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EXPERIMENTAL INVESTIGATIONS ON ECO FRIENDLY CONCRETE

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ABSTRACT: The rapid Urbanization and Industrialization everywhere in the world has resulted in big deposition of Plastic waste and Waste Tyre Rubber. This waste can be applied below right condition to reduce the Cement content material in Concrete. M30 grade conventional concrete is used for maximum of the constructional works. The strength of these concrete consequences has as compared with concrete obtained of Plastic waste and Waste Tyre Rubber various from 0% to 20%. Experimental investigations constituted of checking out bodily requirements of coarse aggregates, fine aggregates, cement and the modifier waste plastic and waste tyre rubber. M30 concrete layout mix taken into consideration as in line with IS 10262-1982. These tests revealed that by using including Waste plastics and rubber as partial alternative in fine aggregate and Coarse aggregate by means of volume, the strength of concrete reduced. The cube strengths had been decreased as the percentage replacement multiplied because of their poor bounding properties, with the aid of using Plastic waste and Waste Tyre Rubber as modifier, we can reduce the quantity of coarse aggregate and fine aggregate with the aid of their extent, hence decreasing the cost of construction. The changed cement concrete can be used in the construction of small drainage works and rigid pavement. Effective usage of waste plastics can be accomplished for an amazing motive shielding worldwide surroundings and effective stable waste control.

Key Words: plastic waste, Waste Tyre Rubber, effective stable waste control, compressive strength.

INTRODUCTION

The modified lifestyle and endlessly increasing population has ended in a great upward thrust in the quantity of put up-customer Plastic waste and Waste Tyre Rubber. The worlds annual intake of plastic materials has extended from round 5 million tons and 20 million tonnes inside the Nineteen Fifties to nearly one hundred million tons in recent times, ensuing in a vast boom in the quantity of Plastic waste and Waste Tyre Rubber technology.

Analysts wanted to utilize Plastic waste and Waste Tyre Rubber in type of solid variable in light of the fact that the solid is second most looked for material by means of individuals after water. The utilization of post-buyer Plastic waste and Waste Tyre Rubber in solid won't handiest be its safe transfer strategy however may likewise improve the solid houses like malleable power, substance resistance, drying shrinkage and crawl on snappy and long haul establishment. The plastic waste and waste tyre rubbers are in general utilized in form of powder, aggregates and fibers as a concrete factor. A lot of this paperwork have easy surface and as a result require floor roughening remedy for higher bond characteristics. Use of plastic waste and waste tyre rubbers in concrete is quite a new research location consequently provides a remarkable research capability. The concept to use post-client Plastic waste and Waste Tyre Rubber as concrete aspect will result in its huge extent disposal that is environmentally safe and does no longer pose any health hazard at gift those trials are primarily constrained to laboratory or studies stage. Utilization of put up-customer Plastic waste and Waste Tyre Rubber in concrete as component can solve its disposal troubles to large volume.

REVIEW OF LITERATURE

M.Sivaraja et. al. examined various mechanical properties of concrete specimens made by means of mixing the plastic fibers in concrete. The quantity fraction of waste became various from 0%, 5% to 15%. They studied the effects of addition of plastic fibers obtained from rural waste in the bolstered concrete beam below cyclic loading. K.S.Rebeiz et.al. tested the flexural behavior of concrete produced by means of addition of recycled Plastic waste and Waste Tyre Rubber containing unsaturated polyester resin. Authors additionally expected flexural strength of such beams. Victor C. Li et al carried out an experimental have a look at on mortar, strengthened by means of synthetic fiber with extent fraction up to 3% to examine the impact on workability and discount in drying shrinkage.ACI 304.5R (1991) recommend the use of unsoaked light weight aggregate to avoid absorption of the additives into the light weight aggregate. Delayed addition of super plasticizers will also reduce the problem.O. Kayali, M.N. Haque, B.Zhu reported that by adding some mineral admixtures using higher dosage of cement and super plasticizer and

decreasing the water to cement ratio, make possible to produce somewhat high strength light weight concrete from scoria aggregate.

MATERIALS

Concrete is an artificially engineered material made from a mixture of Portland cement, aggregates (Coarse and fine) and water. It is maximum normally used production fabric inside the world. Its miles robust, reasonably-priced and durable. Portland cement combines with water because of hydration to bond the aggregates together into a stable whole. The materials used inside the gift investigation are cement, fine mixture, coarse combination, water, extremely good plasticizer, plastic wastes and waste tyre rubbers.

Portland cement:

Portland cement is crafted from heating limestone and chalk, combined with silicates. Portland cement holds the aggregates together and is to be had in unique grades and colours. The kind of Portland cement normally to be had in hardware or lumber store is gray in shade. The cement used on this investigation is Orient Gold make, 53-grade Portland, for casting of the cubes, cylinders and prisms. The physical properties of the Portland cement used are given within the below table.

