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PARTIAL REPLACEMENT OF COAL GREY BY FINE AGGREGATES

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ABSTRACT
In this present journal investigate an attempt is to be partial replacement of coal grey by fine aggregates used in constructions. All over the world sand should be normally available. The new type of construction materials to be provided to high strength and reduce the self-weight of the structure. In Design of light weight concrete are reducing the density and economic benefits achieved if waste materials can be used to replace the fine light weight aggregates. The new sources of aggregates which is produced from industrial wastages. The use of structural grade light weight and helps to construct largest precast units. These materials increasing demand for light weight aggregates and their limited availability of naturally occurring materials. Large scale industries are production of light weight aggregates are started after world war-1. The main forte of this concrete is low density and thermal conductivity. Ultimately there are reduction of dead load, lessen handling cost.

KEYWORDS:, Light weight concrete, Natural aggregate, Fine aggregates, Sand, Industrial waste material.

INTRODUCTION
The use of light weight concrete permitted flexibility, substantial cost savings, reduced dead load, improved flexibility, structural response, longer spans, better fire ratings, thinner sections, smaller size, less reinforcing steel and lower foundations cost. Light weight aggregate is relatively new materials. The aerated concrete is the one types of lightweight concrete. Aerated concrete is also well-known as a cellular concrete. Aerated concrete is divided into two main types according to the method of production. Foamed concrete are produced by injecting preformed stable foam or by adding the special air entraining admixture known as a foaming agent into a base mixed of cement paste or mortar. Light weight concrete is the material used to make the prefabricated walls to make it a unit. The main reason for using light weight concrete for structural purposes is to reduce the self-weight of concrete structures. Compare the density of light weight concrete are approximately 80 percent of normal weight concrete. The density of light weight concrete typically ranges between 1440 and 1840 kg/m^3, whereas these values vary between 2240 and 2400 kg/m^3 for normal weight concrete. Therefore, the most of the important advantages of using light weight concrete are the possible decrease in the construction costs and the reduction in weight of the structure.

OBJECTIVE
Concrete is the commonly used material in the construction industry. The widely used raw material in the concrete are cement, fine aggregate, coarse aggregate and water, of this common river sand is used as fine aggregate. But, now-a-days river sand is at great rate of depletion and expansive, due to which there was a need for an effective alternative. Coal grey, has been found as an economic alternative for sand. In this paper, In this paper investigated the study of Coal grey as partial replacement of fine aggregate in concrete. Mix design has been developed for M25 grade using IS design for conventional concrete and replaced mix. Specimens on cubes, cylinders and beams were prepared for both conventional and 10%, 20%, 50% replacement with coal grey. Tests were conducted on the specimens after 28 days curing to attain its maximum compressive, tensile and flexural strength. Graphs were drawn and results were compared with controlled mix. It is found that the effective replacement of sand with coal grey dust is possible.

REVIEW OF LITERATURE
Hjh Kamsiah Mohd.Ismail indented to study of light weight concrete behaviour the light weight concrete has desirable strength to be an alternative construction material for the industrial buildings. The aerated lightweight

concrete are low for lower density mixture. The foamed light weight concrete is not suitable s non-load bearing wall as the compressive strength is recommended on 27%. The light weight concrete has a low specific gravity compare than ordinary concrete. Aerated concrete are one of the light weight concrete these does not contain coarse aggregate is made by air or other gaseous materials. The light weight concrete are absorbing large amount of water during curing periods. The density of both harden and fresh concrete are normally varies, concrete has to be provide high strength, ductility and water resistance.

M. Iqbal Malik, studied the use of Waste Glass as partial replacement of fine aggregates in concrete. Fine aggregates was replaced by the waste glass powder as 10%, 20%, 30% and 40% by weight for M-20 concrete. The concrete specimens are tested along its compressive strength, tensile strength, durability and density at 28 days and the results obtained were compared with normal concrete. They tested that 20% of replacement of the fine aggregate by waste glass powder achive 15% compressive strength at 7 days and 25% compressive strength at 28 days. With increase in waste glass content, average weight decreased by 5% for concrete mixture with 40% waste glass content thus making concrete should have light weight.

T. Parhizkar, M. Najimi and A.R. Pourkhorshidi, have presented experimental investigation on properties of volcanic light weight aggregates concretes. To this end of experiments, two types of light weight concretes are built and the physical or mechanical and durability aspects are studied**.** The results of compressive strength, tensile strength and shrinkages shows that these light weight concretes meet the requirements. The compressive strength is decrease compared then 20% to 40% of normal concrete. Only use of high quality cements and perfect cement ratios used in light weight concrete structures.

