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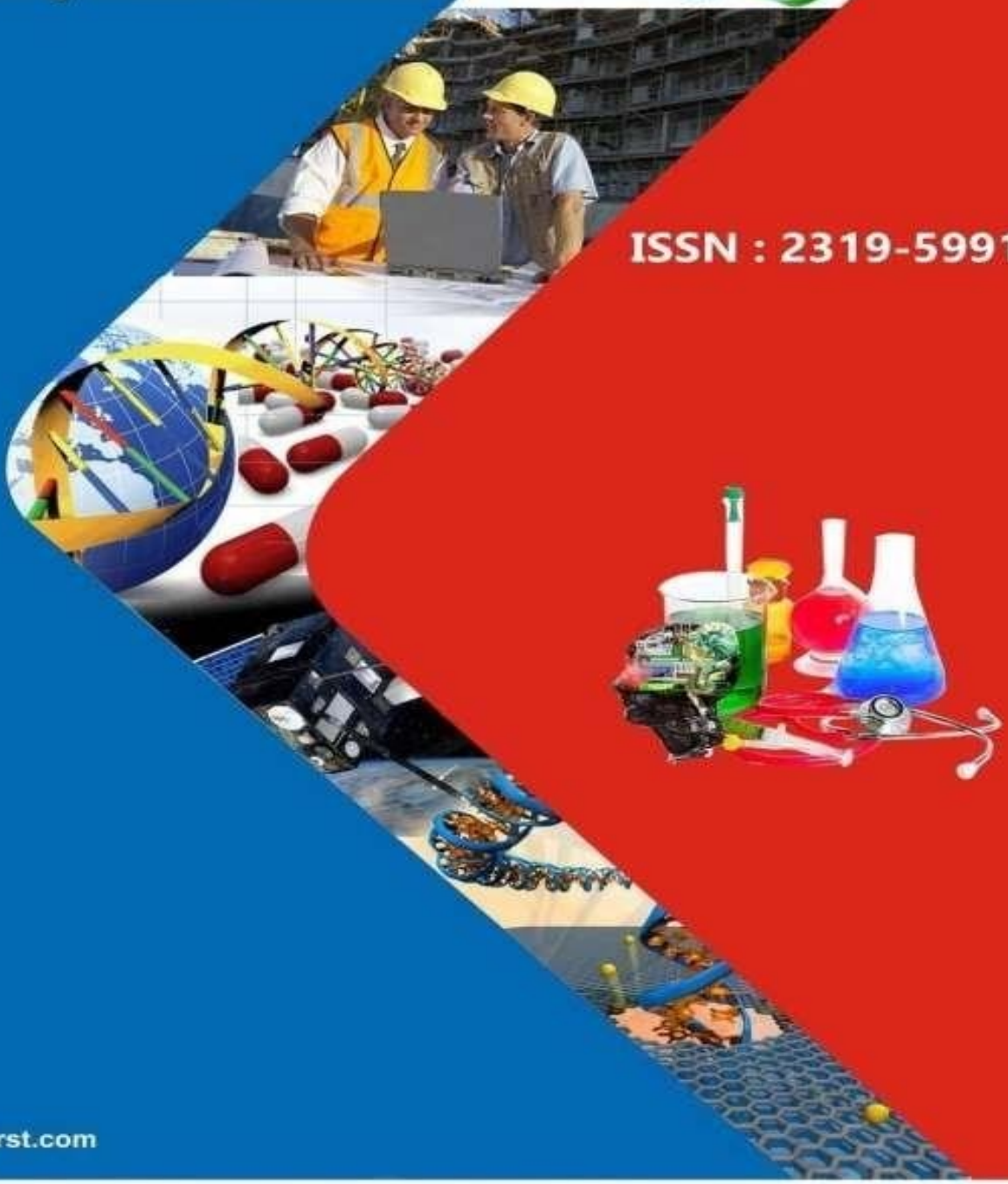

