EXPERIMENTAL STUDY ON RECRON FIBER REINFORCED CONCRETE BLENDED WITH FLYASH AND METAKAOLIN: A REVIEW

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Abstract:- Fiber reinforced concrete is concrete containing a uniformly distributed random short fiber which increases its structural integrity. It contains short discrete fibers and randomly oriented. Fibers include steel fibers, synthetic fibers and natural fibers (coconut fiber) each may vary according to their individual property. In addition, the character of fiber reinforced concrete changes with materials, geometries, distribution, orientation, densities. Fibers are usually used in concrete to control cracking due to plastic shrinkage and drying shrinkage. They also reduce the permeability of concrete and reduce bleeding of water. Some type of fibers provides greater abrasion and fire resistance. Indeed, some fibers actually reduce the strength of concrete. The fiber with high aspect ratio provides high ultimate tensile strength, relatively high modulus of elasticity, better compatibility with ordinary Portland cement, better affinity with water and no health risks.

Keywords: FRC (fiber reinforced concrete), bendable concrete

1.0 INTRODUCTION

Fiber reinforced concrete is ductile in nature. Under the flexural type of loading, the normal conventional concrete tends to fractures in a brittle manner. Whereas fiber reinforced concrete withstand 3to 5% tensile strain capacity compared to normal conventional concrete. Fiber reinforced concrete is specially designed to crack only in controlled manner. In normal concrete cracks are generally Griffith- type cracks; increases in width as they grow longer and these cracks are referred as steady state cracks. Before placing of fresh concrete in the concrete mould oil must be applied in the moulds for the ease of stripping of concrete. The oil used for applying is diesel or kerosene. Proper care was taken while applying the oil in the moulds, to avoid the concrete strains in the moulds after removing the concrete. Once the workability test of fiber reinforced concrete was done, the fresh concrete must be carefully placed with compaction to avoid the honeycombing. After placing of fresh concrete in the moulds vibration were achieved by using a vibrator. This action may release any air entrained voids in the concrete.

2.0 LITERATURE REVIEW

Anusha Chowdary ET. Al (2017) has investigated a study on impact of polypropylene fibers on compressive and tensile strength of concrete. In this investigation M 40 grade concrete mix design was worked out by maintaining the water cement ratio as 0.40. The characteristics of fibers and their impacts and flyash as a replacement for cement material their mechanical properties were analysed and compared with the normal conventional concrete. In the normal conventional concrete when subjected to stresses and impact loads cracks may appear due to this existing of microcracks less tensile strength is obtained but in fiber reinforced concrete because of presence of uniformly distributed fibers arrests the micro cracks. The prepared concrete results in good quality, great strength, and durability in nature. Therefore variety of admixtures are used such as flyash, silica fume, metakaolin, rice husk, GGBS, mud dust to improve the concrete properties. Recron fiber is mainly used because of comparatively low cost and enhancing the better plaster this modified polyester fiber is most utilized as a secondary reinforcement material in the concrete. The special features are it reduces cracks in the outer and inner layer of concrete, water consumption is significantly reduced and flexibility nature is increased. For concrete with absence of recron fibers, concrete has increased workability and better slump for all mix proportion. The concrete with recron fiber, as the amount of fibers percentage increases the workability decreases. By using the recron fiber to the concrete will reduce the maintenance cost by reducing the micro cracks, porosity and hence automatically durability will increase. Bleeding and segregation also reduced by adding fibers to the concrete.

Ridha Nehvi ET. Al (2016) in their studies Effect of different percentages of fiber on the compressive, tensile, flexural strength of concrete. By adding polypropylene fiber in the proportion of 0%, 0.1%, 0.2% of the M35 grade concrete. 0.3% fiber increases the tensile strength of the concrete and flexural strength concrete. Concrete with absence of fibers will create cracks under tension causes plastic and drying shrinkage and also changes the volume of the concrete. Pre-stressing is also one of the most important method to resist low tensile strength. Cubes were casted in the size of 150*150*150mm and mixing was done by using mixer machine and slump cone test was done for each

proportion. The specimen is demoulded after 24 hours and kept for curing after 28 days the compressive strength was taken. Same procedure was followed for tensile strength and flexure strength. The test results show that concrete without fiber achieved maximum slump value. Recron fiber offers positive influence on compressive, split tensile, flexure strength. The significant superiority of 0.5% replacement to the concrete may provide compressive strength of 40.1Mpa. This shows that fiber not only increases the tensile strength but also increases the compressive strength. By adding a recron fiber of low volume fraction exhibits little minute cracking and this reduces the permeability of the surface of concrete this leads to better durability property and resistance to corrosion.

