

STUDY OF TRANSPARENT **CONCRETE**

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INTRODUCTION

TRANSPARENT CONCRETE.

Transparent Concrete or LiTraCon (Light Transmitting Concrete) can be produced as prefabricated building blocks, the trick is done with embedding parallel fibers of glass or plastic in a proprietary concrete mixture.

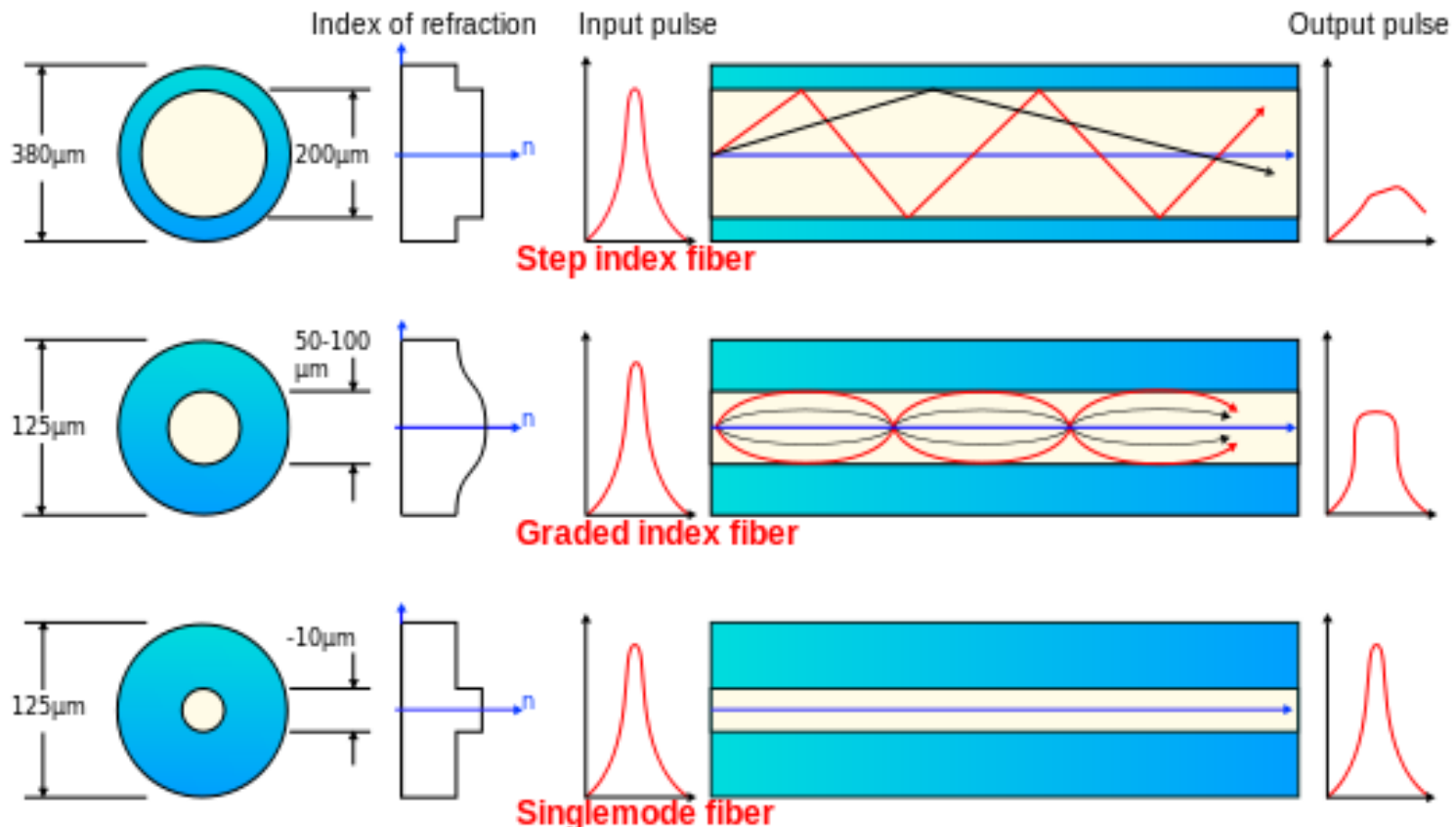


Material used

- There are two basic materials used for making transparent concrete, one is from construction field and another from sensing field.
- Concrete
- Optical fibres