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EXAMINING THE CAPABILITY OF COCOPEAT AS A SUSTAINABLE SUBSTITUTE FOR FINE AGGREGATE IN CONVENTIONAL CONCRETE

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Abstract- *In this project, it is proposed to study the behavior of concrete while adding coco-peat as partial replacement for sand. Generally, waste materials obtained from industries are used as a replacement material. Like this, coco-peat is an organic material which is a waste material obtained from coconuts. Like a sponge, coco-peat can hold large quantities of water, it will reduce the rate of curing. The features of using the coco-peat in concrete are reduction in construction cost, minimum curing rate, light weight concrete, thermal insulating property etc. There are places where there is scarcity of sand (fine aggregate) there they are using ROBOSAND as a fine aggregate.This sand has low binding and low strength as compared to normal sand.So in order to overcome this problem we going to replace Coco-peat as a replacing component.*

The M35 concrete specimens of conventional are made and the comparison of compressive strength between conventional concrete to the coco-peat concrete at 7days 14days and 28 days of curing, split tensile strength with 7days and 28days curing is also done in this project.

KEYWORDS: Coco-peat, Robosand, sand replacement.

I. INTRODUCTION

Concrete is a basic construction material. It is used in a wide range across the world. Usage of concrete becomes vast due to the infrastructural development and increased construction activities. As the demand for concrete increased some negative impacts arises like lack of raw water level, cement manufacturing plants increases CO2 content by production of large quantity of cement. These reasons have generated a lot of concern about environment in the construction field and leads to researches, experimental investigations on alternative solution for concrete ingredients.

Coco-Peat is the non-fibrous, spongy, light weight, corky material that holds together the coir fibre in coconut husk. It was in early 90's that the horticultural use of coco peat was discovered and the material demand has been in the rise ever since. Conventional concrete consists of sand as fine aggregate and gravel or limestone as coarse aggregate. Using there is a growing interest in materials as alternative fine aggregate materials and significant research is made on the use of many different materials as aggregate substitutes such as coal ash, blast furnace slag, coconut fibers and coco-peats.

This type of use of waste material can solve problems of lack of aggregates in various construction sites and reduce environmental problems related to aggregate mining and waste disposal. The use of waste aggregates can also reduce the cost of the concrete production. The coco-peat has the capability to holds water itself for a long period of time. Using this property, the curing time and amount of water required for curing process may become decrease. Compared

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to sand, coco-peat is a light weight material and hence the light weight concrete has to be made while using this coco-peat, as a partial replacement of sand. The river sand is one of the non-renewable source. But the coco-peat is one on the waste material. Hence it is eco-friendly in nature.

Coco Peat

Objectives of the study

1. The main objective of the present work is that to check the possibility of incorporating the usage of coco-peat to replace a part of a fine aggregate to attain the target mean strength of 43.25 Mpa it is proposed
2. To study the material properties.
3. To study the conventional and modern mix design with various percentage of coco-peat as a replacement of fine aggregate.
4. To prepare the test specimen to determine the mechanical properties.
5. To check the possibility of incorporation the usage of river sand to replace a part of fine aggregate to attain required strength.

II. LITERATURE REVIEW

Mr.Sarvesh Suresh More, Mr.Rohit Ravindra Sadamate,et.al.,(2023)
In this project, it is proposed to study the behavior of concrete while adding coco-peat as partial replacement for sand. Generally waste materials obtained from industries are used as a replacement material. Like this, coco-peat is an organic material which is a waste material obtained from coconuts. The use of coco-peat as partial replacement of fine aggregates should be encouraged for sustainable and eco-friendly construction.

Rakesh Kumar, Meet Parmar,et.al.,(2024)
This review explores the self-curing properties of concrete when coir pith residue is incorporated as a fine aggregate at varying proportions of 1%, 3%, and 5%. Self-curing concrete aims to retain water within the mixture, enhancing hydration and reducing the need for external curing methods. The concrete's impact strength, sufficient to withstand impact loads, is found at 98 blows when 2% of the coir pith is replaced.