Kim ET Al (2012) carried out impacts of metakaolin on lightweight concrete by various type fine aggregates. The materials used are three types of aggregates and two types of bottom and one type expanded shale. The effect of metakaolin and shale in the concrete such as workability, porosity, elasticity, compressive strength of lightweight concrete are mentioned. The Replacement ratio and aggregate size decides the metakaolin effects on the concrete during hardening properties. Metakaolin is a white fine powder of 2μm size and exhibiting the excellent esthetic quality when applied to the structural works. Metakaolin is an excellent cement replacement. Metakaolin is the mineral admixture which will increase the compressive strength and durability property of lightweight concrete. The fresh concrete workability drastically reduced with increased replacement of metakaolin to the concrete though the increase replacement of metakaolin increases the compressive strength and elasticity. By using the bottom ash the compressive strength increased up to 22.06%. By using shale aggregates only 7.9% in increase. SEM analysis of metakaolin provides the chemical composition of metakaolin and by referring to that binding nature can be decided. The concrete density for optimum mix attained 1790kg/m^3 and density of bottom ash concrete is 1651kg/m^3.

Rajesh ET Al (2016) in this paper experimental study on bendable concrete. ECC is a term generally denoted for bendable concrete whereas ultra-ductile in nature. The term ECC refers to engineered cementitious concrete thus absence of coarse aggregates in the concrete generally smooth in texture. This can expose high ductility and high flexural property. By adding fibers to the concrete with different replacement percentages of 10%, 20%, 30% and 40%. This varies in mixes gives different strength of hardening concrete properties. ECC is generally made up of low modulus of polyester fiber with suitable mix design. Recron fiber is generally considered as secondary reinforcement material. Because of his unique property of arresting crack and reduces the permeability in the concrete. Superplasticizer (commix SP1030) was used for better workability and also reduces the water consumption in mixing of fresh concrete. Thus by adding the superplasticizer not only decreases the water consumption and also increases the strength and density of the concrete. As volume of adding fibers increases workability may reduce and the concrete considered being uneconomical because cost of fibers is high. Therefore optimum mix is practiced to determine the compressive, tensile, flexural strength. Failure obtained in the ECC is a controlled manner because of crack controlling in nature. For M30 mix concrete 16.4% greater in compressive strength when compared to normal conventional concrete. 30% replacement with flyash and 3% replacement with fiber provide maximum flexural strength.

SagarGadhiya ET Al (2015) have experimented the parametric study on flexural strength of Engineered Cementitious Concrete. Normal conventional concrete in un- bendable in nature and only withstands strain capacity of only 0.1% and it makes brittle and rigid in nature. ECC is made up of uniformly distributed short random fibers and cementitious material (flyash, silica fume, steel slag, quartz powder). The type of fiber used in the concrete is polyvinyl alcohol fiber. This type of fiber is thin and slick coating which helps in to prevent the fiber from rupturing which will causes large cracking. The physical properties and chemical properties are determined by using XRD analysis and SEM analysis. It is important to know the physical and chemical properties of material used which will decides the binding property of the concrete .The fibers used in mix are steel fiber, glass fiber, ester group fiber. ECC has the character of 50% more flexible than normal concrete and 40% times lighter in weight. Because of this weightless character this concrete may greatly use in the skyscrapers, bridges and dams. The test results reveals that under loading the normal concrete fails in two parts whereas ECC only cracks appears in the surface of concrete it is concluded that ductile behaviour of the ECC. The compressive strength of the Engineered Cementitious Concrete was found to be higher when compared with normal conventional concrete.

CONCLUSIONS

Addition of fibers to the fresh concrete significantly increases the compressive, tensile and flexural strength.

The workability of fresh concrete decreases as increase the replacement of metakaolin, flyash and fiber to the concrete.

By adding fiber to the fresh concrete will greatly reduce the maintenance cost by avoiding the micro cracks and porosity

Bleeding and segregation is also reduced when recron fiber is added to the concrete

The replacement of cement with flyash and metakaolin increases the compressive strength and tensile strength up to 15%.

The Fibers adding to the concrete decreases the slump value and hence workability is also reduced

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