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An Experimental Study on Translucent Concrete

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Abstract: ***This experimental study of translucent concrete which has the property of transmitting light from concrete by using optical fibers. Since years concrete has a low impression because of its dirty greyish colour , opaqueness and sharp edge but this concept has been changed after the development of light emitting concrete, which gives the increased strength, better looks and light transmitting features. Plastic optical fibers are used because of its total internal reflection as its working principle as it gives maximum efficiency in transmitting light. This report deals about the introduction of translucent concrete, materials used for making translucent concrete such as fine concrete, cement, optical fiber and procedure of making is also discuss for translucent concrete. After the study of different research paper results respected to 5%, 10% and 15% replacement of aggregate with optical fiber is discuss in this study.***

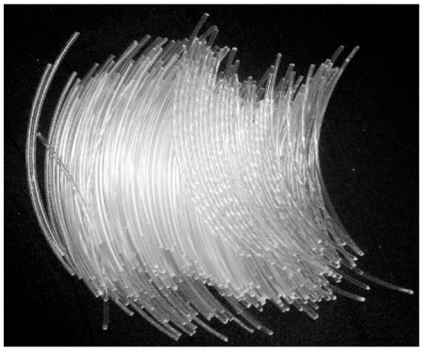
I. INTRODUCTION

Concrete has been used for transportation and residential construction since roman times but its fundamental features have remained the same. The dry mix is made up of three ingredients: coarse aggregate, comprising of larger bits of substance such as stones or gravel; fine aggregate, composed of finer fragments such as sand; and cement, a very fine powder substance that holds the mixture together when applied water. Only a few decades back, concrete was mostly mistaken, despised and caught due to the accelerated urbanization of the 1960s due to its face set. Yet concrete has made tremendous strides since then, not just in terms of engineering but also in terms of aesthetics. With global growth and the advancement of science-technology, more and more large structural engineering systems are being constructed around the world, such as tall towers, underwater towers, and landmark buildings, etc. although economic development is a kind of extensive development: high production, high consumption, and high pollution, energy-saving technology, particularly in developing countries, is very weak. The visibility of the indoor world is preserved solely by artificial illumination, which has expended a great deal of energy.

Translucent concrete is used as a exterior material in fire construction and for interior wall cladding. Concrete that transmits light was also added to various construction goods. There are many ways in which translucent concrete is made. They are all based on a fire grain concrete (about 95%) with just 5% light conducting components applied during the casting process. The concrete is cut to slabs or stones with regular equipment for removing stone materials after settling. Because of bends in the fibers and roughness on the cut surfaces of the fibers, light propagation is typically marginally less than half the incident light on the fibers, so only two percent despite five percent fibers. Although the reaction of the human eye to light is non-linear, this can also provide useful daylighting.



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Concrete has learned to respond to almost all new threats. In 2001, the idea of transparent concrete was first put forward at the Technical University of Budapest by Hungarian architect Aron Losonzi, and in 2003, the first transparent concrete block was successfully created by combining vast amounts of glass fiber into concrete, called LiTraCon. The translucent concrete relies specifically on clarity and its implementation purpose applies to green energy and decorative painting. This is the "combination of perfect concrete and optical fibers" Green buildings are increasingly heavily focused on saving electricity by indoor thermal systems. It is also imperative that a new practical material be created to fulfill the systems in terms of security control (such as hazard prevention, fire alert), environmental safety, energy conservation and creative modelling. The area between building is diminished due to globalization and development of high-rise structures; this leads to increased use of non-renewable energy sources, so smart design strategies such as green building and indoor thermal systems are required. Translucent concrete (Transparent Concrete) is a separate method from standard concrete. Instead of using electrical energy, the use of sunlight supply of light is the main aim of transparent concrete to reduce the burden on non-renewable sources and result in energy saving. Optical fibers are an aspect of sensing or transmitting, there by minimizing the use of artificial illumination, replacing the usual concrete with translucent concrete which has natural lighting.





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II. EXPERIMENTATION

Transparent concrete is manufactured by using a combination of fiber optics and fine concrete. These fibers turn into concrete-like other aggregates. These optical fibers can pass light from natural and artificial sources into spaces covered by translucent concrete panels.

The main reason for using optical fiber in concrete is that it can transmit light even at an incident angle greater than 60%. Optical fiber consists of three layers called core, cladding, and buffer coating or jacket. The light is passed through the core of the optical fiber.