Physical Properties of Cement

S.No	Property	Value
1	Grade	53
2	Specific Gravity	3.1
3	Standard Consistency	32%
4	Initial Setting Time	35 Minutes

Fine Aggregate:

Sand is commonly used as fine aggregate for production of the concrete. The sand have to be sharp to grab the cement onto it. This sharp sand is likewise referred to as brick sand or mortar sand. The grains of sand from pit run sand are commonly too round. Stone dust, a waste product from quarries or stone works also can be introduced to provide concrete, and generally for easy combinations for small scale concrete manufacturing. This stone dust provides energy, and decreases shrinkage on placing, and improves visible appearance of concrete. Limestone (dolomite) or marble dirt is two varieties of dust. For the existing experimental work river sand procured from river is used as fine aggregate. The physical properties of this fine aggregate are as proven in Table.

Physical Properties of Fine Aggregates

S.No	Property	Value
1	Specific Gravity	2.57
2	Fineness modulus	3.36
3	Zone of sand	II

Coarse Aggregate:

Crushed hard granite stone or gravel of size less than 20mm is used as coarse aggregate. Stone adds strength in larger work and additionally controls shrinkage. Stone is cheaper than cement. The coarse aggregate is procured from Renigunta, near Tirupati are used for investigation. The properties of coarse aggregate used are shown in Table

Physical Properties of Coarse Aggregate

S. No	Property	Value
1	Specific Gravity	2.79
2	Fineness Modulus	7.33

Waste plastic:

The word plastic means, the substances which have plasticity and as a result whatever this is finished in a tender state and used in a solid state can be called a plastic. those have two types, one is which may be melted for recycling within the plastic enterprise.Ex: Polyethylene, propylene, polymide, polyoxythylene. And 2nd kind is Thermosetting plastic cannot be melted by using heating due to the Molecular chains are bounded firmly with meshed crosslink. Ex: Phenolic

Waste tyre rubber

The rubber concrete reduces the concrete strength; however, this will be used where M10 and M15 grade concrete is required. With proper blend design, approximately 20 percent density will be reduced in evaluation to govern blend when 30 percentage rubber combination is changed with coarse mixture of manage blend.

Water:

It should be free from impurities and clean. The water is from bore well and is Potable. This water is used for both casting and curing. The temperature of the mixing water was maintained constant.

MIX DESIGN:

In this study, the normal strength concrete of M30 grade is considered. BIS code procedure as per IS: 10262-1982 was followed for finding the mix proportions of all the concrete specimens. The mix proportions is as follows

Mix proportion

Water	Cement	Fine aggregate	Coarse aggregate
186 kg/m^3	404 kg/m^3	586 kg/m^3	1191kg/m^3
0.46	1	1.45	2.95

The replacement of waste plastic and waste tyre rubber in order to fine and coarse aggregate was done according to the volume replacement. For 10% of material replacement, considered 5% waste plastic in the replacement of fine aggregate and 5% waste tyre rubber in the replacement of coarse aggregate.

For this present investigation at every replacement three no. of cubes and three no. of cylinders were need to cast. The scheme of project was as:

MIXING:

The mixing process should be suitable for any concrete to get good results. The exact proportion of every material needs to be considered according to the calculated quantity. For every mix weighing of material was needed. Waste Plastic, waste tyre rubber for blending needed to be taken as per the standard size of fine and coarse aggregate.

S.NO	%OF WASTE PLASTIC REPLACEMENT	% OF WASTE TYRE RUBBER REPLACEMENT	NO. OF CUBES CASTED	NO. OF CYLINDERS CASTED	TOTAL
1	0	0	3	3	6
2	2.5	2.5	3	3	6
3	5	5	3	3	6
4	7.5	7.5	3	3	6
5	10	10	3	3	6

RESULTS AND DISCUSSION:
ON FRESH CONCRETE
SLUMP RESULTS

% OF WASTE PLASTIC AND WASTE TYRE RUBBER REPLACEMENT	SLUMP VALUE (cm)
0	2.5
5	2.7
10	3
15	3.2
20	3.8

COMPACTION FACTOR TEST RESULTS

Compaction factor values

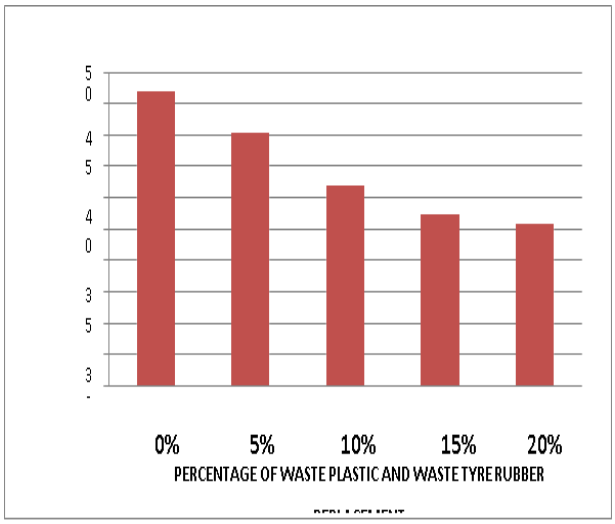
% OF WASTE PLASTIC AND WASTE TYRE RUBBER REPLACEMNET	COMPACTION FACTOR VALUE
0	0.87
5	0.87
10	0.86
15	0.86
20	0.85

