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# An Investigating Study on a Transparent Concrete as a Green Material

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**ABSTRACT:** Since the beginning of the human civilization, we have been continuously involved in the development of innovative materials and technology. The desire of making our life easy and more advanced differ humans from other animals. In this stage of continuous development, concrete comes as a no less than a miracle for human development. Transparent concrete is one of those innovative types of concrete, which do not only break the orthodox image of concrete as dull and pale material but also helps to save energy, which is one of the biggest concerns of the modern world. The paper discusses the basic principle, previous applications and uses of transparent concrete in different fields. This paper also compiles the finding and results of the previous research and studies on transparent concrete, which can be used as a base to carry out further studies and development in the field of transparent concrete. The transparent concrete mainly focuses on transparency and its objective of application pertains to green technology and artistic finish. It is the “combination of optical fibers and fine concrete”. At present, green structures focus greatly on saving energy with indoor thermal systems. Therefore it is imperative to develop a new functional material to satisfy the structure in terms of safety monitoring (such as damage detection, fire warning), environmental protection and energy saving and artistic modeling.

**KEYWORDS:** Transparent Concrete, Optical Fiber, Nano-Optics, Compressive strength

## I. INTRODUCTION

### 1.1 OVERVIEW

Concrete has been used since Roman times for the development of infrastructure and housing, but its basic components have remained the same. Three ingredients make up the dry mix: coarse aggregate, consisting of larger pieces of material like stones or gravel; fine aggregate, made up of smaller particles such as sand; and cement, a very fine powder material that binds the mix together when water is added.

Just a few decades ago concrete was often misunderstood, disliked and captured by its image fixed due to the rapid urbanization of the 1960s. But since that time, concrete has made considerable progress, not only in technical terms, but also in aesthetic terms.

It is no longer the heavy, cold and grey material of the past; it has become beautiful and lively. By research and innovation, newly developed concrete has been created which is more resistant, lighter, white or colored, etc. Concrete has learned to adapt to almost all new challenges that appeared. In 2001, the concept of transparent concrete was first put forward by Hungarian architect Aron Losonzi at the Technical University of Budapest, and the first transparent concrete block was successfully produced by mixing large amount of glass fiber into concrete in 2003, named as LiTraCon.

The transparent concrete mainly focuses on transparency and its objective of application pertains to green technology and artistic finish. It is the “combination of optical fibers and fine concrete”. At present, green structures focus greatly on saving energy with indoor thermal systems. Therefore it is imperative to develop a new functional material to satisfy the structure in terms of safety monitoring (such as damage detection, fire warning), environmental protection and energy saving and artistic modeling. Due to globalization and construction of high-rise building, the space between buildings is reduced; this causes to increasing the use of non-renewable energy sources, so therefore there is a need of smart construction technique like green building and indoor thermal system. Translucent concrete (Transparent



concrete) is new technique different from normal concrete. Translucent concrete allow more light and less weight compared to normal concrete. The use of sunlight source of light instead of using electrical energy is main purpose of translucent concrete, so as to reduce the load on non- renewable sources and result it into the energy saving. Optical fibers is a sensing or transmission element, so decrease the use of artificial light, the normal concrete is replaced by translucent concrete, which has natural lighting and art design.

Light transmitting concrete are available as prefabricated blocks / panels. Litracon rooms will be brightened and proximal objects situated on the brighter side of a transparent wall will be revealed as silhouettes on the other side. Though the optical fibers compose only 4% of the concrete, some light is transmitted because of their parallel arrangement in a matrix between to the two outer surfaces of each block. Load-bearing structures can also be built from these blocks, since optical fibers have no negative effect on the strength of the concrete. The blocks come in various sizes and option of embedded heat-isolation. Since not everyone appreciates the look of exposed concrete.

