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# Comparative Study on the partial replacement of Coir Fibre and Recron Fibre as a Cement replacing material and steel slag with Fine aggregates in the Concrete

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**ABSTRACT:** Civil constructions made of steel-reinforced concrete are often subjected to the negative effects of salt use, which causes these structures to become suddenly disillusioned. Consistent maintenance and repairs are necessary to improve the life cycle of those structures. The error of the strong constructions composed of cement reinforced with steel can be addressed in a number of ways. Adhesively invigorating hair fibre composites onto the framework is the bespoke process. Hairs are added to cement as a fiber-strengthening material to study its effects on the concrete's capacity to withstand compression, flexure, and cracking while reducing the environmental problems caused by the decomposition of hair. Hair fibre reinforced concrete (HFRC) needs to be able to conclude financially with an existing fortifying framework in order to be considered a useful development material. The fibre is a little piece of strengthening material with certain unique qualities. Angle percentage is a useful measure that is often used to represent fibre. The ratio of the fiber's length to the distance across is known as its angle proportion. The angle proportion for run-of-the-mill falls between (30 and 150). In order to consider its effects on the smashing, flexural, compressive strength, and splitting control for the management of concrete as well as to lessen the condition concerns created by hair decay, hair fibres are used as a fibre fortifying material in cement. Reducing natural problems caused by hair disintegration is one of the main uses of hair in concrete. They are used as fiber-strengthening agents in concrete to investigate the effects on splitting control, flexural quality, compression, and crushing in economy concrete. One of the most often used building materials is concrete, which is primarily composed of three ingredients: cement, sand, and fillers. These ingredients are reinforced by binding to form a strong structure that is essentially man-made stone. It has low stiffness and a good compressive quality. This shortcoming has plumbing issues including shrinkage in concrete and breaking of cement relies upon such a large number of variables including the fixings, temperature, relative mugginess of concrete, measurement and the structure. In this study, The Cement is replaced by Coir Fibre with 0.5 %, 1.5 %, 3 %, 4.5 % replacement and Recron Fibre with 0.5 %, 1.5 %, 3 %, 4.5 % replacement Sand is replaced with steel slag with 6 %, 12 %, 18 % and 24 % replacement. As per IS: 10262-1982 mix design was prepared for M25 grade and same design was used in preparation of test samples. After curing for 24hrs the samples were demoulded and subjected to compressive strength test and tensile split test for 7 and 28 days.

**KEYWORDS :** Ordinary Portland Cement(OPC),Coir fibre,Recron fibre.

## I. INTRODUCTION

### 1.1 General

Concrete, which consists of cementitious materials, water, fine and coarse aggregate, and aggregate, is one of the primary development components. These days, the cost of these materials is increasing, therefore we need to consider ways to lower the cost of construction materials overall, and concrete in particular. A continuous advancement in the development sector is the replacement of materials in concrete. Material substitution provides condition security, energy funds, and cost reduction [1]. One of the biggest upsets ever is concrete. A lot of unexpected landmarks were built with concrete. However, under the current circumstances, ordinary resources are being exhausted every day in order to create the concrete wilderness. It makes more sense to choose alternative optional resources for binder, fine aggregate, and coarse aggregate before all available common resources are used[2].

### 1.2 Coir Fibre

A natural fibre with many uses, coir is taken from the mesocarp tissue, or husk, of the coconut fruit. The fibre is referred to as golden fibre because it often has a golden hue after being extracted from the coconut husk. The economics of producing coir fibre are built on a multi-link chain where a large portion of output is reliant on readily available, inexpensive manual labour. It might not be the most obvious course of action to mechanise the fibre extraction facility due to the socioeconomic conditions that exist at the village level. Mechanisation techniques must be implemented carefully to ensure that no one loses their job and that there are viable options for generating revenue in the community. Coir fibres measure up to 35 cm in length with a diameter of 12-25 microns. A coconut harvest occurs once in 45 days. From 1000 coconuts it would be possible to extract 10 kgs of coir. Among vegetable fibres, coir has one of the highest concentrations of lignin, making it stronger but less flexible than cotton and unsuitable for dyeing. The tensile strength of coir is low compared to abaca, but it has good resistance to microbial action and salt water damage and needs no chemical treatment.



