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Use of Coconut Fibres as an Enhancement of Concrete

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ABSTRACT: Concrete is the most widely used construction material all over the world. Concrete is weak in tension and flexure, most commonly, it is reinforced using steel reinforcing bars. However usage of steel reinforcement is expensive. Natural fibre such as coconut fibre has certain physical and mechanical characteristics that can be utilized effectively in the development of reinforced concrete material. Sometimes, these coconut fibres are dumped as agricultural waste, so it can be easily available in large quantity hence making them cheap. Experimental study on the use of coconut fibre as an enhancement of concrete. Addition of Concrete Fibre improves engineering properties of the concrete like torsion, toughness & tensile strength. The ability to resist cracking and spalling were also enhanced. In this study addition of fibres will adversely affected the compressive strength, torsional strength, as well as energy absorbing capacity.So, use this waste as a Increasing properties of the concrete by using basic mix Proportion with variation of aspect ratio of coconut fibres and different weight fraction of coconut fibres.

KEYWORD: Coconut Fibres in concrete, Compression, Tensile and Flexural Strength, Torsion and Toughness.

I. INTRODUCTION:

Concrete is weak in tension and flexure, it is strengthened utilizing steel reinforcement bars. However, use of steel support is costly. In the structure of international research, a significant work is going on in the utilization of fast growing, annually sustainable, cheap agricultural crops and crop deposits as likely fiber reinforcement in concrete. Coconut fiber being the most ductile among all natural fibers and it is potential to be utilized as reinforcement in concrete. They are cheap, biodegradable, non-abrasive and there will be no distress with wellbeing and safety. Natural fiber such as coconut fiber has certain physical and mechanical characteristics that can be utilized effectively in the development of reinforced concrete material. In most cases, these coconut fibers are dumped as agricultural waste, so can be easily available in large quantity hence making them cheap. The primary goal of this project is to conduct experimental studies for enhancement of properties of concrete by reinforcing it with coconut fibers.

II. METHODOLOGY:

Based on the previous research work, a comparison of strength properties of fibre reinforced concrete is made with respect to conventional concrete and the influence of shape of fibres on strength are also studied. Tests are conducted using processed and clean coconut fibres. A concrete mix was designed to achieve the minimum grade of M20 (by taking 1:1.5:3 as nominal mix) as required by IS 456 – 2000. The investigation was done by taking 3%, 5%, and 6% (by the weight of cement) of coconut fibre in the concrete mix. Coconut fibres were obtained from local market. Minimum of two test specimen were taken for each analysis. The experimental investigations was carried out on test specimens using one basic mix proportion with three variations of aspect ratio of coconut fibres, and different weight fraction of coconut fibre.

- Materials- Ordinary Portland Cement, Fine Aggregate was natural sand and coarse aggregate was crushed granite having a maximum size of 10mm are used. The coconut fibres with diameter ranging between 0.3mm and 0.86mm and length between 5mm and 20mm. Concrete should be Hand mixed.

- Preparation and testing of specimen- Number of specimen of cubes and cylinders were cast for each mix as follows:

1. Three 100mm cubes- subjected to compression
2. Three 100mmx200mm cylinders- subjected to tension and splliting
3. Three 100mmx200mm cylinders- subjected to torsion

- Mixing of concrete with concrete fibres

- Method of Compaction- The moulds with half filled fresh concrete werevibrated vertically on the vibrated table while casting for about 30 seconds. The moulds were then fully filled with fresh concrete and vibrated further for about 60 seconds. This method of compaction was to align the fibres normaltothe directionofvibration.

- Curing- Specimens were removed from water after 28 days of submersion in water for testing the 28 days strength.

- Details of Test- Three cubes and three cylinders from each mix were tested for compression and splitting tensile strength at day 28. After casting using a compression testing machine with a maximum capacity of 2500KN.

- Analysis- The analysis of the results from the laboratory experiments is in this section.

III. CONCLUSION:

The addition of coconut-fibres significantly improved many of the engineering properties of the concrete; torsion, toughness and tensile strength. The ability to resist cracking and spalling were also enhanced. However, the addition of fibres adversely affected the compressive strength. Coconut fibre as an enhancement of concrete is unlikely to replace steel for the vast majority of structures. Experiments and demonstration projects around the world have shown that natural fibre enhancement is a viable and cost effective alternative to conventional building materials. Economic methods of natural fibre extraction, handling, and economical and automated methods of dispersing fibres at a batching plant is needed if large quantities of fibres are going to be used in construction. Applications for coconut fibre enhanced concrete for housing need to be expanded.

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