**1.2 TRANSPARENT CONCRETE**

Transparent concrete is a concrete based building material with light-Trans missive properties due to embedded light optical elements usually Optical fibres. Light is conducted through the stone from one end to the other. Therefore the fibres have to go through the whole object. Transparent concrete is also known as the translucent concrete and light transmitting concrete because of its properties. It is used in fine architecture as a facade material and for cladding of interior walls. In this project, to integrate the merits of concrete and optical fiber, for developing transparent concrete by arranging the high numerical aperture Plastic Optical Fibres or big diameter glass optical fiber into concrete. 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 for good aesthetical view of the building.

**Table 1: Properties of Transparent Concrete Blocks ByLitracon Company**

<b>PRODUCT</b>	<b>Litracon- Light Transmitting Concrete</b>
<b>Form</b>	<b>Prefabricated blocks</b>
<b>Ingredients</b>	<b>96% concrete, 4% optical fibre</b>
<b>Density</b>	<b>2100-2400 Kg/m2</b>
<b>Block Size</b>	<b>600mm x 300mm</b>
<b>Thickness</b>	<b>25-500 mm</b>
<b>Colour</b>	<b>White, grey or black</b>
<b>Fibre distribution</b>	<b>Organic</b>
<b>Finished</b>	<b>Polish</b>
<b>Compressive strength</b>	<b>50 N/ mm2</b>
<b>Bending tensile strength</b>	<b>7 N/ mm 2</b>

Transparent concrete or translucent concrete is work Based on “Nano-Optics”. Optical fibres passes as much light when tiny slits are placed directly on top of each other as when they are staggered. Principal can carry because optical fibers in the concrete act like the slits and carry the light across throughout the concrete. Transparent concrete is the best example of decorative construction. Because the transparent or light-transmitting concrete is pass light through it. In a night the light-transmitting concrete is more decorative. Generally, transparent concrete is similar to ordinary concrete because the strength of both concrete is similar. But the major disadvantage is the transparent concrete is costly compare to ordinary concrete.

**1.2.1 HISTORY**

Transparent concrete also called as translucent concrete or light transmitting concrete is achieved by replacing aggregates with transparent alternate materials. The bonding material in transparent concrete may be able to transmit light by using clear resins the concrete mix. Use of optical fibers and fine concrete also used as transparent concrete. The Transparent Concrete Concept Is First Found In 1935 by Canadian patent. But due to the development of optical fiber and other materials, this concept is not more popular. But after some time this concept also comes and in 2001 the idea of transparent concrete is found by Hungarian architect aronlosoncz. In 2004, he started the german company,

named LiTraCon, and started producing LiTraCon commercially. Transparent concrete is produced by mixing 4% to 5% (by volume) optical fibers in the concrete mixture. This concrete has less weight compared to original concrete.

### 1.2.2 PRINCIPLE

Transparent concrete or translucent concrete is work based on “NanoOptics”. Optical fibers passes as much light when tiny slits are placed directly on top of each other as when they are staggered. It is because optical fibers in the concrete act like the slits and carry the light across throughout the concrete. Thousands of optical glass fibers form a matrix and run parallel to each other between the two main surfaces of each block. The fibers mingle in the concrete because of their insignificant size and they become a structural component as a kind of modest aggregate. The blocks can be produced in various sizes and with embedded heat-isolation.

Light transmitting concrete is a combination of optical fibers and fine concrete. It can be produced as prefabricated building blocks and panels. Due to the small size of the fibers, they blend into concrete becoming a component of the material like small pieces of aggregate. By arranging high numerical aperture Plastic Optical Fibers (POF) or big diameter glass optical fiber into concrete, it transmits light so effectively that there is virtually no loss of light conducted through the fibers.

The glass fibers lead light by points between the two sides of the blocks. Because of their parallel position, the light-information on the brighter side of such a wall appears unchanged on the darker side. The most interesting form of this phenomenon is probably the sharp display of shadows on the opposing side of the wall. Moreover, the color of the light also remains the same.

### 1.2.3 ADVANTAGES

The main advantage of transparent concrete is that it can transmit light. There, it can be used to make green buildings. Since it can transmit light from natural as well as artificial sources, the building can have fewer lights to meet its demand for lighting. Thus saving huge energy cost. Transparent concrete uses sunlight as source of light instead of electrical energy and reduces power consumption. This concrete can also be used cold countries to transmit heat with sunlight.