Fig.1.1 Coir Fibre

### 1.3 RECRON FIBRE

Recron is a triangular polyester fibre having a cross sectional area of 6 and 12 mm that is extensively utilised in the Indian building sector. It costs a lot less than any other foreign fibre used in building. Millions of fibres create a mesh in the concrete at the prescribed dosage of 0.25% by weight of cement. In each matrix coordinate, the distance between any two fibre filaments is roughly less than 1 mm. The general characteristics and uses of RECRON fibre reinforced concrete in building are discussed here. When utilised at modest dosages, the thinner and stronger elements that are distributed over the entire area stop cracking.



Fig.1.2 Recron Fibre

### 1.4 Steel Slag

Recron is a polyester fibre that is triangular in shape and has a cross sectional area of 6 and 12 mm. It is widely used in

the construction industry in India. Compared to other foreign fibres used in construction, it is far less expensive. When added to concrete at the recommended dosage of 0.25% by weight of cement, millions of fibres form a mesh. In each matrix coordinate, the distance between any two fibre filaments is roughly less than 1 mm. This article discusses the general properties and applications of RECRON fibre reinforced concrete in construction. The thinner and stronger materials that are applied evenly across the region cease to fracture when used in little dosages.



Fig.1.3 Steel Slag

### 1.5 USES OF STEEL SLAG

Following are the various uses of steel slag:

- 1 Steel slag can be utilized to improve the properties of soil.
- 2 Slag is helpful as an elective crude material for clinker generation and such use can diminish a concrete plant's fuel utilization and in general emanation of carbon-dioxide per ton of bond.
- 3 Steel slag has been utilized effectively to treat acidic water releases from surrendered mines.
- 4 Steel slag powers the overwhelming metals to drop out of arrangement in water spillover on account of its high oxide mineral substance.
- 5 Steel slag has discovered use as an obstruction material solution for waste locales where substantial metals will in general drain into the encompassing condition.

### 1.6 RESEARCH OBJECTIVES

- 1 To calculate the Optimum content of coir fibre, Recron fibre and steel slag in concrete.
- 2 To find out the values of strength properties like flexural strength, Split tensile strength, and compressive strength of the concrete having coir fibre, Recron fibre and steel slag.
- 3 To find out some fresh characteristics of the concrete.

## II. LITERATURE REVIEW ON COIR FIBRE, RECRON FIBRE AND STEEL SLAG

**J.Sahaya Ruben et al (2014)** did the comparative study on the strength parameters of concrete by using coir fibre. The general objective of this examination is to research the social investigation of normal fiber in solid structure. The coir fiber as of late pulled in an enthusiasm as a feasible fiber composite material, because of some particular mechanical property which can be contrasted with counterfeit fiber. The Coir fiber is dealt with utilizing regular latex prior to utilizing in concrete, with the goal that it isn't be influenced by dampness content introduced in concrete. In this test investigation of 28 days the compressive quality and split rigidity are completed utilizing extraordinary coir fiber length of 20mm, 25mm and 30mm individually of various rate as 0.5%, 0.75% and 1%.

**Achudhan et al (2018)** did the comparative study on the strength parameters of concrete by using coir fibre. This examination presents the flexibility of coconut fiber is one of the normal filaments richly accessible in tropical areas, and is separated from the husk of coconut organic product the properties of composites of cement in which coconut strands are utilized as fortification, are examined. The research completed and the ends drawn by various specialists in most recent couple of decades are likewise quickly introduced. Coconut strands strengthened composites have been utilized as modest and solid non-auxiliary components. The point of this task is to spread consciousness of coconut filaments as

a development material in Civil Engineering.

