

REVIEW ON LIGHT TRANSMISSION AND STRUCTURAL PERFORMANCE OF TRANSLUCENT CONCRETE

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Abstract-- Concrete is a bonding material and in present phase is used in the construction field. It normally consists of mix proportion of cement, sand and aggregates i.e, (fine or coarse). Traditional concrete being a solid construction material is being getting renovated. Now engineers approach towards new concept of mixtures which will allows light to pass by using optical fibers. Optical fibers having property of light transmission are used in concrete to make concrete transparent also known as translucent concrete. Fibers are placed horizontally that causes light transmission in two opposite sides of sample block. The main function of this project is that we develop transparent blocks of concrete with use of P.O.F'S and to get maximum use of sunlight so that to reduce the power consumption for green and smart building construction. The tests which were carried out are compression strength, flexural strength, light transmission, workability test.

Keywords: Light Transmission Concrete (LTC), Plastic Optical Fiber (POF), Concrete, Workability, Light Transmission Test, Energy saving, Lux Meter, Architectural.

INTRODUCTION

In every field we made some advancement in technology like we did in construction field. We require materials that fulfill the required need of building occupants. So as a result concrete has been renovated from its basic elements cement, sand, aggregates by adding optical fiber that is known as translucent concrete also known as transparent concrete. Today the whole world is dealing with energy crisis and expenses and have a lot of environmental issues growing to a very high level. Optical fiber having property of light transmission from both parallel sides in order to minimize the consumption of power inside the building to a large scale. The shape of the optical fiber is cylindrical dielectric wave length using phenomena of total internal reflection passing through its own axis. When we are dealing with the external structure that are in contact with the external environmental effects like rain, snow, wind there could happen serious damage or casualties. So we have to keep all these things in one's mind when we develop structures. To minimize these issues we have different material known as pellucid or transparent concrete which can transmit different feature in concrete and has energy saving as well as economical in use. It is brand new, most significant and compendious segment in energy efficient buildings.

Main aim of casting translucent concrete blocks is to analyze the quantity of light that is transmitted and to check the compressive strength by putting different percentage of fiber strands.

LITERATURE STUDY

1. Aron Lasanczi (2001) :- Hungrain architect aron was the first who developed the pellucid concrete in 2001 at The Technical University of Budapest. The fiber cables are set into the sample of concrete for illumination transmission through both natural and artificial pellucid panels. The fiber impart light accordingly that there is very less or almost no loss of light managed along the fibers.

2. Zhi Zhou et al (2006) :- according to this the performance of light that is transmitted and surface roughness in certain sections of concrete is being determined with the help of inbound fiber area ratio. A specific exhibition rather than just a construction material POF is based pellucid concrete is an art crafted in museums also for aesthetic view.

3. Jianping Heetal (2011):- In the study by varying the quantity of fiber put an influence in total compacting strength of sample and will also reduced the anti permeability by using POF in concrete. The evaluation of effectiveness of concrete depends upon the POF volume ratio with respect to concrete of its light passing property.

4. Varsharainat (2013):- Construction of eco friendly buildings in modern times and energy consumption for decorative purpose. We use conventional natural lighting origin to minimize electricity usage by using optical fiber cables or strands which lead to green concept of energy.

5. Prof AA Momin et al (2013):- Studies indicate sample carrying fibers in it having varying proportion; comparison is done with concrete without using fibers. With the help of this experiment it predicts the strength of concrete using fibers ranging

25 to 28n/mm². It can satisfy for M30 grade of concrete. So, we can conclude that light can be transmitted in concrete without any effect on its strength.

6. *Dr . Bhavnaben K. Shah*:- studied, the investigation regarding different sizes or diameters of fiber in concrete. The basic function of this study was use of natural light in order to decrease the level of glow. By using fibers so that it can access the implementation regarding load at different points and in terms of aesthetical point of view.

7. *Shekar D. Bhole*:- In this study, researcher investigates about the property of concrete being translucent. The study was based upon the utilization of sun rays as main source to reduce the power factor of glitter. It shows about mechanical features of concrete attached to optical fiber.

8. *Avik Dutta* :- Talking about the characteristics of translucent concrete, the researcher restricts his field study with respect to method of reinforcement concrete in such a manner it can be performed on site so that it can bear load in a given structure. He came up with the idea translucent concrete having efficient light travelling quality its correlation of fiber capacity to concrete were proportional to emission.

9. *Akshaya b.kamdi (2013)*:- suggested, that how this translucent concrete construct and its enthusiastic upcoming future. The conclusion of his study is that it is among the most fascinating and can be used on historically rigid and unincline building construction matter.

10. *P.M.Shanmugavadivu (2014)*:- The study is related with the efficiency of optical fiber, comparing compressive strength with normal specimen of grade M20 and it is proved by the test performed that efficiency increases in almost in every aspect.

11. *Patil Swapnal V and Patil Gaurao S(2015)*:- “Light transmission concrete”, (IJER). Volume-3, ISSN: 2091-2730. The researchers studied that the translucent concrete is having better illumination, and possessing properties of both self sensing and mechanical. The conclusion they gave was based on the transparency and its aesthetically beautiful nature and its use in museums not just being used as a building construction.

12. *B. Sawant (2014)*:- (LTC) by using plastic optical fiber ,(IJIES), Volume-3. Researcher focuses upon the cost effectiveness, strength and illumination capability. He has noticed that, in this modern age of construction we have high rise buildings around us very close to each other due to lack of availability of land and this creates a problem in achieving solar light in the buildings. So in order to minimize this problem utilization of artificial lighting of structures is swelling up.