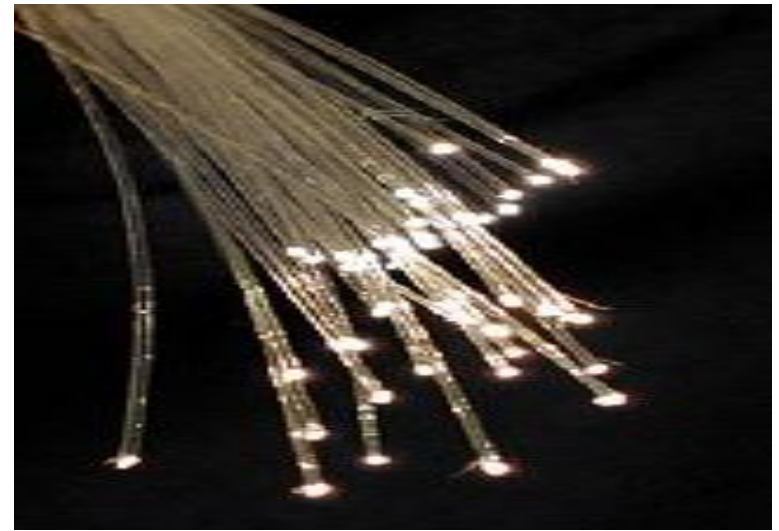
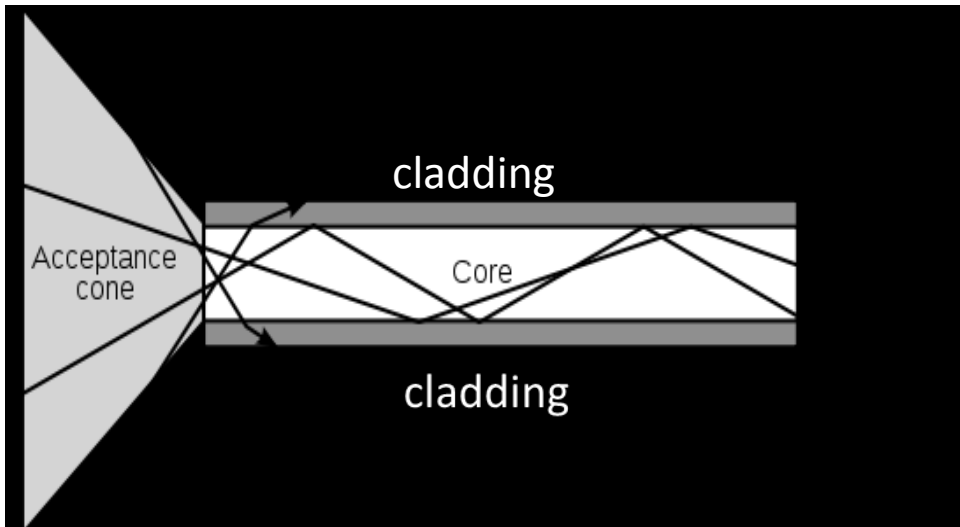
TYPES OF FIBRE

- Multimode step-index fiber
- Multimode graded-index fiber
- Single-mode step-index fibers.



MECHANISM OF OPTICAL FIBRE

- An optical fibre is a cylindrical dielectrical wave that transmit light along it by the process of Total internal reflection.
- It consists of a core surrounded by cladding layer.



The propagation of light through a [multi-mode optical fiber](#).

CONSTRUCTION OF BLOCKS USING **POF**



Fig 1



Fig 2



- First step is to make a mould using tin of desired shape like a cuboid (fig 1)
- Many holes are punched on the walls and optical fibres are made to pass through it on both ends.(fig2)
- Then the concrete is poured in to the mould. (fig 3)
- The concrete then undergoes a curing process and then excess of fibre is cut and polishing is done on the material.