**Yalley, P. P.** did the significant study on the applications of coir fibre in concrete. This examination portrays exploratory investigations on the utilization of coconut fiber as improvement of cement. The expansion of coconut-strands essentially improved huge numbers of the building properties of the concrete, eminently twist, sturdiness and elasticity. The capacity to oppose splitting and spalling were additionally improved. In any case, the expansion of strands unfavorably influenced the compressive quality. When coconut fiber was added to plain concrete, the torsional quality expanded (by up to about 25%) as well as the vitality retaining limit, yet there is an ideal weight portion (0.5% by weight of concrete) past which the torsional quality began to diminish once more. Comparative outcomes were too gotten for various fiber perspective proportions, where again results appeared there was an ideal viewpoint proportion. An expansion in fiber weight part gave a steady increment in flexibility up to the ideal content (0.5%) with relating fiber viewpoint proportion of 125. Generally speaking the examination has shown that expansion of coconut fiber to solid prompts improvement of cement the durability twist and the ductile pressure.

**V.Sai Uday et al (2017)** the significant study on the applications of coir fibre in concrete. This investigation depicts the conduct investigation of coconut fiber in solid structure. The expansion of coconut fiber in concrete improves different building properties of cement. Coconut fiber is treated as normal fiber before utilizing in concrete. Expansion of coconut fiber improves the compressive quality, flexural quality and split elasticity of cement. The examination was directed on high quality cement with the expansion of fiber with 5 blend extents (1%, 2%, 3%, 4%, and 5%) by the heaviness of concrete. The compressive quality and split elasticity of relieved cement assessed for 3 days, 7 days, 28 days. The examination found the ideal fiber substance to be at 1% (by the heaviness of the cement). This results show coconut fiber can be utilized in development.

**Nithin Sam et al (2016)** did the significant study on the applications of coir fibre in concrete. The utilization of filaments in concrete has illustrated incredible basic execution, there still exists the requirement for understanding the sturdiness of fiber strengthened cement in the earth to which solid structures are for the most part uncovered. The point of this investigation is to assess the toughness properties of coir strands in the auxiliary cement. Trial examination investigates strength properties for example, water retention, corrosive obstruction and sulfate obstruction. The fiber volume division ranges from 0 to 3% for a length of 1.5 and 3 cm. From the trial examination, it was discovered that there is improvement in strength properties for coir fiber strengthened solid when thought about to plain concrete cement. Additionally coir fortified cement improves the breaking opposition contrasted with plain concrete.

**Rohit Hooda** stated the applications of Recron fiber in concrete. Elite Concrete is utilized to clarify concrete with extraordinary properties. Prior HPC was known to be a solid with high quality. However, headway in concrete innovation has made another definition for HPC. Engineered fiber (i.e Recron fiber) in different rate i.e 0.0%, 0.1%, 0.2%, 0.3% and 0.4% to that of all out weight of cement and projecting was finished. At long last, unique level of silica range 0%, 10%, 20%, 30% and 40% with the substitution of concrete keeping steady fiber substance and cement was casted. In the current work two kinds of concrete, Portland Slag Cement and Ordinary Portland Cement have been utilized to get ideal outcomes. Extraordinary size mortar, 3D shapes, chamber and crystal were projected. Finally compressive test, parting test, flexural test are directed. Likewise to acquire such exhibitions that can't be acquired from traditional cement and by the current strategy, an enormous number of preliminary blends are required to choose the ideal blend of materials that meets exceptional execution. It is seen from the research that 0.2% Recron fiber and 20% SF is the ideal mix to accomplish the ideal need.

