e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:08/August-2022 Impact Factor- 6.752 www.irjmets.com

EXPERIMENTAL STUDY ON INTERNAL CURING OF CONCRETE USING LIGHT WEIGHT AGGREGATE

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ABSTRACT

As water is becoming a scarce material day-by-day, there is an urgent need to do research work pertaining to saving of water in making concrete and in constructions. Curing of concrete is maintaining satisfactory moisture content in concrete during its early stages in order to develop the desired properties. Keeping importance to this, an attempt has been made to develop self-curing concrete by using light expanded clay aggregate (leca). In this experimental investigation the strength characteristics of normal strength concrete cast with the self-curing agent leca have been studied and compared with the corresponding conventionally cured concrete. Is method of mix design was adopted, for the normal strength internal curing concrete of grade m30 grade of concrete is design on trial and error basis. For producing internal-curing concrete replacements of 10%, 20% and 30% of leca by volume of aggregate was used and tested.

Keywords: Curing, Shrinkage, Cracking, Expanded Clay, Expanded Shale.

I. INTRODUCTION

Concrete is a composite material composed of gravels or crushed stones (coarse aggregate), sand (fine aggregate) and hydrated cement (binder). Concrete is the most widely used construction material in the world. It is used in many different structures such as dam, pavement, building frame or bridge. Water is a necessary component of the cement hydration reaction. The hydration reaction is responsible for the conversion of the gray cement powder into the binding cement paste which gives concrete its strength. It is well known in concrete construction that a 'proper curing period' is essential at early ages to enable the concrete to gain strength.

Lightweight aggregate batched at a high degree of absorbed water may be substituted for normal weight aggregates to provide “internal curing” in concrete containing a high volume of cementitious materials. High cementitious concretes are vulnerable to self-desiccation and early-age cracking, and benefit significantly from the slowly released internal moisture

II. METHODOLOGY

A. Cement

Cement is by product of calcinations (1300-1500^{o}c) of oxides of calcium and silica and some other ingredients. Cement content Lime (60-65%), Silica (17-25%), Alumina (3-8%), Iron oxide (0.5-6%), and Magnesia (0.1-4%) Alkalis (0.4-1.3%) [8]. Ordinary Portland cement of 53 grade used of Ultratech compamy.

B. LECA

Lightweight expanded clay shale aggregates are used to replace the coarse aggregate in concrete with size of 8-15mm. It is porous in nature because of it , it can store the water when it is soaked in water for the period of 24 hours and later on it can release the water when the water intake is low.

C. River sand

River sand is used as fine aggregate. Which has proper particle size distribution because of it concrete could be dense and void free. The river sand passing through the IS sieve of 4.75mm sieve is taken. The specific gravity of river sand is 2.56.

D. Coarse aggregate

Aggregate retain on 4.75 mm sieve are called coarse aggregate. Foe mix design we used 20 mm coarse aggregate of specific gravity 2.68 and water absorption 1.87%. Round shape of aggregate gives highly workable mix and angular shape aggregategives high strength

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III. MIX DESIGNS

The various mix designation are shown in Table 1, For all mix design the grade of concrete expected was M30 and the mixproportion obtained is given in the Table 2.

TABLE 1: MIX DESIGNS

Mix Designation	Aggregate (%)	LECA (%)
MD1	100	0
MD2	90	10
MD3	80	20
MD4	70	30

TABLE 2: DETAILS OF MIX (M30)

Water (l/m^3)	Cement (kg/m^3)	Crushed sand (kg/m^3)	Coarse Aggregate (kg/m^3)	W/C Ratio
197	438	628.94	1091	0.45

