

“Design and Experimental Study on Transparent Concrete”

Ankita B. Meshram¹, Prof. Dilip L. Budhlani²

¹PG Student, Department of Structural Engineering, Guru Nanak Institute of Technology of Nagpur, Maharashtra, India

²Assistant Prof. Department of Civil Engineering Guru Nanak Institute of Technology of Nagpur, Maharashtra, India

Abstract –Due to globalization and construction of high rise buildings result in the obstruction of natural light in buildings. Because of this problem, use of artificial light has increased in great deal and energy is consumed in large amount. Thus, it becomes necessary to scale back artificial light consumption in structure. This results in the introduction of innovative concrete, Transparent concrete. Transparent concrete is fiber reinforced concrete which is employed for aesthetical application by inserting the optical fibers in concrete. Both natural and artificial light passes through the transparent concrete due optical fibers reflection property. This sort of concrete gives pleasing aesthetics to structures and energy saving construction material. Light-transmitting concrete can plays a crucial part in construction and environment fields.

Key Words: Transparent concrete, Optical Fiber

1. INTRODUCTION

Transparent concrete or Light transmitting concrete or Translucent concrete is a concrete which transmitting light through it by using optical fiber. It is a material which makes green building and provides pleasing appearance to the structures. Conventional concrete is formed with the mixture of cement, fine aggregate, coarse aggregate and water which is unable to transmit lights. Transparent concrete is formed with cement, fine aggregate, coarse aggregate and water with optical fibers reinforced in concrete from one face to another which guide the light passing through it following the reflection property.

2. LITERATURE

Prof.Sonali M.Kankriya. “Translucent Concrete By using Optical fiber and Glass rods” within the present paper, author compare the compressive strength of optical fiber reinforced transparent concrete and glass rod reinforced concrete. Cost of optical fiber and glass rod reinforced concrete is additionally compare and concluded that the compressive strength of transparent concrete is reduced to some amount and thus it’s applicable for mainly partition wall instead of structural elements like column and beam. The initial cost of transparent concrete is more as compared to standard concrete but thanks to continuous increase in tariff and payback calculation done,

from the payback analysis it are often concluded that the saving of electricity bill is Rs.1368.58/- therefore the payback period for excess amount invested for light transmitting block will be 1.00 years for domestic consumption and 0.72 years for commercial and industrial consumption. The quantity of carbon emission from transparent concrete is a smaller amount.

Soumyajit Paul and Avik Dutta. “Transparent Concrete”

Author Casted and analyze special kind of concrete with light Trans missive properties, to study their characteristics. They worked on transparent concrete with different percentage of optical fiber (1to 6%) and large diameter of glass fiber. The invention has greater mechanical strength properties as compared to conventional concrete with lower density and mechanical characteristics that enable same to be utilized in both structural and architectural manner. This paper concluded that the transparent concrete has good light guiding properties and the light transmission is directly proportional to the amount of optical fiber. This concrete does not lose strength parameter when compared to conventional concrete and also it has very vital property for the aesthetical point of view.

Abhishek Tiwari and Parmod Saharan(2016). “Study of behavior of translucent concrete is using Rice Husk and Steel fiber” In these papers study, experiments was conducted and compression strength of light-emitting concrete was compared with conventional concrete. The optical fiber results in decreasing the compression strength, to increase this strength, steel fibers and risk husk were added in the concrete. Rice husk is high in the percentage of silica about 85-90% silica content. The Rice husk use in fine cracks in civil structures. Steel fibers were used to improve resistance to impact loading and also resist material fragmentation. In the given experiment transparent concrete with addition of Rice husk Ash and 0.125% of steel fiber. The percentage of glass fiber utilized in the paper varies from 0.25% to 4% and compare the compressive strength of concrete. It concluded that as the percentage of optical fiber increased the compressive strength of concrete decreased but by the addition of Rice hush ash and steel fiber strength of concrete is increased.

Salmabanu Luhar and Urvashi Khandelwal (2015). "Compressive strength of Transparent Concrete" during this paper, the author investigated the compressive strength of transparent concrete so on to utilize transparent concrete for construction of green buildings. Three cubes of size 7cm*7cm*7cm were casted out of those two were control concrete and one was of transparent concrete. The plastic optical fiber of diameter 1mm were embedded in it and were distributed in horizontal direction equally at distance of 8mm. they constituted 1% volume of concrete cube. Each cube was separated by perforated plates. The optical fibers were passed through the holes of those perforated plates. Before filling these cubes with concrete, they were coated with oil, sin order that the cubes wouldn't adhere to the mould. The compressive strength of the cube was acknowledge using compression testing machine and concluded that the compressive strength of transparent concrete is analogous thereto of control concrete. The investigation shows that transparent concrete can reduce the electricity bills without compromising the strength of building.