N. Sivallinga Rao, Y.Radha Ratna Kumari, V. Bhaskar Desai, this research based on the study of fibre reinforced concrete should be replaced on concrete structure. There are select the material, that is natural pumice stone. Pumice is one of the rock material volcanic eruption. Compressed Molten lava was rapidly cooling by using water. They found compressive strength should be decreased in this type of concrete. In the test optimisation of cement contents is 1.5% of fibre content are usually allowed. The strain energy values of fibre decrease compared with content of normal concrete. The amount of allowed replacement of natural aggregate 20% of pumice stone and 1.5% of steel fibre quantity are recommended.

EXPERIMENTAL PROCEDURE

Preparation for testing

All the cast specimens were demoulded after 24 hours and were placed in curing tank for a period of 7 to 28 days. The specimens were taken for testing such as compression test, split tensile strength test and flexure test. The specimens were tested in the universal testing machine. Three numbers of specimens in each were tested and the average value is calculated. The results were compared and analyzed with that of control mix.

Mix design

Definition

Mix design is the process of selecting suitable ingredient if concrete and determines their relative proportions with the object of certain minimum strength and durability as economically as possible.

Concept Of Mix Design

- The concrete mix design was proposed by using Indian standard for control concrete.
- The grade was M25.
- The mixture will be prepared with the cement content of 6kg.
- The water cement ratio is 0.43.
- Then natural fine aggregate is used.
- The replacement levels of cement, coal grey were used in terms of 10%, 20% & 50%.
- Chemical admixture is not used here.

TESTING OF SPECIMEN

Various tests on Hardened Concrete is done to ensure the design strength of concrete and quality of concrete construction is achieved.

1. Compressive Strength,
2. Split Tensile Strength,
3. Flexural Strength.

Compressive Strength of Concrete Cubes

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This test is done to determine the cube strength of concrete mix prepared. This test is used to determine the compressive strength of a concrete cube, which has usually been made from fresh concrete cast in a standard test mould. The value of compressive strength can then be used to assess whether the batch that the concrete cube represents meets the required compressive strength. Following cube manufacture and curing, which should both be closely controlled, the cube is crushed at a stated constant speed until it can sustain no further increase in load. The strength is then derived by calculation using the maximum load and cube dimensions. The test is conducted on the 7th day, 14th day and the 28th day and its observation are listed below in the form of a graph. Compressive strength values with replacement for coarse aggregates by coal grey with 10%, 20% and 50%.

Fig 1.Compressive Strength of Concrete Cubes

Split Tensile strength of cylinder

This test is done to determine the tensile strength of the cylinders. The cylinder is placed in a horizontal position and the load is applied gradually and value is recorded if the cylinder splits into two half or if the cylinder fails while applying the load on it. The tensile strength of concrete is one of the basic and important properties. Splitting tensile strength test on concrete cylinder is a method to determine the tensile strength of concrete. The concrete is very weak in tension due to its brittle nature and is not expected to resist the direct tension. The concrete develops cracks when subjected to tensile forces. Thus, it is necessary to determine the tensile strength of concrete to determine the load at which the concrete members may crack. Tensile strength values with replacement for coarse aggregates by coal grey with10%, 20% and 50%.

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Fig 2. Split Tensile strength of cylinder

Flexural Strength of Beam

Flexure tests are generally used to determine the flexural modulus or flexural strength of a material. A flexure test is more affordable than a tensile test and test results are slightly different. The material is laid horizontally over two points of contact (lower support span) and then a force is applied to the top of the material through either one or two points of contact (upper loading span) until the sample fails. The maximum recorded force is the flexural strength of that particular sample.

Fig 3. Flexural Strength of Beam

RESULT COMPARISON TABLE

TABLE: 1.COMPARISION COMPRESSIVE, SPLIT TENSILE AND FLEXURAL STRENGTH

	Replacement Of sand by Coal Grey	Compressive strength(N/mm^2)			Split Tensile strength(N/mm^2)			Flexural strength(N/mm^2)		
		7days	14days	28days	7days	14days	28days	7days	14days	28days
1	0%	14.08	18.08	22.66	2.11	3.05	3.67	2.89	3.27	3.84
2	10%	14.44	17.24	21.97	3.10	3.68	3.95	3.23	3.89	4.25
3	20%	12.97	16.04	20.97	2.86	3.09	3.32	2.97	3.26	3.65
4	50%	11.91	14.40	18.97	2.65	2.80	2.88	2.53	2.80	3.09