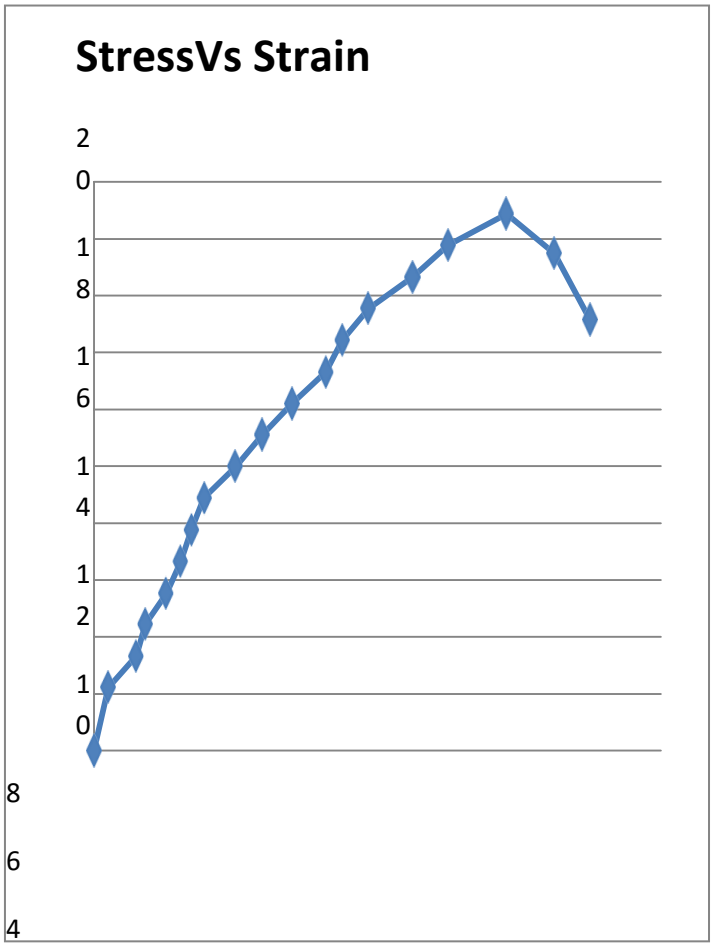
HARDENED CONCRETE:

The compressive strength of cubes are given below in N/mm^2

No. of samples	0% REPLACEMENT	5% REPLACEMENT	10% REPLACEMENT	15% REPLACEMENT	20% REPLACEMENT
Sample 1	47.7	40.5	31.3	26.1	26.1
Sample 2	45.6	41.2	31.3	27.3	25.4
Sample 3	47.9	39.6	33.2	28.1	25.4
Avg	47.01	40.3	31.9	27.2	25.8

Comparison of average compressive strength of cubes Vs percentage replacement of waste plastic and waste tyre rubber





CONCLSIONS:

Based on the above study following conclusions are presented.

1. The cubes specimen cast with 0% replacement of waste plastic and waste tyre rubber have the maximum compressive strength of 47.9 MPa
2. The cubes specimen cast with 5% replacement of waste plastic and waste tyre rubber have the maximum compressive strength of 41.2 MPa
3. The cubes specimen cast with 10% replacement of waste plastic and waste tyre rubber have the maximum compressive strength of 33.2 MPa
4. The cubes specimen cast with 15% replacement of waste plastic and waste tyre rubber have the maximum compressive strength of 28.1 MPa
5. The cubes specimen cast with 20% replacement of waste plastic and waste tyre rubber have the maximum compressive strength of 26.1 MPa

6. In the present investigation it was fond that at 0% replacement of waste plastic and waste tyre rubber the compressive strength is increased and at 20% replacement of waste plastic and waste tyre rubber the compressive strength is decreased.
7. As the percentage replacement of waste plastic and waste tyre rubber increased, it was found that the concrete has poor bonding properties and hence there is a decrease in compressive strength.
8. This type of concrete is being used for non structural works such as pavements and drainages

As the percentage of waste plastic and waste tyre rubber is being increased it is found that there is a decreasing in ultimate stress.

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