- The main advantage of these products is that on large scale objects the texture is still visible - while the texture of finer translucent concrete becomes indistinct at distance.
- When a solid wall is imbued with the ability to transmit light, it means that a home can use fewer lights in their house during daylight hours.
- It has very good architectural properties for giving good aesthetical view to the building.
- Where light is not able to come properly at that place transparent concrete can be used.
- Energy saving can be done by utilization of transparent concrete in building.
- Totally environment friendly because of its light transmitting characteristics, so energy consumption can be reduced.
- Reduces dead weight.
- Reduces carbon emission.
- Reduces power consumption.

### 1.2.4 DISADVANTAGES

- High cost of optical fibres.
- Requires skilled labours and supervision for casting.
- Cannot be used in column and beams as they do not possess much strength.
- Not effective from inspection point of view.
- Not effective where rays of sunlight do not fall.
- Maybe dangerous in handling as glass pieces are there.

### 1.2.5 APPLICATIONS

- For decorative elevation.
- Illuminate wall.
- Get creative with a design.
- Use in a pavement or load-bearing walls.

- Increase visibility in a dark subway station.
- Use as transparent and decorative floors.
- Light sidewalk at night.
- In furniture for aesthetic view.
- It can act as a building material for interior and exterior walls. The rays of sun on falling on such concrete hits at a lower angle resulting in bigger intensity of light.
- It can be used as a pavement block. Also, it gives a shiny appearance during sunset and during daytime it perfectly seems as a concrete block.
- It can be used as partition walls between dining room and hall.
- It can be used in furniture either for decorative purposes or can be used in handles.
- It can be used to illuminate speed breakers on highways at night.

## II. LITERATURE REVIEW

**SATHISH et.al (2015)** Experiment on Study Of Behaviour Of Light Transmitting Concrete Using Optical Fibre According to Sathish the results obtained from the compressive & tensile test shows that the increases in both compressive & tensile strength of the concrete with reinforcement of optical fibre. Gradual increase in the Mechanical properties of the concrete by increasing the optical fiber up to 0.25% and on further addition of the optical fiber decreases the strength parameters.

**AA.MOMIN et.al (2014)** A Study On Light Transmittance Of Concrete Using Optical Fiber And Glass Rods have done an experiment aiming to produce concrete specimens by enforcing glass rods and optical fibers with different percentages and observed that compressive strength obtained for the specimen with optical fiber is almost same and transparency of concrete specimen with optical fiber was found more than glass rods and proved that without affecting the strength ,transmission of light is possible in concrete and enhance architectural view.

**SAWANT et.al (2014)** Present study on Light Transmitting Concrete By Using Optical Fiber” , said that the compressive strength of concrete block reduces with the increase the percentage of fibers. (i.e. percentage of surface area of concrete block) used in concrete block. As per observation and comments discuss in previous points further project work was carried out on 4% and 5% of fibers.(i.e. percentage of surface area of concrete block),because for 5% fiber the compressive strength is slightly reduced than target strength and for 4% it is slightly higher than target strength.

**Soumyajit et.al (2013)**An experiment on Translucent Concrete, adding optical fibre or large diameter glass fibre in the concrete mixture has vital property for aesthetic point of view & also the concrete doesn't loses the strength parameter when compared to regular concrete. The concrete can be used for architectural appearance of the building also can be used where the light cannot reach with appropriate intensity.

**BHAVIN K. et.al (2013)** Study On Transparent Concrete, according to him, the light transmitting concrete does not decreases in its strength when made its comparison with ordinary (conventional) concrete and additionally it has also have many vital assets in term of its aesthetical applications. It is used for attaining awesome architectural view in the construction. And also it is used where light can't reach with suitable intensity.

