse of aggregate.

Table -1: Cement test- field test

S.NO	NAME OF THE TEST	RESULT
1	Temperature inside cement bag	It was cool when our hand is plunged into a

		cement bag and it became warm when hydration takes that inside the cement bag.
2	Smoothness test	When we rubbed the cement in between fingers, it was smooth.
3	Water sinking test	The cement was float when we thrown into water

Table -2: Cement laboratory test

S.NO	NAME OF THE TEST	RESULT
1	Specific gravity test	2.9
2	Consistency test	5 mm
3	Initial setting time	30 min
4	Final setting time	600min

Table -3: Testing on fine aggregate

S.NO	NAME OF THE TEST	RESULT
1	Specific gravity test	2.19
2	Fineness modulus test	5.1%
3	Site slit test	15%

Table -4: Testing on coarse aggregate

S.NO	NAME OF THE TEST	RESULT
1	Specific gravity test	2.8
2	Water absorption	3 %
3	Impact test	18.06 %
4	Crushing test	17.15

5. MIX DESIGN

Mix design can be defined as the selection of suitable ingredients of concrete and determining their relative proportions with the object of producing concrete of certain minimum strength and durability as economical as possible.

Table -5: Mix design

DESCRIP -TION	w/c (Kg/ m3)	CEMEN T (Kg/m 3)	FINE AGGREG ATE (Kg/m3)	COARSE AGGREGATE (Kg/m3)
Quantity (kg)	186	306	340	700
ratio	0.5	1	1.16	2.2

6. CASTING AND CURING OF SPECIMEN

The standard size of cube specimens, cylinder specimens are 150x150x150 mm and 150Φ and 300 mm length. Cubes, cylinder were tested for their compressive strength. Inner sides of the each mould were coated with one coat of shuttering oil for de-moulding the specimen easily. The design mix concrete as well as prepared and filled with moulds in layer by layer, with a thickness of 5cm. each layer was compacted manually by using bullet headed tamping rod. Top layer was finished and levelled uniformly by using trowel to coincides with top level of mould. After 24 hours the casted specimens were de-moulded and then immersed in water tub for 24 hours, the casted specimen curing upto 28 days. The water for curing should be tested every 7 days and the temperature of the must be at 27+-2°c.

Fig -3: Cube casting

Fig -4: Curing of concrete cube

7. TESTING OF SPECIMENS

There are various steps could be followed such as

- Remove the specimen from the water after specified curing time and wipe out excess water from the surface.
- Take the dimensions of the specimen.
- Clean the bearing surface of the testing machine.
- Place the specimen in the machine in such a manner that the load shall be applied to the opposite sides of the cube cast.

- Align the specimen centrally on the base plate of the machine.

Fig -5: Cube testing

Fig -6: Cylinder testing

8. RESULT

The specimen can be tested over following days as 7,14,28 days. The compressive strength of the specimen at various days can be plotted as table shown in below . It shows the equal strength when fully using sand as a fine aggregate.

Table -6: Percentage of compressive strength

S.NO	CURING PERIOD	COMPRESSIVE STRENGTH (%)
1	7 DAYS	68
2	14 DAYS	84
3	28 DAYS	96

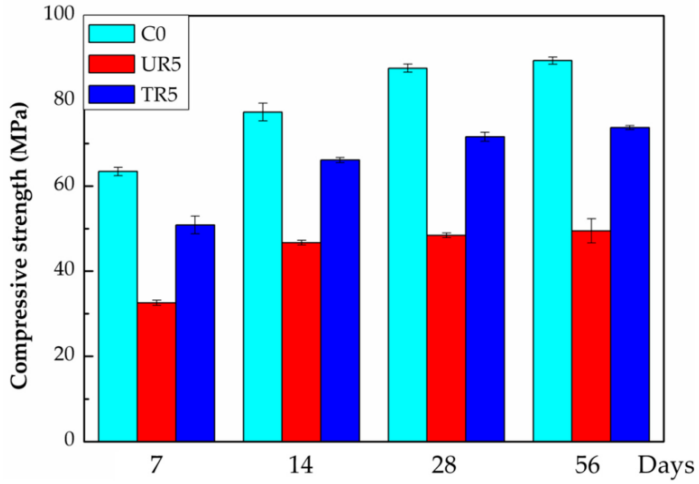

Chart -1: Compressive strength of concrete using rubberized asphalt

9. CONCLUSIONS

From the laboratory study carried out to evaluate the performance of recycled asphalts as coarse aggregate and waste tyre in concrete the following main reasons are recycled asphalt are lower specific gravity and waste absorption than the natural aggregates.

The crushing and impact value of test as prescribes in BS812 for assessing the strength of aggregate should a more appropriate assessing measure is required. RAAC concrete is workable is same comparing with corresponding concrete produced with conventional aggregate. Recycled tyre has lower specific gravity and has no water absorption. The compressive and flexural strength of concrete produced with recycled asphalt as coarse aggregates were found those made from natural aggregates. The strength of the RAAC concrete is based on the bond strength of asphalt mortar coating on the aggregates. The maximum compressive strength of the concrete that can be produce by using recycled asphalt aggregates as coarse aggregates is approximately 25 MPA.
On the basis of the investigations.it is apparent that recycling of waste asphalt aggregate for concrete aggregate is feasible and may become a vital and routine process for the generation of aggregates for middle and low strength concrete.

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