III. MATERIALS AND MIX DESIGN

The properties of materials used for making concrete mix are determined in laboratory as per relevant codes of practice. Different materials used in present study were Cement, Coarse aggregates, Fine aggregates, Cocopeat. The aim of a study of various properties of material is used to check the appearance with codal requirements and to enable an engineer to design a concrete mix for a particular strength. The description of various materials which were used in this study is given below:

Portland cement

Portland cement is the most widely recognized sort of concrete all in all utilization around the globe as a fundamental element of solid, mortar, stucco, and non-forte grout. A few sorts of Portland bond are accessible. The most well-known, called common Portland bond (OPC), is dark in shading, however white Portland concrete is additionally accessible.

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OPC 53 Grade Cement

Aggregates

Aggregates constitute the main part of a concrete blend and give dimensional soundness to concrete. To build the thickness of coming about blend, the totals are oftentimes utilized in at least two sizes. The most critical capacity of the fine total is to help with creating usefulness and consistency in blend.

Coarse aggregates

Those particles that are prevalently held on the 4.75 mm (No. 4) sifter and will go through 3-inch screen are called coarse total. The coarser the aggregate, the more temperate the blend. Bigger pieces offer less surface region of the particles than a comparable volume of little pieces.

Coarse aggregates

Fine aggreagtes:

Those particles passing the 9.5 mm (3/8 in.) Sieve, essentially passing the 4.75 mm (No. 4) strainer, and transcendently held on the 75 µm (No. 200) strainer are called fine total. For expanded usefulness and for economy as reflected by utilization of less concrete, the fine total ought to have an adjusted shape.

Fine aggregates

Coco peat

Coco-peat, a byproduct of coconut husks, is gaining traction in the construction industry as a sustainable and cost-effective alternative to traditional materials, offering benefits like lightweight concrete, thermal insulation, and sound absorption.

Water

The potable water is a general recommendation for mixing and curing of concrete. Hence this potable water is used for manufacturing concrete. The water is considerably free from any dangerous toxins and hence is capable for use in the concrete mixture.

Mix design of concrete

Mix design is a methodology of choosing the appropriate elements of cement and their relative extents with a goal to get ready cement of certain base quality, wanted usefulness and sturdiness as financially (esteem built) as would be prudent.

Final trial mix for M30 grade concrete is 1:2.67:3.09 at w/c of 0.55

IV EXPERIMENTAL INVESTIGATION

Casting of cubes and cylinders

Casting of concrete shapes and chambers as improved the situation M30 review concrete, the blend extent is for which we are casting cubes and cylinders for typical cement, with the incomplete substitution of solid silica fume and Marble dust.

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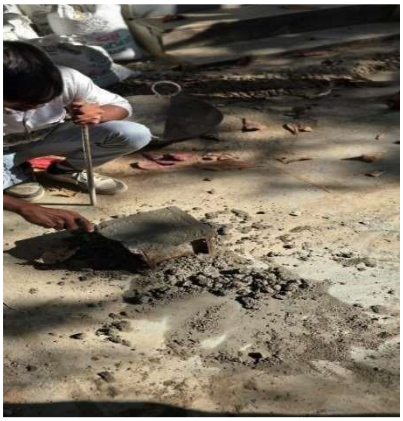
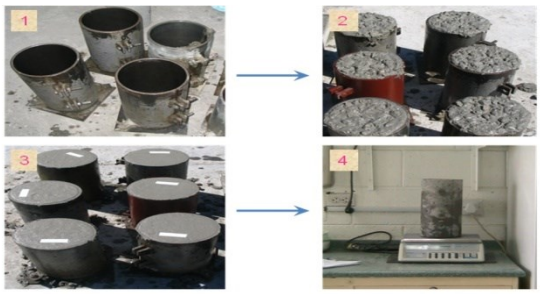


Casting Cube moulds

Compaction with compacting bar

150 mm molds ought to be filled in three roughly break even with layers (50 mm profound). A compacting bar is accommodated compacting the solid. It is a 380 mm long steel bar, weighs 1.8 kg and has a 25 mm square end for smashing.