**PADMA BHUSHAN et.al (2013)** Investigation on Optical FibersIn The Modeling Of Translucent Concrete Blocks, said that apart from the aesthetic appearance, it also includes security and supervision. If outside walls of building are outfitted with light transmit concrete blocks, it can be easily observed and understand if there was anyone seeking or willing to enter into premises without permissions. Guards in the prisons can easily recognize if prisoners are trying to escape or fighting with each other. Electricity savings is addition to the list of its splendid applications.

**Kamdi (2013)** has focused on materials for preparation, mixing procedure, uses, environmental impact and future of TC. He mainly gives an idea about using optical fiber with fine concrete for making transparent concrete. He reveals the fact that TC is not used widely due to its limited application in developing only precasted and prefabricated blocks and panels. Nevertheless, by reducing the energy uses, transparent concrete can make a big impact on the environment.

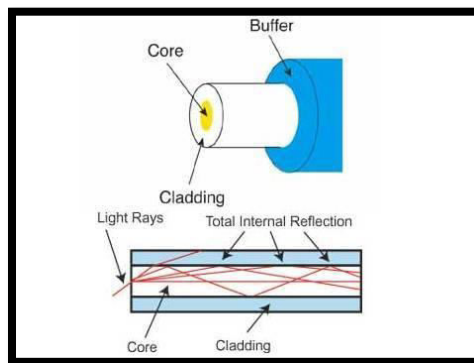
**Momin et al. (2013)** have stated that specimen with optical fiber permits more transmission of light through it than a specimen with the glass rod. In their research work, they have used the mould of size 150mm x 150mm x 150mm for the casting of glass rod cubes and 150mm x 150mm x 100mm for the casting of cubes with optical fiber. Light transmitted through the glass rod and optical fiber cubes was 0.254%-1.57% and 7.41%-9.5% respectively. However, the compressive strength of optical fiber cubes was slightly less than that of glass rod cubes

**Tiwari and Saharan (2016)** have studied the compressive strength properties of two different types of concrete. In the first type they studied the normal TC mix and in the second type, they added 0.625% percentage of rice husk along with 0.125% of steel fiber by mass. The optical fiber of diameter 0.5mm with the varying percentage ranging from 0.25-4% of total volume of cubes was used for both types of concrete. They used concrete moulds of size 15cm x 15cm x 15cm and cement, sand & aggregates were taken in the proportion of 1:1.5:3 respectively with water cement ratio of 0.45. As the percentage of optical fiber increases, the compressive strength of cubes decreased. However, it can be increased, by adding rice husk and steel fiber.

### III. INGREDIENTS OF TRANSPARENT CONCRETE

#### 3.1 OPTICAL FIBERS

An optical fiber is a flexible, transparent fiber made of glass (silica) or plastic to a diameter slightly thicker than that of a human hair. Optical fibers are used most often as a means to transmit light between the two ends of the fiber. An optical fiber consists of a core, a cladding layer and a buffer coating.



(Fig.3.1: Optical Fiber)

**Core** –The core is a cylindrical rod of dielectric material. Dielectric material conducts no electricity. Light propagates mainly along the core of the fiber. The core is generally made of glass. And in another way we can say it is a central tube of very thin size made up of optically transparent dielectric medium and carries the light form transmitter to receiver. The core diameter can vary from about 5µm to 100 µm.

**Cladding** – It is the outer optical material surrounding the core having reflecting index lower than core. It helps to keep the light within the core throughout the phenomena of total internal reflection. Even though light will propagate along the fiber core without the layer of cladding material, the cladding does perform some necessary functions. The index of refraction of the cladding material is less than that of the core material. The cladding is generally made of glass or plastic.

**Buffer Coating** – plastic coating that protects the fiber made of silicon rubber. The typical diameter of fiber after coating is 250-300 µm. For extra protection, the cladding is enclosed in an additional layer called the buffer coating. The buffer coating is a layer of material used to protect an optical fiber from physical damage. The material used for a buffer is a type of plastic. The buffer is elastic in nature and prevents abrasions. The buffer also prevents the optical fiber from scattering losses caused by micro bends. Micro bends occur when an optical fiber is placed on a rough and distorted surface.

