

# “Transparent Concrete Is a Modified Concrete by Using Fiber Optic”

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**Abstract-** This article deals with the usage of translucent concrete and also the advantages it brings in the field of smart construction, that it can reduce the power consumption of illumination and use the optical fibre can be made to sense the stress of structures and this concrete as an architectural purpose for good aesthetical view of the building. This project seminar deals with the modeling of such translucent or transparent concrete blocks and panel and their usage and also the advantages it brings in the field. The main purpose is to use sunlight as a light source to reduce the power consumption of illumination and to use the optical fiber to sense the stress of structures and also use this concrete as an architectural purpose of the building. Translucent concrete is a concrete based material with light-trans missive properties, obtained by embedding optical fibres in it. Light is conducted through the fibre from one end to the other. This results into a certain light pattern on the other surface, depending on the fibre structure. Sometimes we do not realize in how many cases and various ways concrete is used in towns and cities. As we know, human curiosity and quest for newer and newer solutions and capabilities does not leave such amazing material as concrete alone. There are many varieties of concrete, depending on what people want to achieve. By changing its chemical composition, technological process and adding various other materials, we receive various types of concrete. We use them to create durable supporting structures, a variety of concrete which is resistant to constant moisture or different chemical types. Additionally, some aspects of aesthetics in architecture are made with the help of concrete..

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## I. INTRODUCTION

Today we are living in a world where energy expenditure and environmental problems have escalated to global scale. In today' s developed world our built environment takes energy; energy to make the materials that go into the buildings, energy to construct them (Embodied energy) and energy to heat, cool & light them (Operating energy). Countries with great population have buildings to be ratio higher than that of small population. Those buildings are isolated biosphere only based on manmade lights to maintain people's optical activities. For example, India consumes 20% of total electrical energy for lighting the buildings. At present, green structures are greatly focusing on saving energy with indoor thermal systems.

### A. Conventional Concrete

In the broadest way concrete is defined as a uniform mixture of cement, sand, aggregate and water in prescribed proportions, which sets, hardens and acquire strength over a period of time. The concreting operation consists of measuring the ingredients, mixing them to obtain a uniform mixture, placing the concrete in the moulds, known as form work, compacting allowing setting and then curing for appropriate period, generally 28 days, by keeping it constantly moist.

### B. Transparent Concrete

Hungarian architect, Aron Losoncz, first introduced the idea of light transmitting concrete in 2001 and then successfully produced the first transparent concrete block in

2003, named LiTraCon Translucent lightweight Concrete is a new material with various applications in the construction field, architecture, decoration and even in furniture industry. In today' s time where whole of the research is concentrated towards non utilization of natural resources as much as possible and to reduce its consumption which are decreasing with time, Lightweight LiTraCon. The strength of concrete, its durability and usability are systematically modified so that the buildings made in this technology can be higher, with larger span, and prolonged period of their use. Although it seems that theoretically everything that a man could build has already been invented, yet new possibilities are still emerging. One of the ideas is to create a material with a bearing capacity of concrete and translucency of glass. The composition and technology of such a material and possibilities of its usage were created by a Hungarian designer Aron Losoncz. His purpose was to obtain a construction material with transparent properties of glass. The combination of conventional concrete with a very expensive and technologically advanced fibre-optic material resulted in an amazing effect. The only one, but unfortunately very big disadvantage of this material is the price, which has limited its spread and narrowed the field of applications which are available only for the richest.

## II. OBJECTIVES

1. Transparent concrete blocks suitable for floors, pavements and load-bearing walls.
2. Facades, interior wall cladding and dividing walls based on thin panels.

3. Partitions wall and it can be used where the sunlight does not reach properly.
4. In furniture for the decorative and aesthetic purpose.
5. Light fixtures.
6. Light sidewalks at night.
7. Increasing visibility in dark subway stations.
8. Lighting indoor fire escapes in the event of a power failure.

### III. "ORIGIN AND DEVELOPMENT OF FIBRE OPTIC"

Concrete is a composite made from aggregate, water and binding agent which is cement. By using certain additives concrete parameters can be changed in order to obtain a specific texture, desired weight, bearing capacity or colors. Currently concrete is the most popular building material. Annually about 5 thousand Articles on concrete are published every year. This is primarily due to the possibility of developing different forms. In addition, concrete as a building material has very good load-bearing parameters which affect the variety of applications in different structures. The first use of concrete dates back to Roman times. One of the largest ancient structures made from concrete is the Pantheon's dome which is over 43 meters in diameter, weighing more than 5,000 tons. The history of concrete development as a building material and types of structures which can be created from concrete .