**S. Satish Kumar et al** did the study on the strength properties of concrete by using Recron Fibre, Coir Fibre and Steel slag in concrete. The principle goal of this trial study is to research the quality presentation of Recron fiber strengthened cement of M30 grade delivered by supplanting concrete with Egg Shell Powder in different rates like 5%, 10%, 15% and 20% both in OPC and PSC and furthermore expansion of Recron strands in various rates like 0.2%, 0.3%, 0.4% and 0.5%. The Ideal level of ESP in OPC and PSC can be resolved what's more, it very well may be utilized for deciding Compressive and Split Tensile quality tests by including various rates of Recron filaments. The quality attributes of Conventional OPC and Recron fiber strengthened cement and the Conventional PSC and Recron fiber strengthened cement are thought about. And furthermore the quality attributes of Recron Fiber fortified cement of OPC are contrasted and Recron Fiber strengthened cement of PSC at the age of 7 to 60 days. In this examination, Cube and Cylinder examples are ready for Compressive and Split Tensile quality tests furthermore, they were tried at the age of 7, 28 and 60 days.

**M.S. Ramli et al (2014)** did the experimental study on the strength parameters of concrete by using coir fibre. The

reason for this investigation is to tentatively explore the physical attributes and mechanical properties of cement delivered utilizing destroyed coconut fiber composites. The accompanying rate measures of fiber were tried: 0 % (control), 0.6 %, and 1.8 %. The coconut filaments were sliced to a specific length as per past examinations which proposed that the best length is around 30 - 60mm. The test outcomes indicated that the compressive quality of cement diminished as the level of absolute fiber in the solid blend expanded. The exploratory outcomes too indicated that coconut fiber concrete performed agreeably regarding split development in correlation with that of ordinary cement. At last, it was reasoned that the utilization of coconut filaments has extraordinary potential in the creation of lightweight concrete or typical concrete for use in the development of solid structures. As coconut fiber is a whiz material that is effectively accessible and modest, it is an especially decent, minimal effort elective. Along these lines, this material can possibly defeat the issue of heightening expenses in the business.

### III. CONCLUSION

Following are the various conclusions drawn after the test performance on cube samples of concrete by using coir fibre, Recron Fibre and Steel Slag:

- 1 The compressive strength of concrete increases by the addition of coir fibre, Recron fibre and steel slag.
- 2 The optimum percentage of Coir Fibre, Recron fibre and steel slag is 3 %, 4.5 % and 18 % in the Compressive strength of the concrete.
- 3 The maximum Compressive strength test is achieved 33.87 in the mix of 3 % CF+ 1.5 % RF +18 % Steel Slag.
- 4 The split tensile strength of concrete increases by the addition of coir fibre, Recron fibre and steel slag.
- 5 The optimum percentage of Coir Fibre, Recron fibre and steel slag is 3 %, 4.5 % and 24 % in the Split tensile strength of the concrete.
- 6 The maximum Split tensile strength test is achieved 3.568 in the mix of 3 % CF+ 1.5 % RF+18 % Steel Slag.
- 7 The Flexural strength of concrete increases by the addition of coir fibre, Recron fibre and steel slag.
- 8 The optimum percentage of Coir Fibre, Recron fibre and steel slag is 3 %, 3 % and 18 % in the Flexural strength of the concrete.
- 9 The maximum Flexural strength test is achieved 7.25 in the mix of 3 % CF+ 1.5 % RF +18 % Steel Slag.
- 10 The overall optimum mix of all the test is M-19 having 3 % coir fibre + 1.5 % Recron Fibre +18 % Steel Slag.
- 11 The literature study concludes that the flexural strength and compressive strength increases with the coir fibre and Recron fibre in the concrete.
- 12 With the increase in coir fibre, recron fibre and steel slag in concrete, the workability of concrete also increases.
- 13 The cost of forming concrete can be reduced by using coir fibre, recron fibre and steel slag in it.
- 14 By using coir fibre, recron fibre and steel slag, we can make environment more sustainable.

### FUTURE SCOPE

For further research and further study, Recron fibre and coir fibre could be used with grand granulated blast slag and iron slag and the scope for the same could be analysed extensively in the future. Other wasted resources can also be utilized in concrete

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