**Following are the benefits of optical fiber:**

- It can be bend in different shapes.
- It has a less bending radius.

- It is resilient to damage.
- It is abuse than glass.
- Cutting, wiring, bonding, connecting and processes are easier.
- It does not produce radiation.
- It is immune to radio magnetic interference, radio frequency interference and noise.

### 3.2 CEMENT

Cement is a binder, a substance that sets and hardens as the cement dries and also reacts with carbon dioxide in the air dependently, and can bind other materials together. Portland cement is the most common type of cement in general use around the world, used as a basic ingredient of concrete, mortar, stucco, and most non specialty grout. The OPC was classified into three grades namely, 33 grade, 43 grade and 53 grade depending upon the strength of the cement at 28 days when tested as per IS 4031-1988. As the optical fiber is only responsible for transmission of light, there is no special cement required. So, ordinary Portland cement is used for transparent concrete. Standard ordinary Portland cement of 43 grade was used in this experiment conforming to IS-8112-1989

### 3.3 Fine Aggregate (Sand)

Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. The composition of sand is highly variable, usually in the form of quartz. Sand particles should pass through 1.18 mm sieve. The sand used is the normal sand. It should be free from impurities such as vegetation and gravels. A river sand passing through 1.18mm is used such that where all the components are of micro-metric size and reacts with even a very small amount of water, when it is mixed the paste when it is wet it looks like clay and when sets it becomes stronger than conventional concrete. conforming to IS-383-1970. The fine aggregates serve the purpose of filling all the open spaces in between the coarse particles. Thus, it reduces the porosity of the final mass and considerably increases its strength. Usually, natural river sand is used as a fine aggregate. However, at places, where natural sand is not available economically, finely crushed stone may be used as a fine aggregate.

### 3.4 Coarse aggregates

Crush granite aggregate available from local sources has been used. The coarse aggregate with maximum size of 10mm having the specific gravity value of 2.6 and fineness modulus of 5.60 were used as a coarse aggregate. The loose and compacted bulk density values of coarse aggregate are 1437 and 1556 kg/m<sup>3</sup> respectively, the water absorption of 0.4%. Crush granite aggregate available from local sources has been used with 16mm down size aggregates. conforming to IS-383-1970.

### 3.4 Water

Water is the key ingredient, which when mixed with cement, forms a paste that binds the aggregate together. The water needs to be pure in order to prevent side reactions from occurring which may weaken the concrete, the role of water is important because the water to cement ratio is the most critical factor in the production of "perfect" concrete. It should be of drinking water quality. That is it should be free from all impurities.

## IV. PROPOSED METHODOLOGY

The manufacturing process of transparent concrete is almost same as regular concrete. Only optical fibers are spread throughout the aggregate and cement mix. There are different methods for the installation of optical fiber in concrete. One method is that, small layers of the concrete are poured on top of each other and infused with the fibers and is then connected. Thousands of strands of optical fibers are cast into concrete to transmit light, either natural or artificial. Light-transmitting concrete is produced by adding 4% to 5% optical fibers by volume into the concrete mixture. The concrete mixture is made from fine materials only it does not contain coarse aggregate. Thickness of the optical fibers can be varied between 2  $\mu$ m and 2 mm to suit the particular requirements of light transmission. Originally, the fiber filaments were placed individually in the concrete, making production time-consuming and costly.

Newer, semi-automatic production processes use woven fiber fabric instead of single filaments. Fabric and concrete are alternately inserted into moulds at intervals of approximately 2 mm to 5 mm. Smaller or thinner layers allow an increased amount of light to pass through the concrete. Following casting, the material is cut into panels or blocks of

the specified thickness and the surface is then typically polished, resulting in finishes ranging from semi-gloss to high-gloss.

In another method, the first step is to make a mould for the prototype block using tin. The tin is made into a mould of the desired shape, like a cuboid with the top end open. Many holes are punched on the opposite walls of the cuboids. The optical fibers have to be run through these holes from one end to the other and then concrete is made to set in it with the fibers inside. What happens here is that the light falling on one side of the block gets transferred to the other side through these many optical fibers running from one end to the other.

