EFFECT OF POLYPROPYLENE FIBER ON CONCRETE

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Abstract: Concrete a homogeneous mixture of Cement, Sand, and Aggregate in addition to water plays the most vital role in the construction industry. Moreover this construction material has a wide range of research areas to improve its properties and performance in different loading and environmental condition. Entrainment of fibers in concrete is a more focused area in concrete technology. Fibers are inculcated in concrete to improve flexural and tensile performance as well as compressive strength. This paper represents the review of some literature identified during the study of the effect of polypropylene fibers on concrete. The use of polypropylene fibers improves the properties of hardened concrete as well as fresh concrete. This inclusion of fibers proves the ability of concrete to stand in adverse conditions of loading and environmental condition. It is more advantageous in repairs works and proves economic in cost analysis.

Keywords: Polypropylene fiber, Compressive strength, Tensile Strength, Flexural Strength, Cost Analysis.

I. INTRODUCTION

Concrete, the most widely used construction material, has a large scope towards the research area. Many researches are going on in the domain of concrete technology to develop the various properties of concrete. Among these all research works concrete with fibers has an important role in concrete technology. This variety of concrete which is developed by inculcating different fibers with identified proportions. In the family of fibers there are various categories of fibers such as, plastic fibers, glass fibers, asbestos fibers, polypropylene fibers, etc. Every category has its own identity when mix in concrete. Research shows that the fibers not only modified as asphalt but it affects their toughness and strength and load resisting capacity of structures.

In this paper the review on the effect of polypropylene fibers on concrete has been mentioned. During this study, it is observed that, polypropylene fibers mixed with concrete, is more beneficial for repair works as it modifies reinforced and bond with concrete mixture. This concrete shows stability in high temperatures as a crack resistance and water-resistant. This is applicable in the case of concrete pavement where crack resistance is required to be enhanced. The inculcation of fibers such as polypropylene and steel improves the fire resistance of concrete structures up to a sufficient extent. On the other side some effects due to polypropylene fibers on the performance of high-temperature concrete has been also observed. This effect is different for the different proportions of polypropylene fibers in the concrete and hence it is primarily required to identify the dosage of polypropylene fiber to be incorporated in concrete to know the strength and also the mechanical properties of polypropylene fiber concrete.

Researches have been carried out to identify the dose or the proportion of polypropylene fibers to be added in concrete so that it will meet the expectation of the researcher or the structural engineer. Every research shows the different proportions to use in different grades of concrete. This paper has represents the review of those research papers mainly work on the use of polypropylene fibers in concrete. That literature also specifies that the use of these fibers also affects the durability of concrete as it improves the resistance of concrete in different environmental conditions and also on the crack formation in concrete.

II. Literature Review

[1] Karththekeyan.T and Baskaran presented that the past decades the fiber has been used for reinforcement brittle material most of the time asbestos fiber is used. But it was declared as a harmful substance reinforcing a brittle Matrix with different fiber is an old concept. The modern era use of fiber it was the started from in early 1960 in that day only Steel fiber where it was found out the higher improvement occurs in this area at ductility and fracture toughness, as well as flexural strength increase, also reported the rules of the mixture was applied to observe the fiber contribution after some of the researches identified fiber reinforced concrete can be designed. To get the specific ductility for energy absorption even the pretend have been accepted since the turn of the century for a different method of reinforcing concrete with steel up to 1950 invent the Steel fiber reinforcement Technology was not concerned. Tell fiber has been in hands to some extent for the incorporation of concrete. Fiber reinforcement in the form of short different fiber so they act energetically as a rigid inclusion in the concrete Matrix. Substantially these behave like aggregate inclusion therefore the fiber reinforcement cannot be concluded are their substituents of horizontal reinforcement of reinforced or prestressed structural member. Whenever to improve the resistance of the least resistance traditionally reinforced structure member to filling the cracks deflection and other serviceability conditions using fiber reinforced in the concrete is the best option. As recommended by when the use of structural function polypropylene fiber reinforcement concrete should only be used as an auxiliary role to inhabit tracking register to dynamic loading and to resist material of decomposition in a structural member. Where flexural or tensile load will arise the reinforcing Steel must be able of supporting to tensile load.

