

Use of Human Hair as Admixture in High Strength Concrete

Abstract— This project is intended to analyze the Performance of Human Hair in Concrete. Human hair concrete can offer a convenient, practical and economical method for overcoming micro-cracks and similar type of deficiencies. Since concrete is weak in tension hence some measures must be adopted to overcome this deficiency. Human hair is strong in tension; hence it can be used as a fibre reinforcement material. Hair Fibre (HF) an alternate non-degradable matter is available in abundance and at a very cheap cost. It also creates environmental problem for its decompositions. This particular project has been undertaken to study the effect of human hair on plain cement concrete on the basis of its compressive strength, flexural strength, and rheological parameter.

Keywords— Human Hair.

I. INTRODUCTION

Almost Concrete is a mixture of cement (usually Portland cement), water and stone aggregate possessing low tensile strength, limited ductility and little resistance to cracking. Since cement is frail in pressure henceforth a few estimates must be received to conquer this inadequacy. Hence, incorporating fibre into the concrete can increase the properties of concrete like the tensile strength of the concrete, reduce the air voids and water voids and also the inherent porosity of gel, increases the durability of the concrete.

Fiber is a little bit of fortifying material having certain attributes properties. Expansion of filaments to solid impacts its conduct which altogether rely upon the sort and level of fiber. The properties of fiber fortified cement is affected primarily by the physical and mechanical properties of the fiber. A decent fiber ought to include great bond inside the grid and versatile flexibility modulus. It must be perfect with the fastener, which shouldn't be assaulted or annihilated in the long haul. It ought to be short, fine and adaptable to allow blending, transporting and setting and furthermore solid enough to withstand the blending procedure.

II. ABOUT HUMAN HAIR

Human hair is great in pressure; consequently it very well may be utilized as a fiber fortifying material. Hair Fiber (HF) is a nondegradable issue accessible in plenitude and at an extremely shabby expense. Human hair is considered as a waste material in many parts of the world and is a typical constituent found in metropolitan waste streams which cause colossal ecological issues from its corruption. Additionally the high elasticity, novel substance piece, warm protection and so forth makes the hair fibre appropriate to be utilized as a fortifying material.

The hair string has an exceptionally sorted out tube shaped structure, framed by inactive cells of keratin, following an extremely exact and pre-characterized plan. Regarding crude components, on a normal, hair is made out of 50.65% carbon, 20.85% oxygen, 17.14% nitrogen, 6.36% hydrogen, and 5.0% Sulfur. Keratin gives the hair quality, adaptability and strength. Cortex keratin is in charge of this property and its long fastens are packed to shape a customary structure which, other than being solid, is adaptable. The physical legitimacies of hair include: protection from extending, flexibility and hydrophilic power. The protection from breakage is an element of the distance across of the string, of the cortex

condition. Hair fiber has a versatile trademark, and it might experience moderate extending either wet or dry. Whenever dry, the hair string may extend 20-30% of its length; and, in contact with water, this may reach up to half.

As an Innovation to the field of Fiber Reinforced Concrete, use of Human Hair as a Fiber picked up its significance.



III. WHY HUMAN HAIR AS A FIBRE:

Hair is used as a fibre invigorating material in concrete for the going with reasons :

- ✓ It is likewise accessible in bounty and requiring little to no effort.
- ✓ It strengthens the mortar and keeps it from spalling.
- ✓ Hair, a non-degradable issue is making an ecological issue so its utilization as a fibro fortifying material can limit the issue.

IV. PREPARATION AND DETAILS OF SPECIMENS:

Casting and testing of cubical specimens of size 150mm×150mm×150mm for compressive strength and beam specimens of size 100mm×100mm×500mm for flexural strength was done as per IS 516:1959 specifications. Whereas casting and testing of cylindrical specimens of size 150mm diameter and 300mm length for splitting tensile strength was done as per IS 5816:1999 specifications. Compressive strength test was performed on 150mm cubes, tested at 28 days, with their specimen in each case and cured in the water tank completely immersed at ambient temperature until the test age. All the test specimens were demolded after 24 hours of casting. compressive strength of concrete is its ability to resist a crushing force. It is the ratio of load at failure to surface area of concrete specimen.