EXPERIMENTS OF SMART TRANSPARENT CONCRETE

TRANSMITTING PERFORMANCE OF THE SMART TRANSPARENT BLOCK



Fig: Test of a POF-based smart concrete block

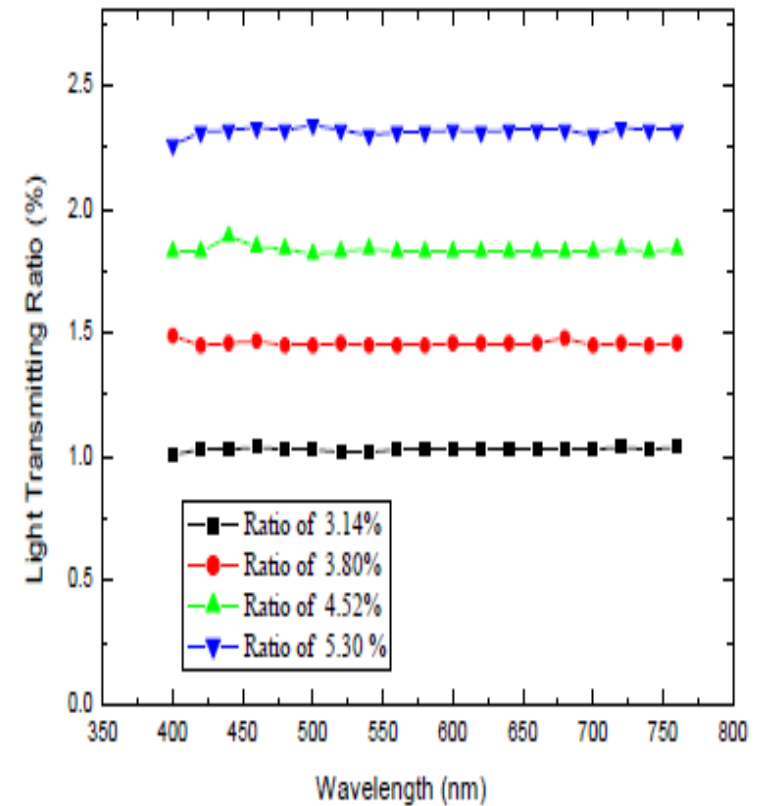


Fig: Transmitting performance of the transparent block

MECHANICAL PERFORMANCE OF THE SMART TRANSPARENT BLOCK



a) Test setup



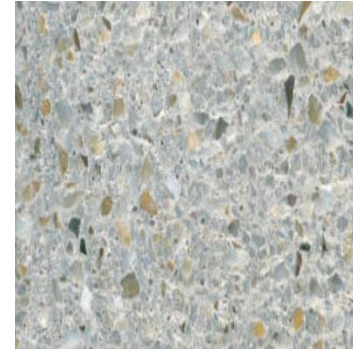
b) Damage mode

Table 1: Data of the compression performance of the transparent concrete block

| Proportion | 0.0% | 3.14% | 3.80% | 4.52% |
|-------------------|-------|-------|-------|-------|
| Test data (kN) | 190.5 | 190.0 | 219.0 | 180.5 |
| | 220.0 | 228.0 | 194.0 | 182.0 |
| | 195.0 | 185.0 | 174.0 | 184.0 |
| Average | 201.8 | 201.0 | 195.7 | 182.2 |

Technical Data Sheet.

| | |
|--------------------------|----------------------------------|
| Trade mark name | :LiTraCon |
| Form | :Prefabricated blocks |
| Ingredients | :96%concrete,4%optical fibers |
| Density | :2100 –2400kg/m ³ |
| Maximum block size | :600 x 300 mm |
| Standard block size | : 600 x 300 mm |
| Thickness | :25 – 500 mm |
| Color | :Grey, black or white |
| Compressive strength | :50 N/mm ² |
| Bending tensile strength | :7 N/mm ² |



COMPARISON WITH CONVENTIONAL CONCRETE

- ❖ **Quantity of optical fiber is the rate influencing parameter.**
- ❖ **Life of LiTraCon depends on the bending radius of the optical fibers.**
- ❖ **Aesthetic appearance is comparably high.**
- ❖ **The parameters like bending strength, compressive strength, density is similar to conventional concrete.**
- ❖ **They provide same structural performance as conventional concrete.**

ADVANTAGES

- ❖ 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.

DISADVANTAGES

- ❖ The main disadvantage is these concrete is very costly because of the optical fibres.
- ❖ Casting of transparent concrete block is difficult for the labour so special skilled person is required.
- ❖ Natural or any artificial light passes through in the direction of fibers laid, only at this condition shadow image appears on darker side.

APPLICATIONS



Transparent Partition Wall



Litracon blocks can be used as lightning lamps



use of Litracon in pavement



It can be also applicable at:

- Transparent concrete blocks suitable for floors, pavements and load-bearing walls.
- Facades, interior wall cladding and dividing walls based on thin panels.
- Partitions wall and it can be used where the sunlight does not reach properly.
- In furniture for the decorative and aesthetic purpose.
- As speed bumps in roads.
- Light sidewalks at night.
- Increasing visibility in dark subway stations.

CONCLUSION

- ❖ A novel architectural material called transparent concrete can be developed by adding optical fibre or large diameter glass fibre in the concrete mixture.
- ❖ The transparent concrete has good light guiding property and the ratio of optical fibre volume to concrete is proportion to transmission.
- ❖ The transparent concrete not loses the strength parameter when compared to regular concrete and also it has very vital property for the aesthetical point of view.
- ❖ It can be used for the best architectural appearance of the building. Also used where the light cannot reach with appropriate intensity.
- ❖ This new kind of building material can integrate the concept of green energy saving with the usage self-sensing properties of functional materials.

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