

**STUDY ON VARIOUS ASPECTS OF TRANSLUCENT CONCRETE**Mohit Baruwala<sup>1</sup>, Dr. Kaushal Parikh<sup>2</sup><sup>1</sup>Post Graduate Student, Structural Engineering, GEC Dahod, Gujarat, India<sup>2</sup>Head, Applied Mechanics Department, GEC Dahod, Gujarat, India

---

**ABSTRACT:** *Translucent concrete is concrete based material with light trans missive properties, obtained due to embedded light optical element like fibers in it. Light is conducted through the stone from one end to other end. These paper deals with the properties of fibers, characteristics compressive strength of translucent concrete and also the advantages it brings in field of smart construction.*

---

**KEY WORDS:** *Translucent concrete, optical fibers, compressive strength, energy saving, architectural.*

---

**I. Introduction**

In 21st century a small buildings are replaced by high rise buildings and sky scrapers; so there is need of advancement in construction techniques and construction material to full fill the requirement of healthy buildings. As a result concrete is upgraded from usual concrete made of cement, sand, aggregate to the concrete additionally made of fiber known as translucent concrete. In, 2001 the concept of translucent concrete was first put forward by Hungarian architect aronlosonzi. The translucent concrete is also known as transparent concrete.

There are two basic materials used for making transparent concrete, one is from construction field and another from sensing field. First, concrete is one of the most important civil engineering materials with the advantages of rich raw materials, low cost and simple production process and second the optical fiber has good light guiding property which can be arrange to transmit the light and the sun light transmit according to pre-design road without light-heat, light-electrical or photochemical process, and photo elastic effect which can be used to study the stress distribution of structures. Combining the advantages of the concrete and optical fiber, developing a novel functional material known as transparent concrete has an important value in the application of construction and sensing.

Natural sunlight is the best source for light which is actually free of cost. With translucent concrete walls in a room, it'd be brightly illuminated with natural sunlight. It's a requirement for green buildings; therefore it's a very good advantage for them. These optical fibers also work as heat insulators, so they are very effective in cold countries, thereby reducing energy and saving lots of money in both the cases. As mentioned above, translucent concrete can help add a great deal of security and supervision in places like schools, museums and prisons etc, where the presence of the people and their actions are seen but not their entire image, thereby protecting their privacy as well.

**II. Literature review**

Dr. Bhavnaben K. Shah [1] Studied, the integration of merits of concrete and optical fiber, for developing transparent concrete by arranging the high numerical aperture Plastic Optical Fibres (POF) or big diameter glass optical fiber into concrete. The main purpose was to use sunlight as a light source to reduce the power consumption of illumination and to use the optical fiber to sense the application of stress of structures and also use this concrete as an architectural purpose for excellent aesthetical view of the building and other structures.

SHEKAR D. Bhole [2] worked on translucent concrete. The main purpose of the investigator was to use sunlight as a light source in order to reduce the power consumption of illumination. Author studied the mechanical performance of the concrete infused with OPTICAL FIBRE.

AVIK DUTTA [3] Along with the translucent characteristics, the author confined its area of study towards the reinforcement method of this type of concrete such that they can be practically implemented as a load bearing structure. This new kind of building material can integrate the concept of green energy saving with the usage self-sensing properties of functional materials and he concluded that The translucent concrete had good light guiding property and the

ratio of optical fibre volume to concrete was proportion to transmission. The translucent concrete not loses the strength parameter when compared to regular concrete and also it has very vital property for the aesthetical point of view.

Dr. S. Krishnamoorthi [4] investigated the behaviour of concrete and mortar with optical fibre. Author casted Concrete and mortar cube with fibres to study the properties and he compared the compressive strength between normal mix concrete with optical fiber and normal mortar with optical fiber after 7 days, 14 days and 28 days respectively. The compressive strength of concrete samples made with different fiber amount varies from 2% to 4% were studied. The compressive strength of translucent concrete was seen to increase with the increase in fiber content. He concluded That samples with fibers of 4% showed better results in comparison with the others.

Simonetta L. Pagliolico [5] studied the potential reuse of coarse glass wastes as insert in a high performance cement matrix to produce translucent concrete panels for architectural applications such as interior walls. The effects of the addition of glass scraps on chemical and optical properties of concrete were studied by author. Alkali-silica reactivity resistance tests were carried out to evaluate the reactivity between amorphous waste glass and alkaline concrete pore solution. Light transmittance LT was evaluated through Radiance simulations and measurements on sample prototypes. The author studied increase in the amount of daylight in a sample room and the reduction in the energy demand for lighting EDI were investigated through Daysim simulations. Compared to two opaque side walls, the use of two translucent concrete walls with a LT of 5% allowed a reduction in EDI up to 16% in Palermo (L=38.3°N).