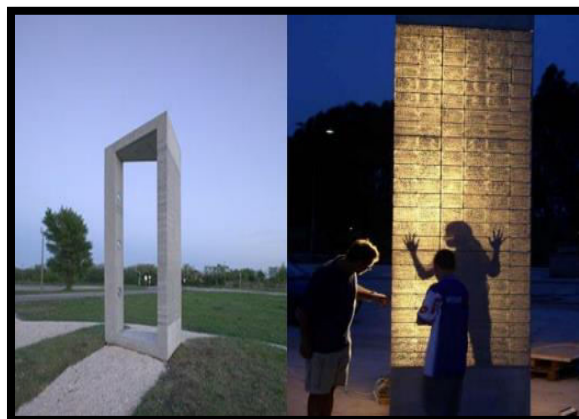
This is the trickiest part of the construction, passing each thin fiber through the tiny holes of one perforated sheet to another one. This is also an integral part of the process as the whole idea of transparency comes from these fibers. The light is transferred from one end to another end through these, as mentioned earlier. So much care has been taking in this process. The next step is to cast the mortar over these fibers placed in the tin mould. The concrete then undergoes a curing process. The excess fibers running out of the block are cut off and slightly polished. The modeling of transparent concrete block is complete.

- 96% concrete and 4% optical fibres are used to cast the Light transmitting concrete.
- Due to the small size of the fibres, they blend into concrete becoming a component of the material like small pieces of aggregate.
- Mostly quick setting cement is preferred for making concrete mix with sand and stone dust as fine aggregates. Craft clay is used for providing the base to optical fibre which are placed parallel.
- The concrete panels of light transmitting concrete retain all the properties of high quality concrete and can be used for interior designing. The resulting product can be used for interior or exterior walls, illuminated pavement or in art or design.

## V. A FEW EXAMPLES

### 5.1 EUROPEAN GATE

European gate is an artistic installation which was designed to mark the celebration of Hungary joining the European Union (EU), located at the public entrance of Fortress Monostor in the Hungarian town of Komárom. This is one of the most impressive pieces of art conjugating visual lighting display as well as artistic using translucent concrete. The sun illuminates the 37.6ft large Litracon piece of the statue in the mornings and late afternoons, and by night an even more impressive view can be seen because of the embedded light sources. Day and night view of European gate is shown in fig: 5.1.



(Fig 5.1: Day and night view of European gate)

### 5.2. CELLA SEPTICHOVA VISITOR CENTRE

The 2 tons heavy Litracon door serves as the main entrance of the Visitors Centre. It was made out of 48pcs of 10cm thick blocks. The blocks are in steel frame to be able to move the structure. On daytime, one can see the shadows of the pedestrians and the surrounding trees from inside. By night, the door is illuminated from inside. Day view and night view of litracon door is shown in fig 5.2 and fig: 5.3.





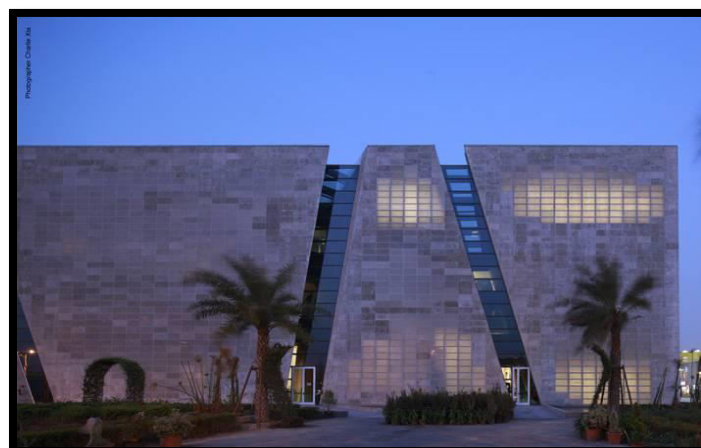
(Fig 5.2: Day view of litracon door from inside)



(Fig 5.3: Night view of litracon door)

### 5.3 Italian pavilion

Italian pavilion at Shanghai World Expo 2010 in China also presents growing trend of transparent buildings. Instead of using optical fibers, precast concrete panel protected by adding special plastic resins to an innovative mortar was adopted. To cover the surface area of 1887 m<sup>2</sup>, 3774 TC panels were used. The weight of each plate was around 50kg with the dimension 1x0.5m and 5 cm in thickness.