Transparent concrete is manufactured using fine materials only. It does not include coarse aggregates. This type of concrete has a compressive strength like that of ordinary high-strength concrete around 70 MPa (10,000

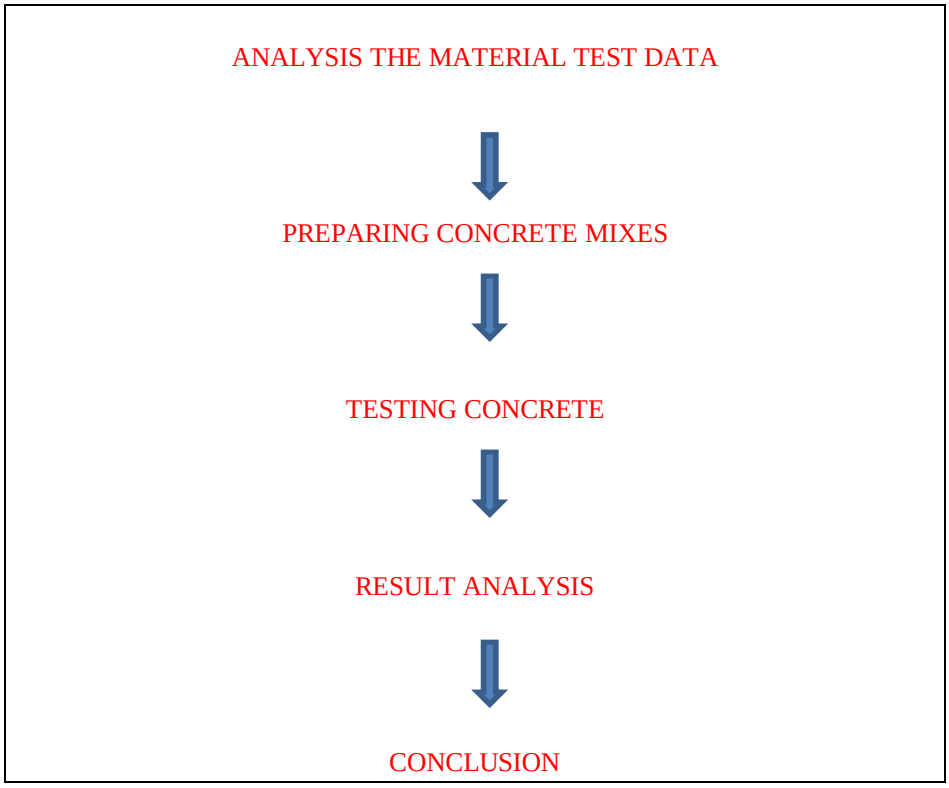
III. CASTING DETAIL

Moulds of wood or steel are prepared of rectangular size. Clay is placed on the sides for easy demoulding as optical fibers are exposed to the mould of wood or steel cuts in the optical fibers are such a way that they can be placed perfectly inside the steel or wood mould. The optical fibers are placed layer by layer. Also, holes are driven on wooden or steel plates to let Xthose fibers pass through the plates. The concrete mixture is then poured slowly, slowly with caution so that no disturbance is created to the optical fibers below transparent concrete void is prevented with the help of vibrating tables.

After one day, the mud is pulled off and before the mould is removed and then, cut the extra-long fibers to the same size as the thickness of the panel. The surface is then polished with the help of polishing paper or sandpaper, resulting in finishes ranging from semi-gloss to high gloss.

Compaction of all the specimen was done by using shake table vibrator. The top surface of concrete is levelled, finished smooth by using a trowel and wooden float. The specimen detail and date of concreting was specified on top surface to identify it properly. After six hours, all the concrete specimen were removed from the mould and placed in the curing tank for 3, 7, 28 days curing purpose. The various tests on the concrete ingredients that were required for the proper design mix were carried out separately and given by

IV. LINE DIAGRAM FOR VALVE

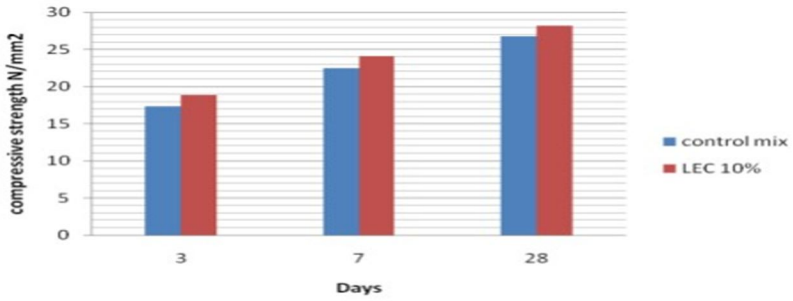


Flow Chart of the Study

A. Comparative Compressive Strength for 3, 7, and 28 Days

The compressive strength test result for M20 grade of concrete after 3, 7 and 28 days of curing is as given in below table.

S.No	Optical fiber percentage , %	Compressive strength		
		3 days	7 days	28 days
1	5	17.9	23.1	27.1
2	10	18.9	24.1	28.2
3	15	16.9	22.7	25.3



B. Observation

In this graph we can see that the compressive strength of control mix at 7 days for M20 Grade is minimum than 10% to 20% replacement of cement by glass powder. But the compressive strength of control mix is maximum than 30% to 40% replacement of cement by glass powder. Hence from this graph of 10% replacement of cement by glass powder gives 1.06 times more compressive strength at 7 days than control strength at 28 days than control mix.