A. B. Sawant [6] done the compressive strength Testing of translucent concrete cubes in Compression Testing Machine of 2000 KN capacity to determine the compression strength of design mix M30 after testing of cubes at 7 days, 14 days and 28 days author concluded the compressive strength of Translucent Concrete (4%) was reduced by 30%, 20%, 18% for 3days, 7days and 28days respectively that of conventional concrete. For achieving golden mean between compressive strength and percentage of optical fibbers laid in cube, trial cubes with different percentage of fibers ( 1 % to 5%) were casted.

Prof. A.A. Momin[7] had done experimental study of producing the concrete specimens by reinforcing glass rods and optical fibers with various percentage and comparing it with the normal concrete. Different tests were carried out on the concrete specimens by him like compressive strength test, light transmission test etc. he concluded that The compressive strength results obtained for the specimens with optical fibers was almost same as that of normal concrete specimen. The transparency of concrete specimens with glass fibers was found to be more as compared to the specimens with glass rods, for which the compressive strength of the latter was more than the normal concrete specimens, which clearly indicates that without affecting the strength transparency of light was possible in concrete which enhances the architectural view. After the experimental investigation, author concluded that The compressive strength of Light Transmitting Concrete was found to be ranging between 20 – 23 N/mm<sup>2</sup> with optical fiber specimen and with glass rods specimen the compressive strength was found to be ranging between 24-26 N/mm<sup>2</sup>, which indicates that the concrete satisfies the compressive strength requirement for M20 grade concrete.

### **III. Conclusion**

Based on studies of various research paper following conclusions are drawn

- According to various researches it is concluded that, on usage of 4% of optical fibers the compressive strength increase. The compressive strength of concrete cube depends on diameter of the holes in the mould and the diameter of the optical fiber and it is directly proportion to its compressive strength
- Translucent concrete is best option for green building concept as it is heat insulator as well as thermal insulator which maintain room temperature without being affected by external temperature.
- The ratio of optical fiber to concrete is proportioning to the light guiding property.
- Translucent concrete can be use as interior panel of slab and walls.
- Transparency property of translucent concrete is not affected the chrecteristics strength of translucent concrete.
- The transparency of concrete specimen with glass fiber is more than the transparency of concrete specimen with glass rod.
- Weight of translucent concrete is same as conventional concrete. It can be use in many ways and de highly advantageous due to power saving. That's why green building would get an easy accreditation.
- Translucent concrete is smart way of architectural & aesthetical evolution.

#### **IV. Critical remark**

- The research can be take to next level and the optimum percentage of fiber can be determine for different structural elements like slab, column, beam.
- Translucent concrete may be analyse with different percentages of reinforcement provided in structural elements.
- The effect of various admixture on translucent concrete and according to percentage variation in fiber quantity can be analyse.

#### **V. References**

- [1] Bhavin K. Kashiyani, Varsha Raina, Jayeshkumar Pitroda, Dr. Bhavnaben K. Shah, “ A Study on Transparent Concrete: A Novel Architectural Material to Explore Construction Sector”, *International Journal of Engineering and Innovative Technology*, Vol. 2, Issue 8, February 2013.
- [2] Neha R. Nagdive & Shekar D. Bhole, “To Evaluate Properties Of Translucent Concrete /Mortar & Their Panels”, *International Journal of Research in Engineering & Technology*, Vol. 1, Issue 7, Dec 2013.
- [3] Soumyajit Paul, Avik Dutta, “Translucent Concrete”, *International Journal of Scientific and Research Publications*, Vol. 3, Issue 10, October 2013.
- [4] R. Pradheepa, Dr. S. Krishnamoorthi, “ An Experimental Study on Translucent Concrete”, *International Journal for Scientific Research & Developmen*, Vol. 3, Issue 03, 2015.
- [5] Simonetta L. Pagliolico a, Valerio R.M. Lo Verso , Annalisa Torta , Maurizio Giraud, Fulvio Canonico , Laura Ligi, “A preliminary study on light transmittance properties of translucent concrete panels with coarse waste glass inclusions”, *6th International Building Physics Conference, IBPC 2015*.
- [6] S. Ravivarman, M.Mageswari, A.S.Kanagalakshmi, “Experimental study of LiTraCon”, *IOSR Journal of Mechanical and Civil Engineering*, Vol. 12, Issue 6, December 2015.
- [7] A. B. Sawant, R. V. Jugdar, S. G. Sawant, “Light Transmitting Concrete by using Optical Fiber”, *International Journal of Inventive Engineering and Sciences*, Vol. 3 Issue-1, December 2014.