#### A. Materials Used

- a. Ordinary Portland Cement of 53 Grade.
- b. Manufactured Sand of pertaining Sieve size (<4.75mm) as per IS standards.
- c. Glass Rods 0.5 mm in Diameter are used for casting transparent concrete.

#### B. Methodology

Preliminary tests were conducted on the normal conventional concrete materials as per IS standards & specifications for its physical & engineering properties, cubes were casted in the standard metallic moulds & vibrated to obtain the required sample size of specimen. The moulds were cleaned initially and oiled on all the sides before concrete sample is poured in to it. Thoroughly mixed concrete is poured into the moulds in three equal layers and compacted using vibrating table for a small period of 5 minutes. The excess concrete is removed out of the mould using trowel and the top surface is finished with smooth surface.

The manufacturing process of transparent concrete is same as of the regular conventional concrete blocks with the Only change is glass rods are spread throughout the fine aggregate and cement mix & Small layers of the concrete are poured on top of each other and infused with the rods in the wooden casted box. Light transmitting concrete is produced by adding 1%, 2%, 3%, 4% & 5% of glass rods by weight into the concrete mixture, the translucent concrete mixture is made from fine aggregate materials only & does not contain coarse aggregates.

*The main aim of the methodology is to-*

- To calculate the compressive strength of M25 grade plain concrete & translucent concrete by laboratory experiments as per IS specifications.
- To calculate the Split tensile strength of M25 grade plain concrete & translucent concrete by laboratory experiments as per IS specifications.
- To calculate the Flexural strength of M25 grade plain concrete & translucent concrete by laboratory experiments as per IS specifications.

#### *Tests (physical properties) conducted on Concrete materials*

##### ↗ **Test on cement**

- Fineness of cement.
- Normal Consistency of cement.
- Soundness test.
- Specific gravity.
- Initial setting time of cement.
- Final setting time of cement.

#### *Test on fine aggregates – Manufactured sand (Size <4.75mm)*

- Specific gravity and Water absorption test.

#### *Tests (Engineering properties) conducted on Transparent Concrete*

##### ↗ **Test on Transparent concrete**

- Slump test.
- Compaction factor.
- Vee Bee consistometer.
- Compressive strength of concrete.
- Split tensile strength of concrete.
- Flexural strength of concrete.

### IV. ADVANTAGES

- Resistant of compression - 50 N/mm<sup>2</sup> and bending - 7 N/mm<sup>2</sup>
- Blocks may have different dimensions (even 30 x 60 cm)
- May be construction material which allows to build several meter high walls with light transmitting
- Changes in the intensity of light, referred as "light information", are transferred from the brighter side of the wall to darker side without major changes (including colour), due to the parallel arrangement of the fibres
- Reduction of energy due to the penetration of daily light into the object

### V. DISADVANTAGES

- compressive strength is classification as standard
- square meter thickness of 2.5 cm costs about 750 euro
- available only in the form of ready, it can't be made on the building site

## VI. CONCLUSION

Based on result analysis it could be concluded that:

- It will also reduce the carbon emission which is hazardous for environment & can be treated as one of the high performance concrete.
- The transparent concrete made with glass rods finds its applications mainly in partition wall rather than structural element such as columns and beams.
- The main advantage of translucent concrete is its lightweight which reduces the self-weight of any concrete structure & also can be used as decorative concrete in interior design of buildings as panels in slabs, walls etc.
- From the above study, it can be concluded that the Optical fibers can be used in concrete mix up to 5% replacement will give an excellent results both in strength & quality aspects.

## VII. FUTURE SCOPE

Following are the points which can be considered for future scope of floating concrete:

1. Transparent concrete is the most attractive material for many infrastructure.
2. Transparent concrete is great insulating material that protects against outdoor extreme temperature while also letting in daylight.
3. It can be used to illuminate underground building and structure, such as speed bumps that could be lit” , from below to make them more visible at night” , or to light indoor fire escapes in case of a power failure.

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