

A LITERATURE REVIEW ON THE TRANSPARENT OR TRANSLUCENT CONCRETE

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Abstract- Concrete a building material is widely used in construction of various structures as it is used since roman times. The four major components are used in concrete usually i.e. cement (binding material), fine aggregate (sand), coarse aggregate (stones of size more than 4.75 mm according to BIS), water (used for mixing and provides workability to concrete). Concrete, that comes second in consumption after water consumption now-a-days. Concrete can also be used to transmit light by optical fibre and Reflection of light phenomenon. By using the several techniques like mixing of optical fibre ingredient with concrete it becomes reality to produce transparent concrete. Light transmitting concrete, also known as translucent concrete. It is one of the brightest building material developments in recent years. It is one of the newest, most functional and revolutionary building material in green construction. In this paper the manufacturing, uses and future scope of translucent concrete is briefly given. The main purpose is to use sunlight as a light source to reduce the power consumption of illumination and to use the optical fibre to sense the stress of structures and also use this concrete as an architectural purpose for good aesthetical view of the building.

Keywords : Translucent stone, optical fibre, concrete (cement, sand, aggregate and water), ecofriendly.

1. INTRODUCTION

Translucent concrete is a Modern type of concrete as optical fibres are mixed with concrete. The optical fibres exhibit the property of light as also follow the law of reflection of light. That means the angle of incidence of light will be equal to the angle of reflection. The Hungarian architect Aron losonzi firstly gave the concept of transparent concrete in 2001. In 2003, the first transparent concrete block was prepared named as LiTracon. The main focus of using transparent concrete is that it reduces the consumption of electricity power thus making it ecofriendly. This is a type of green building and indoor thermal system as sunlight can be used during day time. The weight of transparent concrete is very less as compared to normal concrete.

2. MATERIAL USED FOR TRANSPARENT CONCRETE

Translucent concrete work is basically based on nano optics. The ingredients used in transparent concrete are Cement, Sand (fine aggregate), Coarse aggregate, Optical fibres, Water. As these components are briefly defined as followings:-

2.1 Cement

The Cement is a binding material. OPC (Ordinary Portland Cement) was used in this transparent concrete which has specific gravity of 3.14. OPC is usually available in three grades i.e. 33 grade, 43 grade, 53 grade as per IS 4031-1988. Higher the grade like 53 grades means that the heat of hydration of 53 grade cement is more as compared to other grades of cement. As we used OPC 53 grade cement which has standard consistency of 40%. The initial setting time of the cement was 45 minutes and final setting time was 530 minutes.

2.2 Fine aggregate

The aggregate which passes through the 4.75 mm sieve according to the BIS are known as fine aggregates. The bulk density of sand is 1688 kg/m³, specific gravity is 2.75 and fineness modulus of 2.80 used as fine aggregate. The water absorption is 1.1%. Basically sand is used as fine aggregate. Usually the natural river sand is used but if in case the river sand is not available we can also use the crushed stone sand as fine aggregate. Sand fills the gaps of coarse aggregate as it reduces the porosity of concrete and making the concrete more strong.

2.3 Coarse aggregate

The aggregate which do not pass through the 4.75 mm sieve or we can say that which has the size more than 4.75 mm according to the BIS are known as coarse aggregates. The bulk density of coarse aggregate is 1556 kg/m³, specific gravity is 2.60 and fineness modulus of 5.60 were used as coarse aggregate, the water absorption of 0.4% .

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2.4 Optical fibers

There are three layers of optical fibres i.e core, cladding and buffer coating. The innermost layer is called core where reflection of light takes place. the layer above the core or the very second layer is called cladding which do not let the light to reflect back into the core. the final outermost Layer is called buffer coating which protects the optical fibre from damage and moisture.

2.5 Water

Water used in transparent concrete is free from acids, alkalies and sulphate attacks. But very soft water also affects the properties of concrete or weakens its strength. Water has some important functions in concrete firstly it acts as good lubricant in concrete secondly it provides workability to concrete and cement paste.

3. PRINCIPLE

Thousands of optical glass fibres run parallel to each other thus making the concrete transparent. The 4% to 5% optical fibres by volume are added in concrete which provides the light transmitting property to concrete following the law of reflection of light.

4. METHODOLOGY

Step 1-Preparation of the Mould:

A mould of rectangular size 150mm*150mm*150mm is prepared with wood or steel. the required size of rectangular mould from wood or tin is prepared. Place the clay or mud in the sides where the optical fibers are exposed to the mould for the easy demoulding after the concreting.

Step 2- Optical Fiber:

The cleavage of the optical fibre is done very carefully as per the mould size. The diameters of optical fibers which are commonly available are given as following:-

.25 mm, .5 mm, .75 mm, 1 mm, and 2 mm.

Step 3- Fixing the Fibers:

Fibers are usually placed in layer distribution because in layer distribution or organized distribution they provide good reflection properties. Several holes are driven on steel mould so that optical fibres can pass through them in an organized manner.

Step 4- Concreting:

As optical fibres are inserted first in the mould through holes provided in mould the concreting is done after this very carefully so that it does not disturbs the optical fibres. For obtaining the good compaction The concrete is filled in thinner layers also a needle vibrator is used to avoid the voids formation in concrete.

Step 5- Removing the Mould:

The mould is removed after 24 hours. The casted mould was placed on a very leveled surface or undisturbed surface. Then it was de-moulded very carefully after 24 hours from casting. The respective identification mark/numbers were given immediately after de-moulding, the cube specimens.

Step 6- Cutting and polishing:

The extra fibres can be cut as per the size of the mould. Finally the polishing is done with the help of sand paper or some polishing paper.

5. ADVANTAGES OF TRANSPARENT CONCRETE

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.

6. CONCLUSIONS

A smart transparent concrete is aesthetically pleasing. POF-based transparent concrete could be regarded as an art which could be used in museums and specific exhibitions rather than just a construction material. Although ease of construction is to be compromised, the material is bound to be accepted universally due to its advantages. With the concept of green technology catching up, electrical supply, being supplemented by natural sources, it becomes absolutely necessary to utilize

the natural resource. Although „Litracon“ has yet to be made available for commercial use, it has already been suggested that buildings made with the material could save electricity that would otherwise be required for daytime lighting. When light transmitting properties were examined, the test results have revealed that the produced concrete can be cut into different shapes without losing its transparent property and it can be used as architectural concrete on roofs of special buildings.

7. REFERENCES

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