

Partially Light Weight Transparent Concrete

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ABSTRACT

Clear casting resin is used to prepare light weight transparent concrete that works very effectively as energy saving in structure and also reduces the total load of building on the foundation in a smaller cost . To replace some part of aggregate in regular concrete M 20 mix, with that in the mind a research was conducted. This research involved the preparation of concrete mix which are [1 cement : 1.5sand :3(Aggregate)] and concrete blocks are casted. After casting, the test is performed to know the compressive strength, Light transmission flexural strength test in according with IS-456, IS 3370. The concrete blocks are of dimensions 150mm X 150mm X 150mm.

Keywords:- Cement, sand, Admixture, Clear casting resin ,Aluminummold,Hardener.

1 INTRODUCTION

Some decades ago concrete was often misunderstood, disliked and captured by its image fixed due fast urbanization in 1960's. Now concrete is making considerable progress not only technical terms, but also in aesthetic terms. It becomes light and no longer the heavy, cold and grey material of the past. It has become aesthetically good and lively. By research and innovation, newly prepared light weight transparent concrete has been prepared which is more resistant, effective, white or colored etc. In 2001, first of all the concept of transparent concrete was introduced by Hungarian architect Aronlosonzi and first transparent concrete block was successfully was casted, but this research uses optical fiber as transparent material But this optical fiber increases the cost. So the concrete becomes uneconomical. Transparent concrete in architecture is used as a façade material and for new design to make the construction look much attractive. Light weight Transparent concrete is the output of approaches which use the sunlight to travel in the internal of structure and also as architecture too. Building an environment which depends on the natural resources which is not expected to be finish in life-cycle will be a great change towards the atmosphere for the upcoming generation and transparent concrete is all about it. Our research paper on the Light weight Transparent concrete wants to use the high quantity energy which is of sunlight. While approaching towards a material which can give the same strength as of general concrete with different we should go toward transparent concrete. Light transparent concrete is made by clear casting resin. First of all Light transparent concrete was developed by Hungarian scientist AronLosonczi at Technical university of Budapest Light weight is achieved removing concrete at predetermined extent and light transparency is achieved by using clear casting resin .It can be used for interior and exterior

walls, slabs, floor, partition walls. By embedding clear casting resin light can be transmitted from outside to inside and this concrete is very efficiency as total incoming light get transmitted through clear casting resin medium. A wall made with light transparent concrete has more strength than traditional concrete and embedded array of resin that can display the scenario of outside world with clarity. Casting resin is in liquid form until, it is mixed with the hardener Once, the hardener is mixed, It is mixed with the hardener once, the hardener is mixed It take time in hours to be welted like solid glass. Therefore its casting is done before the casting of concrete and finally it is casting of concrete and finally it is kept in the mold and concrete is place by fixing the clear casting in mold.

2 SIGNIFICANCE OF PROJECT

- 1- To make concrete for aesthetically pleasing by light transmitting through its surface.
- 2- To reduce the total Dead weight of concrete.
- 3- To prepare light transmitting concrete by clear casting resin which is relatively cheaper than concrete prepared by use of optical fiber.
- 4- To check what is consequence of adding the clear casting resin with concretes.

3 .MATERIALS

3.1 Cement

Cement used in the experimental work is Portland Pozzolona Cement (53-grade) conforming to I.S 4031-1988.

Table1:-Physical properties of cement

| S.NO | CHARACTERSTICS | TEST RESULT | STANDARD RESULT(as per IS CODE) |
|------|----------------------|-----------------------|-----------------------------------|
| 1 | Consistency | 30% | 30% |
| 2 | Initial Setting Time | 34min | Not less than 30 min |
| 3 | Final Setting time | 575min | Not more than 600 min |
| 4 | Specific Gravity | 3.10 | 3.15 |
| 5 | Fineness Modulus | 2.6% | Not more than 5% |
| 6 | Compressive Strength | 53.5N/mm ² | Not less than 43N/mm ² |

3.2 Fine aggregate:-

Fine aggregate was taken which fulfills the required parameters of fine aggregate required for research and the sand conforms to zone 4 as per IS 383:1970.

a) Specific gravity = 2.62

b) Fineness modulus = 2.83

(c) Silt content=2.68 (not more than 6%)

3.3 Coarse aggregate:-

The crushed aggregates was 20mm size. The sieve analysis of combined aggregates confirms to IS 383: 1970 for graded aggregates.

a) Specific gravity =2.72

b) Fineness Modulus = 6.84

3.4 Water:-Mixing water should not contain unnecessary organic substances or inorganic elements in excessive proportions. In this research fresh potable water is consumed.

3.5 Clear casting resin:-

- Clear casting resin utilized to reduce the dead weight and transparency of concrete.
- Compressive Strength of clear casting resin is 91N/mm^2 .

