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# A Study on Internal Curing of Concrete using Prewetted Light Weight Aggregate

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**ABSTRACT:** Internal curing is defined as supplying water throughout a freshly placed cementitious mixture using reservoirs, via pre wetted light weight aggregate, that readily release water as needed for hydration or to replace moisture lost through evaporation . Applying water externally to the concrete is the conventional approach for curing. In practice conventional type of curing is difficult to perform as it shall need curing member and also large amount of water is wasted due to evaporation and run off .Concrete curing is of paramount importance in order for concrete to meet performance requirements. Conventionally, curing has been conducted by means of water sparkling, wet burlap or a curing compound. For performance and environmental reasons, internal curing has been gaining increased attention. Pre wetted light weight aggregate such as expanded shale or clay us used for internal curing of concrete

**KEYWORDS:** Prewetted aggregate, Internal curing

## I. INTRODUCTION

Concrete is a composite material composed of crushed stones ( coarse aggregate ), sand(fine aggregate) and hydrates 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 grey cement powder into the binding cement paste which give 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. The American Concrete Institute (ACI) defined internal curing in its ACI Terminology Guide as “supplying water throughout a freshly placed cementitious mixture using reservoirs, via pre-wetted lightweight aggregates, that readily release water as needed for hydration or to replace moisture lost through evaporation or self-desiccation (American Concrete Institute, 2010).” While external curing water is applied at the surface and its depth of penetration is influenced by the quality of the concrete, internal curing enables the water to be distributed more equally throughout the cross section.

A set of water-filled reservoirs is provided within the concrete that supply water on demand to the hydrating cement paste from the time of mixing. Internal curing helps in reducing plastic shrinkage and maintaining workability until the time when moisture equilibrium is achieved between the reservoirs and the surrounding cement paste for reducing dry shrinkage.

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. Experience has shown that high strength concrete is not necessarily high performance concrete and that high performance concrete need not necessarily be high strength. A frequent, unintended consequence of high strength concrete is early-age cracking. Blending lightweight aggregate containing absorbed water is significantly helpful for concretes made with a low ratio of water-to- cementitious material or concretes containing high volumes of supplementary cementitious materials that are sensitive to curing procedures. This process is often referred to as water entrainment. Time dependent improvement in the quality of concrete containing pre-wetted lightweight aggregate is greater than with normal weight aggregate.

## II. METHODOLOGY

A cement is a binder, a substance used for construction that sets, hardens, and adheres to other material to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel together. Cement mixed with fine aggregate produces mortar for masonry, or with sand and gravel, produce concrete. Ordinary Portland cement of 43grade conforming to IS: 12269-1987 is used for this experiment .

Coarse aggregate are a construction components made of rock quarried from ground deposits. Examples of these kind of ground deposits include river gravel, crushed stones from rock quarries and previously used concrete The particle size ranging from 20 mm to 4.75 mm recused as coarse aggregate conforming to IS: 383 is used for this experiment

Light weight expanded clay aggregate (LECA) or expanded clay is a light weighted aggregate made by heating clay to around 1,200 °C in a rotary kiln . The base material is plastic clay which is extensively pretreated and then heated and expanded in rotary kiln at about 1100 °C to form finished LECA product. LECA consist of small, lightweight, bloated particles of burned clay .The yielding gases expand the clay by thousands of small bubbles forming during heating producing a honeycomb structure . LECA has an approximately round or potato shape due to circular movement in the kiln , and is available in different shape and density .LECA is used to make light weight concrete products and other uses .Light expanded clay aggregate (LECA) is dipped in water for 24 hours. This pre wetted LECA is used for casting cubes. Here pre wetted LECA is used as a partial replacement of coarse aggregate by 0%, 5%, 10%, 15%, 20% and 25 % . These pre wetted light weight aggregate stores water in it and act as a reservoir which will be able to release water whenever the concrete needs.