[2] *Sukina Alzyoud Anf Ziadat* stated that to investigate the effect of fiber on forces mechanical mass concrete properties of fiber concrete. The addition of fiber to traditional and high accomplishment concrete had been applied effectively in sustainable construction, due to the reported improvement in the concrete properties. This paper is the part of exhaustive to experimental. On the effect of three most used fibers in the construction field (steel fibers, polythene and glass fiber etc.) on the concrete structure. At the same time it is the life cycle fresh concrete mixture containing different planted types and volume of fiber were tested for workability. Hardened concrete specimens subjected to house curing as well as conditioning approach simulating UAE construction site settings were tested for compressive splitting tensile and flexural strength. The transport properties were major then specimen to pressure day to study the extent dimensional distribution day interruption image analysis was utilized for fiber and that distribution.

[3] *Sandesh S Pandit1, Anuradha S Pansare2* stated that large scale load testing was done on both the plane and fiber reinforced concrete slab on the ground. The fiber reinforcement concrete used a new synthetic microfiber even if the synthetic fiber did not alter tensile tracking of the plain concrete Slab. It increases the flexural load of plain concrete slab almost 25 and 32% with the addition of synthetic fiber of 0.32% and 0.48% by volume respectively for the center loading configuration, similarly synthetic fiber at 0.48 % volume fraction increase the flexural cracking load at plain concrete Slab under edge loading 28%. The addition of 32-48% of synthetic fiber the large bearing capacity of concrete was increased. Fixed strain gauge in the concrete slab and deflection profile measurement indicate the fiber effectively distribute the load throughout this lab volume as cracking progressed, resulting in the increased concrete Slab flexural and ultimate capacity. The structural synthetic fiber of range of economic as well as safety-related benefit to the shot-creat industry worldwide. The advantages of fiber included the reduction of cracking and enhancement of ductility toughness impact resistance and elimination of the potential for enforcement corrosion in addition of the project also able to realize significant loss benefit and the result is reducing the labor as well as a reduced cracking and save the reinforcement cost of project or structure etc.

[4] *Chetan C Patil1, P. Shivananda2* In this experimental study if it has been analyzed the addition of fiber reinforcement concrete is much better than the plain concrete alone has many aspects. It is clear that the mix design ratio is playing a very important role in the properties of concrete especially on the strength. Therefor by analyses the test results mix design ratio of 1:1.5:3(M20) is approved to be stronger and gives more strength as compared to mix design ratio of 1:2:4(M-15) It is proved that the concrete mix made with1:2:4(M-15) does not give the same strength as that of 1:1. 5:3 (M-20)to gain the same strength of 1: 1.5:3 (M-20)in the mix design of 1:2:4 (M-15) clearly shows it's impossible still the strength has been gained in this experimental test and become desirable in the way. When additional material like polypropylene fiber is added and it has been shown that in this test the cement concrete of 1:2:4 mix gave almost the same strength as that of 1:1.5:3 concrete mixed. It was also analyzed after the testing concrete specimen that cube and cylinder made by mixing of polypropylene fiber Post crack ductility which is nearly impossible in plain concrete. Product or specimen it is observed that the specimen tested having fiber is strong enough since the fiber is gripped the whole concrete mix together. During this experiment concrete specimen have not been cured and tested for 90day. It is suggested and hope that the path will clearly work for the highest strength. If it is cured 90 days or even more it depends on results gained. It is also be suggested that polypropylene fiber reinforcement concrete should also be used whole high strength is desired. Basically saving cost and bearing economical solution.

III. CONCLUSION

From this study it could be clearly seen that low specific gravity aggregate, as well as coral type aggregate, was not a suitable element for concrete structure because of its high electrical resistivity and low compressive strength. According to this study of experiments, the strength of concrete increases respectively with increased in the volume ratio of polypropylene fiber the more strength value was seen in the volume of the ratio of polypropylene fiber. The presence of polypropylene fiber had caused a delay in starting the degeneration process by decreasing permeability, decreasing the amount of shrinkage and expansion of concrete that can naturally affect the life span of the structure. It is analyzed from the experimental investigation that the use of polypropylene fiber in the mix design of M-15 grade of concrete mixture gives the same strength as again by the cement concrete of M20 mix concrete. In this way we can use polypropylene fiber in concrete to make our structure an economical and obtain Maximum strength for the structure.

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