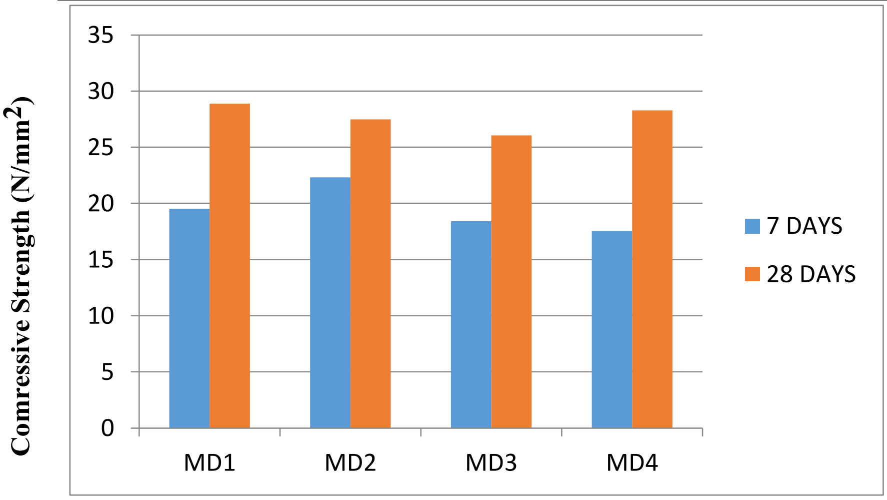
IV. RESULTS AND DISCUSSION

A. Compressive strength test

Compressive strength was conducted on cube specimens of dimension 150mmx150mmx150mm. Table 3 shows the compressive strength values for all mix design.

TABLE 3: COMPRESSIVE STRENGTH

Sr. No	Mix Proportion	Compressive Strength (N/mm^2)	
		7days	28 days
1.	MD1	19.54	28.88
2.	MD2	22.33	27.49
3.	MD3	18.42	26.06
4.	MD4	17.56	28.28



GRAPH 1: COMPRESSIVE STRENGTH TEST

B. Flexural Strength Test

Flexural strength test was conducted on a beam of dimension 100mmx100mmx500mm.Table 4 shows flexural strength test values of all the design mix.

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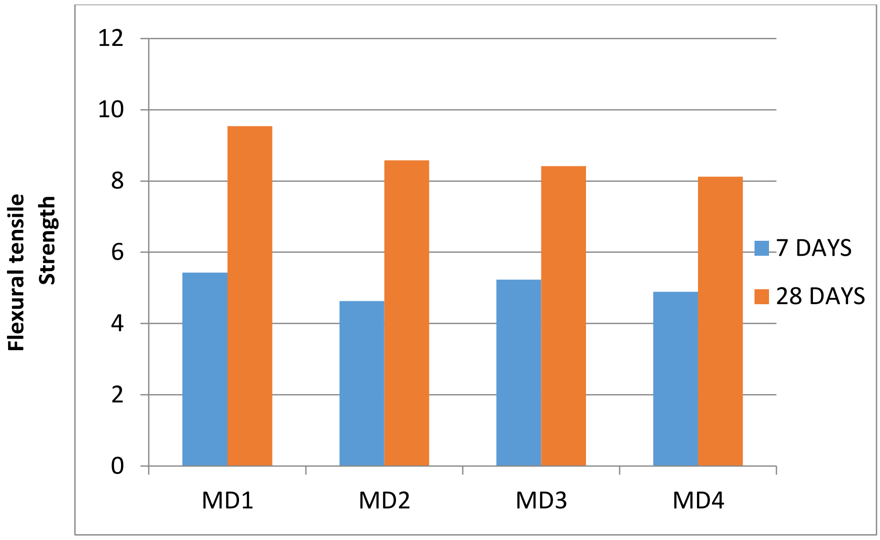
TABLE 4: FLEXURAL TENSILE STRENGTH TEST RESUL

Sr. No	Mix Proportion	Flexural Strength (N/mm²)	
		7days	28 days
1.	MD1	5.43	9.53
2.	MD2	4.63	8.58
3.	MD3	5.23	8.42
4.	MD4	4.89	8.12



GRAPH 2: SPLIT TENSILE STRENGTH TEST

V. CONCLUSION

Conclusion As a result of the analyses, the findings can be summarized as follows:

- Compressive strength of mix proportion MD2 (Aggregate 90% and LECA 10%) sand attainsmaximum compressive strength as compared to other mix designs except for MD1 for 7 days of curing .
- Compressive strength of mix proportion MD4 (Aggregate 70% and LECA 30%) increases as compared to MD2 and MD3 for 28 days of curing.
- Flexural strength of concrete mix proportion MD2 (Aggregate 90% and LECA 10%) sand attains maximum strength as compared to other mix designs except for MD1 for both 7 and 28 days of curing.

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