Compacting the concrete in the cube mould



cylindrical moulds

Curing

The concrete specimens were relieved utilizing six unique strategies until when their compressive qualities were resolved at ages 7,28 days and 56.

Curing of specimens

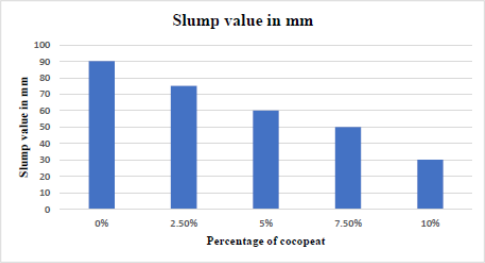
Tests to be conducted on concrete

1. Slump Cone test
2. Compaction factor test
3. Compressive strength
4. Split tensile strength

Testing of compressive strength

V. RESULTS AND ANALYSIS

Slump cone test



Compaction factor test

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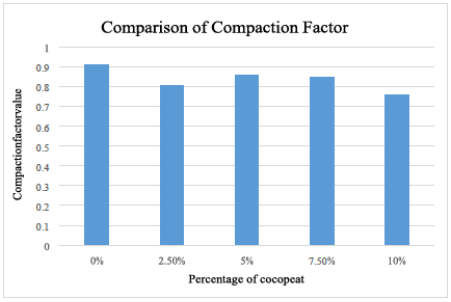
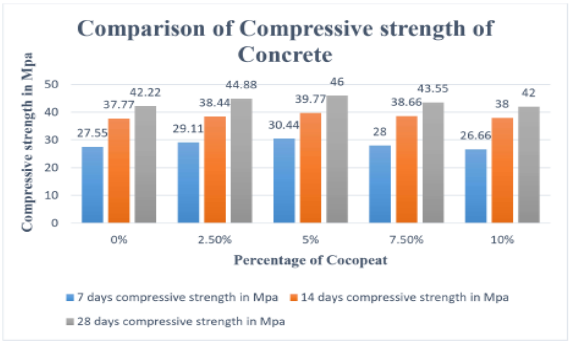
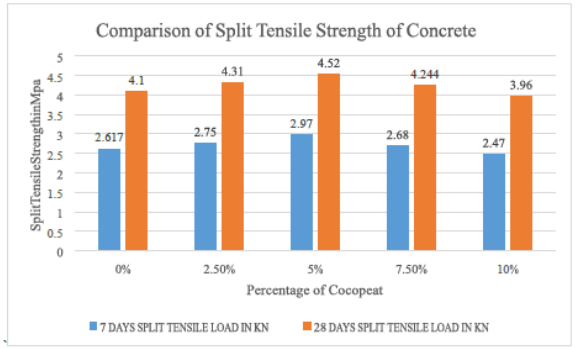


Compressive strength of concrete



Compressive strength of concrete

Split tensile strength



Split tensile strength of concrete

VI. CONCLUSIONS

From the above experimental study, the following conclusions were made

1. Using this coir pith as fine aggregate in building construction reduces the usage of non- renewable resource of sand, so that cost of construction also reduced.
2. As per the observation the value of slump cone reduces with increase in the percentage of cocopeat from 0% to 10% replacement in M35 Grade concrete.
3. The values of compaction factor is also decreases with increase in the percentage of cocopeat in M35 Grade Concrete mix.
4. The optimum value of compressive strength was observed at 10% cocopeat replacement in M35 grade concrete at 7days, 14days and 28 days cueing period. Initially the compressive strength of concrete increases till 10% replacement of cocopeat after 10% replacement the value of compressive strength decreases with increase in the percentage of cocopeat.
5. The optimum values of split tensile strength were obtained at 10% cocopeat replacement at 7days and 28days curing period.
6. Use of coir fiber gives natural cooling effect due to its near to zero thermal conductivity.

Cost wise, natural fibers like coir is very cheap in places like

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