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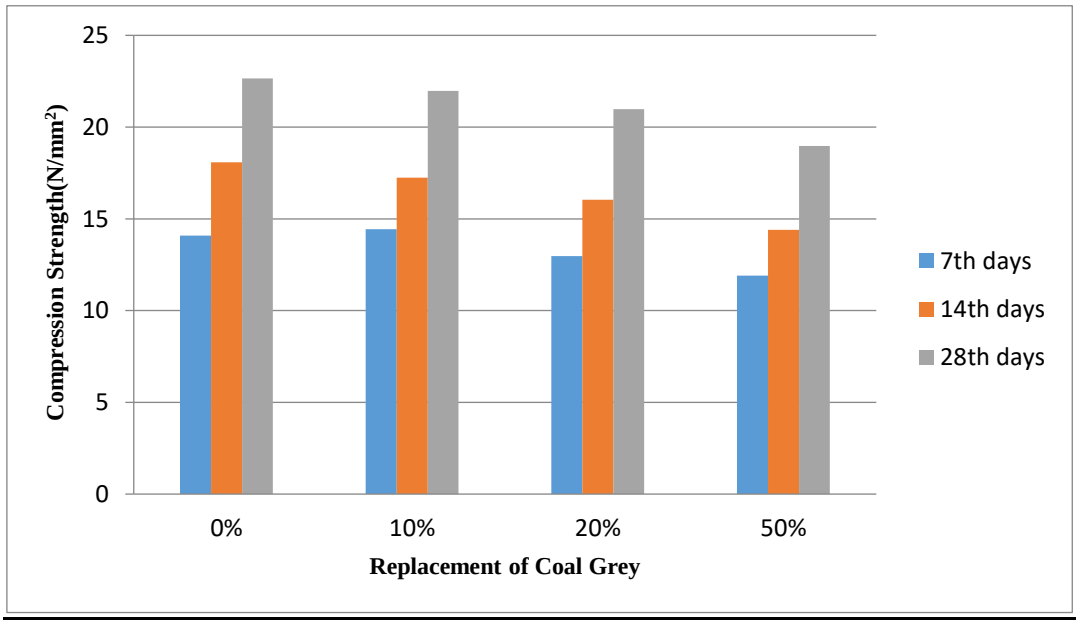
TEST RESULTS AND DISCUSSION

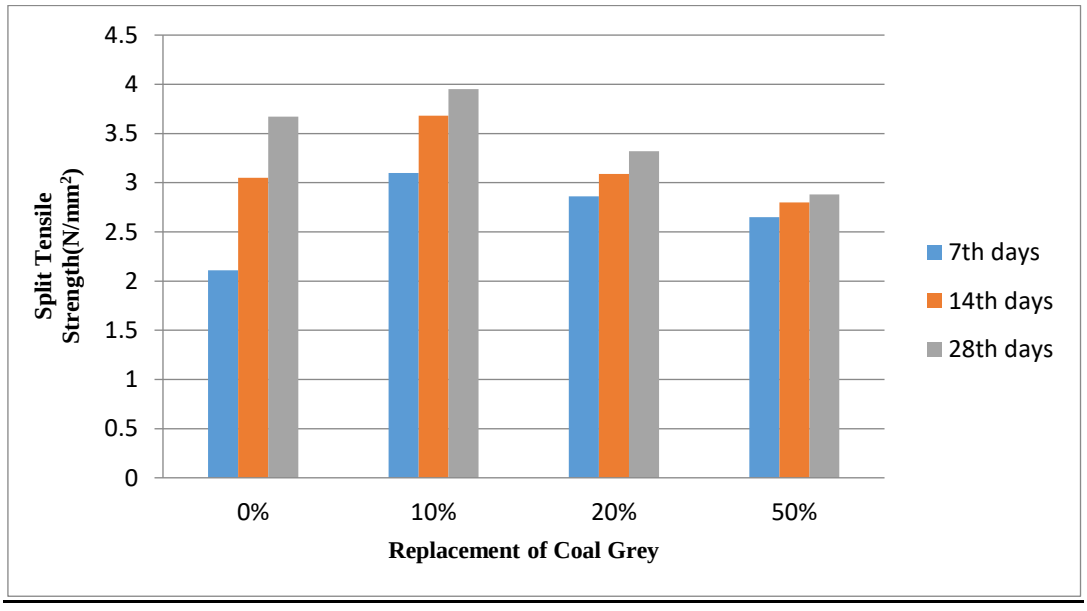
A. Compressive Strength Comparison of M25 concrete

The results of compressive strength were presented in Table 4. The test was carried out to obtain compressive strength of concrete at the age of 7 and 28 days. The cubes were tested using compression testing machine of capacity 2000KN. From the compressive strength is maximum when replacing 20% of coarse aggregate by coal grey in concrete.