Kavya S, Karthik D, Sivaraja M, (2016), "An Experimental study on Light emitting Concrete" This project deals with light emitting property of concrete by using optical fibers. The project study not only includes aesthetical consideration but also strength property of optical fibers in concrete by increasing the percentage of fibers from 2.5% to 5.5%. The deflection in concrete has been determined by software. The application of this concrete is energy saving. This project results show that optical fibers can be easily combined with concrete and thus the optical fibers will provide steady light emitting ratio. This project also shows the mechanical effects by introducing optical fibers into concrete. This concrete are often considered as a green energy saving concrete. The compressive strength of light emitting concrete is seen increase with increase in percentage of fibers optic content up to 4.5% and flexural strength of this concrete is also tends to increase in strength up to 4.5%. As the construction, maintenance and operation of the built environment undergoes significant change based on demands in lower energy consumption, low CO2 emissions higher durability and long lasting quality, the building industry is delivering with innovative solution in new construction methods and technologies. This concrete makes use of more opportunities for brand new emerging products and construction methods. This research experiment are going to be series of initiatives to seem closely at new and emerging advanced construction in future.

Riya A. Gite and Shilpa Kewate. (2017) "Transparent concrete; An Experimental study." In this paper, the concrete specimens are casted by reinforcing optical fibers in hollow stainless-steel pipe of diameter 5mm with

different percentage. Replacing fine aggregate with glass crystals in different percentage and then combining both the materials together and compare it with conventional concrete. Fine aggregate are replaced by glass crystals by 10%, 15%, 20% and 25% in order to reduce the cost of transparent concrete. Glass crystals enhanced the use if waste product and make the concrete environmental friendly. In this study, the mix design of M30 concrete is adopted. Optical fibers are reinforced in to the concrete by 0%, 2%, 4%, 6% and 8% based on surface area. Different test like compressive strength test, split tensile strength, Flexural strength and light transmitting test were carried out on specimen. The result evidently shows that as the percentage of optical fiber increase the strength also increase. Use of glass crystals also shows a slight reduction in cost as compared to transparent concrete and the combination of optical and glass crystals' in concrete gives the prime result as per aspects.

3. CONCLUSIONS

The above research paper gives the following conclusion.

An innovative material called transparent concrete can be established by introducing optical fiber in concrete mix. The Translucent concreter has good lightening property and gives greatest architectural appearance to structures. Transparent concrete can be used in areas where natural light cannot be reach with required intensity. It can create ecofriendly construction that reduces the energy consumption of project.

The strength parameter of transparent concrete is observed to be same as the conventional concrete It was observed that strength of transparent concrete found to be increase till 4% optical fiber and then decreases.

As per discussion, cost of transparent concrete is high but cost is justified because of its advantages and energy saving.

REFERENCES

- [1] **Prof.Sonali M. kankriya.** "Transparent concrete by using optical fiber and glass rods." International Journal of Scientific and Research publications, Volume 6, Issue 10, October 2016, ISSN 2250-3153
- [2] **Soumyajit Paul and Avik Dutta.** "Transparent Concrete" IJSRP, Volume 3, Issue 10, Oct 2013. ISSN 2250-3153
- [3] **Abhishek Tiwari and Parmod Saharan.** "Study of behavior of Translucent Concrete using Rice Husk and Steel Fiber" International Journal of Civil Engineering, Volume 3, issue 7, July 2016, ISSN: 2348-8352.

- [4] **Salmabanu Luhar and Urvashi khandelwal.** "Compressive strength of Translucent Concrete" IJESSET Volume 8, issue 2, September 2015, ISSN: 22316604
- [5] **Kavya S, Karthik D, Sivaraja M.** "An experimental study on Light emitting concrete", International journal of Advanced Research in education & technology, Volume 3, issue 2, April June
- [6] **Riya Gite and Shilpa Kewate.** "Critical study on Transparent Concrete", International Journal of Scientific & Engineering Research, volume 8, issue 3, March 2017, ISSN: 2229-5518