Mix design for M-20 Grade Concrete:-

- At the end of 28 days Characteristic Compressive Strength: 20 N/mm^2
- Aggregate size: less than 20mm
- Exposure type: Severe

Test Data for Materials:

- Specific Gravity of Cement: 3.10
- Specific Gravity of Coarse Aggregate: 2.72
- Specific Gravity of Fine Aggregate: 2.64

4.MANUFACTURING PROCESS

Light Transparent concrete is made of fine-grain concrete and clear casting resin. Because of clear casting resin, solidity and consistency of transparent concrete are more than the traditional concrete. Almost free energy loss light penetration through clear casting resin makes it possible to see light array, shadows and even colors through concrete even by very thick walls. It can be made as prefabricated building blocks and panels. In this way, the resultant is not mixed material like glass in concrete but a new construction material, which is homogeneous in its inner structure as well as on its main surfaces. The clear casting resin lead light passed by points between the two sides of the blocks. Because of their parallel position in concrete, the light-information on the brighter side of such a wall appears unchanged on the darker side and there is similarity of outside light and interior of structure. Use of clear casting resin enhances the strength of concrete as it possess relatively high strength of 91 N/mm^2 . Moreover, the colour of the light also remains the similar as it does not get dispersed in medium.

5. TEST CONDUCTED ON CONCRETE

Three types of test carried on concrete-

- 1- Workability
- 2- Compressive strength test
- 3- Flexural strength test

5.1 Workability

The workability of light weight transparent concrete is examined by carrying slump test and compaction factor test.

Test Result:

1. Slump = 90mm (in the range between 50 to 100)
2. Compaction factor = 0.92

5.2 Compressive Strength Test

- compressive strength of concrete is that value of compressive stress determined when the cube fails completely.
- The compressive strength is determined by conducting compressive strength test on CTM.

Test Result

COMPRESSIVE STRENGTH COMPARISON

| Test day | Ordinary M20 | PLWT concrete | Casting resin |
|----------|--------------|---------------|---------------|
| 3rd day | 8 | 12.9 | 91 |
| 7th day | 13.5 | 17 | 91 |
| 14th day | 18 | 23.46 | 91 |
| 28th day | 20 | 28.78 | 91 |

@ 0.50% W/C

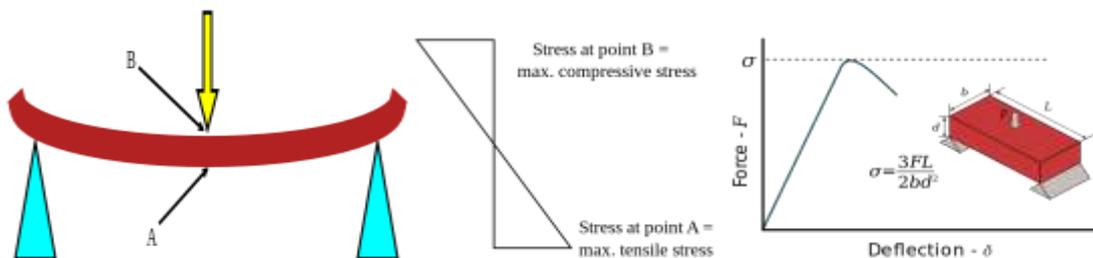
5.3 Flexural Strength Test

Flexural strength of light transmitting concrete is examined by carrying test on UTM. Flexural strength of concrete is defined as stress in concrete exactly before yields in flexural strength test.

$$(3Pl) / (2bd^2) = f_{cbc}$$

where

P - Applied load, b – width,d– depth, l - length



Test Result:-Flexural strength of light transmitting concrete = 9.3N/mm²

5.4 Strength of Clear casting resin

The parameters of clear casting resin were mentioned on the packing’s purchased which is shown listed below.

| Property: | ASTM Test Method | Psi | Mpa |
|-----------------------------|------------------|------------------------|------|
| Flexural Strength | D-790 | 13,200 | 91 |
| Flexural Modulus | D-790 | 7.32 × 10 ⁵ | 5048 |
| Tensile Strength | D-638 | 6,400 | 44 |
| Tensile Modulus | D-638 | 7.17 × 10 ⁵ | 4945 |
| Tensile Elongation, % | D-638 | 1.5 | 1.5 |
| Heat Distortion Temperature | D-648 | 115 °F / 46.1 °C | |
| Hardness, Barcol 934-1 | D-2583 | 38 - 42 | |



6. CONCLUSION

Light transmitting concrete blocks can be used in many ways and implemented into many forms and be highly advantageous. Yet, the only drawback would be it is not easily available in abundant quantity. That doesn't stop high class architects from using it. It's a great sign of attraction and artistic evolution. Any structure with a small hint of light transmitting concrete is bound to make heads turn and make them stand in awe. The compressive strength of Light weight transmitting concrete is more than the strength of the traditional concrete and it has the

quality to transmit light. If the percentage of the clear casting resin increased than the strength of the concrete starts decreasing so we can conclude that the strength of light transmitting concrete is inversely proportional to light transmittance. Light Transparent concrete achieves optimum effectiveness when used in an location with a large degree of light contrast. The strength results of decorative concrete are correlated with results of ordinary plain cement concrete. The tests evidently conclude that the aesthetic concrete also performance on the basis of strength factor is also considerably high. Hence the application of clear casting resin will make the concrete aesthetic as well as can make the concrete structurally efficient.

- It is concluded that on usage of clear casting resin, the compressive strength enhanced as clear casting resin also possess more strength than concrete.
- The study concludes that the Light emitting concrete is possible to make without affecting its compressive strength.

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