B. Split Tensile Strength

The results of split tensile strength were presented in Table 4. The test was carried out to obtain compressive strength of concrete at the age of 7, 14 and 28 days. The cubes were tested using compression testing machine of capacity 2000KN. From 3 the maximum split tensile strength was observed at 10% replacement of coarse aggregate by coal grey in concrete.



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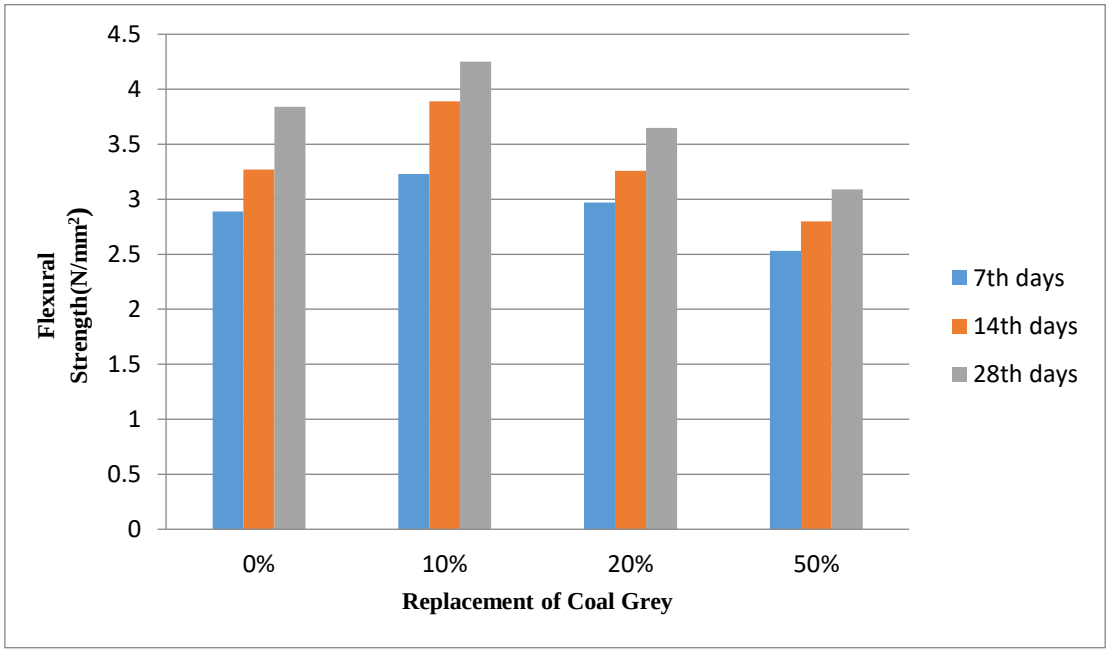
C. Flexural Strength

The results of flexural strength of normal concrete and replaced concrete were presented in Table 4. The test results shows the maximum flexural strength is obtained when 15% replacement of coarse aggregate by E-waste in concrete.



ADVANTAGES

- Light weight concrete 25% to 35% lighter weight compare than conventional concrete.
- Light weight aggregate containing high moisture content may be substituted for conventional aggregates to provide internal curing.
- One of the most extensive applications of structural light weight concrete where lower dead load is achieved.
- One percent material cost is reduction in the slab of reinforcement and reduced size and cost.
- Light weight concrete has been used in bridge decks for over 50 years.
- Reduced construction time and cost.
- Solid and strong construction.
- Light weight concrete are anchorage the green building technology.
- They can be used for fire resistance because these material is completely inorganic and does not easily combustible.
- The light weight concrete are very use full in temporary buildings and industrial building also.
- It helps to reduce at least 30% of environmental waste. There is a decrease of 50% of greenhouse gas emissions.
- Rapid and relatively simple construction.
- Most of the light weight concrete better nailing and sawing properties compare than heavier and stronger conventional concrete.

LIMITATION

- Light weight concrete does not harden immediately at room temperature as in conventional concrete.
- If the foam additive is not properly mixed the probability of foam fully collapsed.
- The number of manufacturer is limited, so cost will drastically increase in places far from industries to site.
- Very sensitive with water content in the mixtures.

- The mixing time consumption of light weight concrete is longer than conventional concrete.
- Difficult to place and finish the surface because of the porosity and angularity of the aggregates.
- In some mixes the cement mortar may separate the aggregate and float towards the surface.

RESULTS

The result in variation of compressive strength of concrete produced by replacing sand by Coal Grey for 7, 14 & 28 days. Only mixes with high amount of cement, meet the strength requirements of structural lightweight concrete. Therefore, these lightweight aggregates are suitable for structural lightweight concrete construction.

.'. 20% of coal grey is replacement for sand is suitable for construction and it's economical.

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