1. Graphs showing different results.

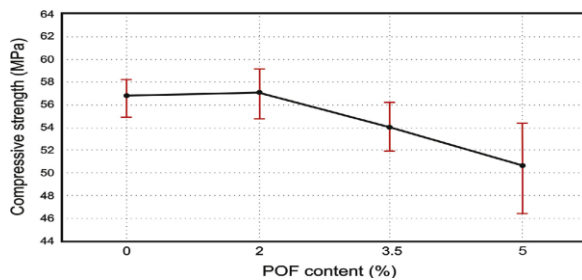


Fig. 1 Average compressive strength of sample with and without fibers at 28 day

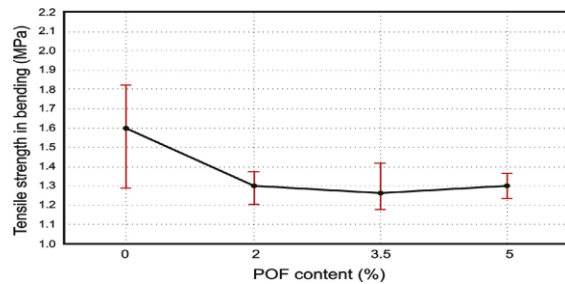


Fig. 2 Average flexural strength of sample with and without of fibers at 28 day.

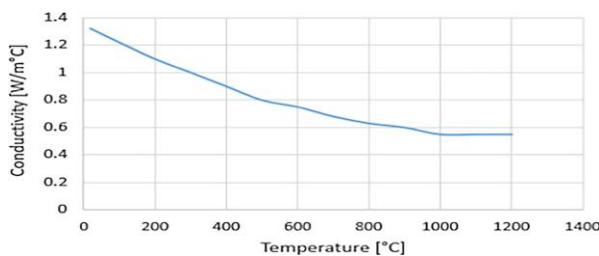


Fig.3 Thermal conductivity of concrete as function of temperature

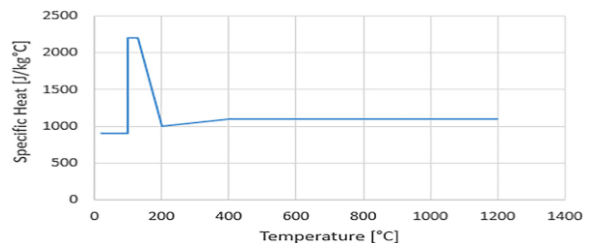


Fig.4 Specific heat of concrete as function of temperature

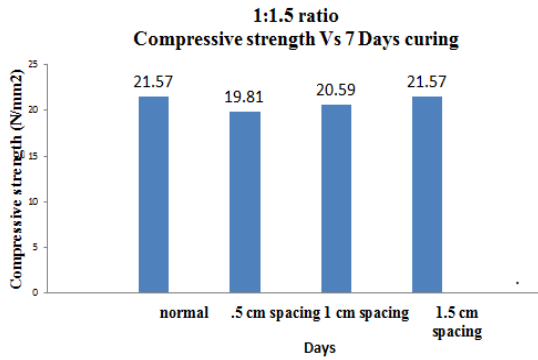


Fig.6 Strength comparison of 1:1.5 ratio Normal concrete with translucent concrete

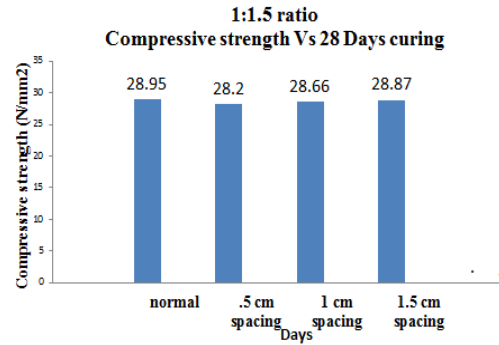


Fig.7 Strength comparison of 1:1.5 ratio Normal concrete with translucent concrete

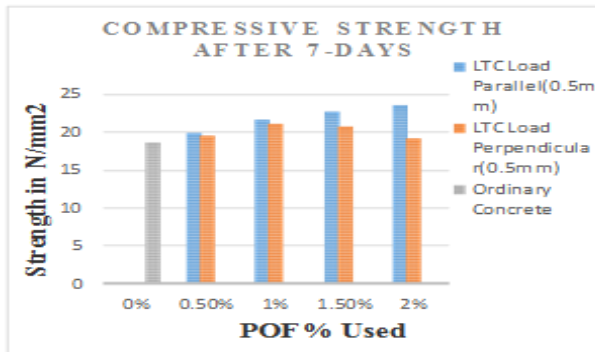


Fig.8 Compressive strength of concrete with 0-2% POF after 7 days

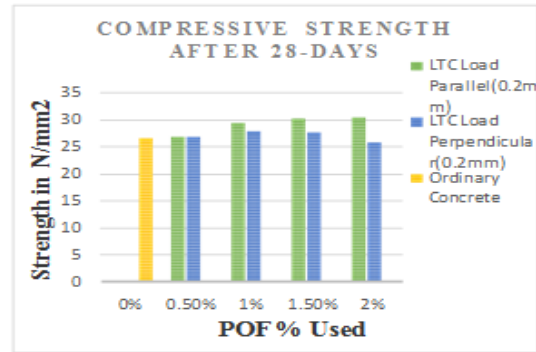


Fig.9 Compressive strength of concrete with 0-2% POF after 28 days

CONCLUSION

Concrete blocks with optical fiber can have a large scope in the construction field in different manner and is very preferable. We should work on the compressive strength and light transmittance of the transparent concrete block. Being an economical in physical state does not mean that designers are not going to explore it in their projects. We should work on the percentage of fibers, if it increases strength decreases i.e, more light passes through .5mm dia than .2mm dia. So we have to select the most favourable percentage of optical fiber cables used in sample for better transmission of light also.

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