V. MIX DESIGN

The process of selecting suitable ingredients of concrete and determining their relative amounts with the objective of producing concrete of the required, strength, durability, and workability as economically as possible, is termed the concrete mix design. In this study, concrete mix was designed as per IS 10262:2009 to achieve a target compressive strength

of 50 MPa. Design mix proportions of M-50 grade are tabulated below :

Ingredient	Weight
CEMENT	597.45kg
FINE AGGREGATE	682.12kg
COARSE AGGREGATE	997.97 kg
WATER	197.16 lts

The human hair fibres were added at percent variation of 0.25%, 0.50%, 0.75%, 1 %, 2 %, and 3 % by weight of cement in M - 50 Grade concrete.

VI. CONCLUSION

According to the compressive performance test performed it is observed that there is remarkable increment in mechanical properties of concrete according to the percentages of hair fiber increased in concrete. The detailed observation of strength result is discussed below with the rate of percentage of human hair fiber.

1. When the percentage of human hair added in concrete the workability of concrete can be increased which has been analysed by slump cone test. From the study it was found that the percentage of human hair increases, the workability also increases.
2. Through the investigation it was found that the shrinkage cracks get reduced when the human hair fiber is added in concrete.
3. Examining the concrete specimens after the tests, it is found that cracks were specimens with hair fibre when compared with concrete specimens without hair fibre content.
4. The neural network application for optimal design problems shows excellent convergence and stability characteristics without oscillation normally found in such complex problems of optimization. It is further observed that neural networks have been shown to be powerful tool for design problems provided that sufficient and representative numbers of test results are used for the training and validating of the neural network.
5. The hybrid applications for design and analysis show that the neural networks can be efficiently applied to the implementation of programs in which the neural procedures are used instead of numerical procedure.

I. FUTURE SCOPE

During our research work we also faced the problem of uniform distribution of hair in the concrete. So an efficient method of mixing of hair fibre to the concrete mix is to be found out.

- A wide study on partial replacement of cement using fine hair fibre out.
- Applications of hair fibre reinforced concrete in the construction of seismic resistant structures.
- The distribution matrix of hair in concrete since the resultant matrix could affect the properties.
- The study of admixtures and super plasticizer which could distribute the hairs without affecting the properties of concrete.
- The use of animal hairs in concrete.
- The research can be further extended to study the influence of hair fibre on other properties of composites such physical, thermal properties cube.

PROBLEM ENCOUNTERED

It is well said that: "The taste of defeat has a richness of experience all its own." During our research work we also faced the problem of uniform distribution of hair in the concrete. So to overcome this problem we have adopted the manual method of distribution of hair in the concrete.

REFERENCES

1. "Human Hair Fiber Reinforced Cement Concrete" by "RamyaT and Tamilamuthan B" Published "International Journal for Research in Emerging Science and Technology"(2017).
2. "Hair Fibre Reinforced Concrete" by "Nila V. M, Raijan K.J, Susmitha Antony, RiyaBabu M, Neena Rose Davis" Published "International Conference on Technological Advancements in Structures and Construction"(2015).
3. "Human Hair Fibre Reinforced Concrete" by "George M Varghese,Adarsh M V, AlphyJomichan" Published "International Journal of Research & Technology"(2017).
4. "An Experimental Study on Mechanical Properties of Human Hair Fibre Reinforced Concrete (M-40 Grade)" by " V. Raja Mahendar, Dr. R.C.Reddy and Shwetakaushik" published "IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)"(2015).
5. "A Concept of Improving Strength of Concrete using Human Hair as Fiber Reinforcement" BY "Achal Agrawal, AbhishekShrivastava, SiddharthPastariya, Anant BhardwajPublished "International Journal of Innovative Research in Science, Engineering and Technology"(2015).
6. "Performance of hair reinforced concrete" By "Kumar Shantverayya and Sugunashree SM" Published "International Journal of Applied Research (2017).
7. "Human Hair as Fibre Reinforcement in Concrete" By " G.Sreevani, Smt. B. Ajitha" Published "International Journal of Engineering Science and Computing"May (2017).