(Fig.5.4 : Italian pavilion at Shanghai World Expo 2010 in China)

#### 5.4 Al-Aziz Mosque

Al-Aziz Mosque in Abu Dhabi is another example of the newly constructed building with using of TC technology. The mosque was opened in 2015 and used optical fibers transmute the light. 1.8×1.4×0.3 m TC panels with total area of 525 m<sup>2</sup> were used in this building.



(Fig.5.5 :Al-Aziz Mosque in Abu Dhabi)

#### 5.5 Radhaus building

Radhaus building in Erfurt, Germany is attracting its customers by distinctive design of glowing bicycles on its wall. The translucent façade for the approximately 70 m long, 6 m wide and between 3 and 8 m high building was made entirely of highly insulated, newly developed 8-chamber polycarbonate sheets, which are partially supplemented with foil ornaments and motifs in gold and silver tones.



(Fig.5.6 :Radhaus building in Erfurt, Germany)

### VI. CONCLUSION

Transparent concrete has good light guiding property. The ratio of optical fibre volume to concrete is proportion for perfect transmission. It does not lose its strength parameter as compared to regular concrete and it has best architectural appearance. This type of concrete will help in building greener earth and energy saver with its self-sensing property.

Although its cost is more, in place of glass fibres plastic fibres can be used to reduce cost so that it can be used by all classes of people but it may also result in low light transmission. Its aestheticity is appealing to people and hence it is more used for making beautiful surroundings rather than structural point of view in case of load calculations. As time passes many industries are coming forward to adopt such innovation by making changes in its property so that they can deliver a better future.

Translucent concrete is made by mixing optical fibres into the traditional concrete. The optical fibre strands constitute only 4 to 5 percent of the volume of the mixture, and the low percentage allows this green construction material to retain all the strength of traditional concrete. Thickness of the optical fibre can vary, resulting in more or less light transmission, allowing a range of applications. Optical fibres are highly efficient. Colours can even be used, creating a variety of possible effects. The concrete is made with 4% glass optical fibres so you can see shadows, colours and light through it. The glass optical fibres allow light to pass through the concrete no matter how thick or thin it is. It can be used as a structural component to a building or as an architectural feature. The use of the Light transmitting concrete can reduce the pollution, increase the use of resources other than conventional resources and also gives a better appearance to the structures. It provides nearly same strength with more natural light and durability. By using plastic optical fibres the light transmission may decrease but it becomes cheaper so that it can be used by all class of people and can be used widely.

### VII. FUTURE SCOPE

Transparent concrete is also a great insulating material that protects against outdoor extreme temperatures while also letting in daylight. This makes it an excellent compromise for buildings in harsh climates, where it can shut out heat or cold without shutting the building off from daylight. It can be used to illuminate underground buildings and structures, such as subway stations. The possibilities for translucent concrete are innumerable; the more it is used, the more new uses will be discovered. In the next few years, as engineers further explore this exciting new material, it is sure to be employed in a variety of interesting ways that will change the opacity of architecture as we know it.

- Transparent concrete can be used in all places where transparency, strength, and safety are required.
- When a solid wall is imbued with the ability to transmit light, it means that a home can use fewer lights in their house during daylight hours.
- It has very good architectural properties for giving good aesthetical view to the building.
- Where light is not able to come properly at that place transparent concrete can be used.
- Energy saving can be done by utilization of transparent concrete in building.
- Totally environment friendly because of its light transmitting characteristics, so energy consumption can be reduced.

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