Hence we can concluded that 10% replacement of cement by glass powder gives maximum strength.

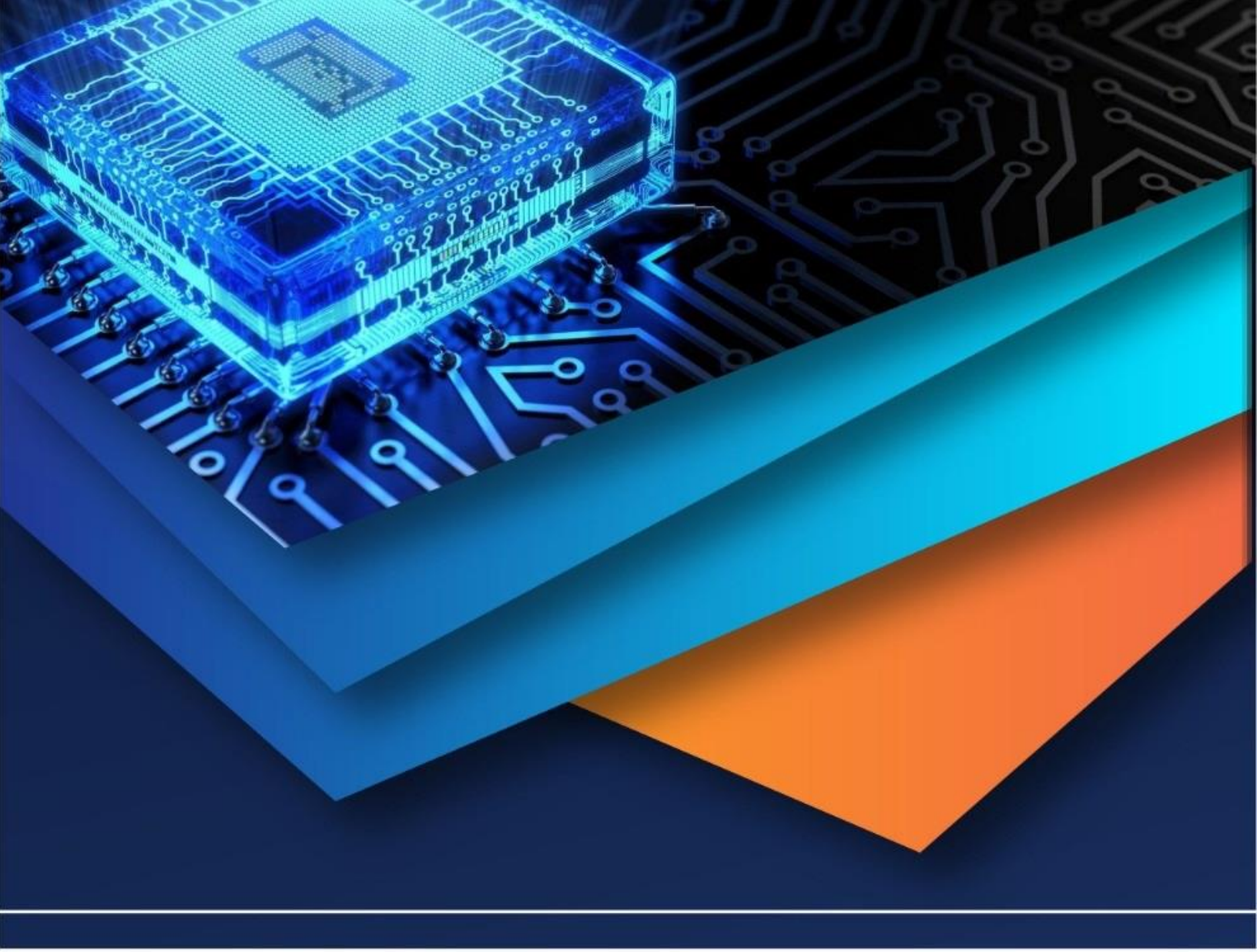
V. CONCLUSION

The basic objective of the study is to prepare a concrete with better appearance and increased in strength. Mix designs for light emitting concrete materials has done and a total of 9 specimen are prepared and tested in the aspect of strength calculation and also comparisons has done. The compressive strength of light transmitting concrete is greater than that of conventional concrete up to some certain limit, beyond that limit the compressive strength goes on decreasing with increase in the volume of optical fiber.

1) The highest compressive strength occurs at optimum 10% of fibers with 18 strands at 4 positions.
2) Its initial cost is high. But, the routine maintains is required and long run it may be advantageous. In fact it worth the cost.
3) It's a green building material reducing the lighting cost during day time. Its proved to provide both aesthetic appearance and structural stability.
4) In future the cost is expected to decrease
5) The highest compressive strength occurs at optimum 5% of fibers with 18 strands at 4 positions.
6) The maximum strength is obtained at 10% of optical fibers.
7) This gives stronger, attractive, energy-efficient, and eco-friendly green building material

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