### III. EXPERIMENTAL RESULTS

Following figures represent the results obtained on strength parameters like compressive strength, splitting tensile strength, flexural strength.

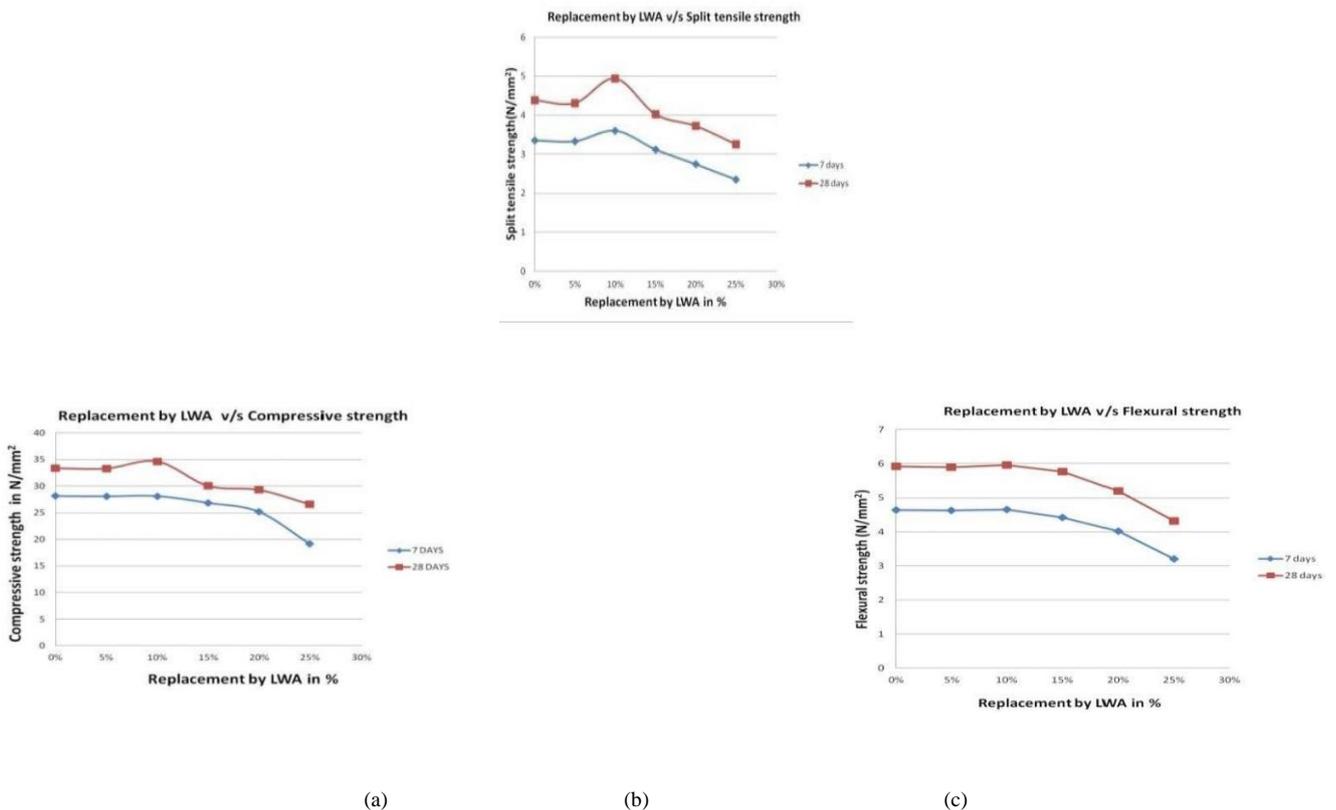


Fig.1. Strength parameters (a) Compressive strength (b) Splitting tensile strength (c) Flexural strength

## V. CONCLUSION

Based on the results it has been concluded that,

The addition of Expanded clay increases the degree of hydration, producing a denser microstructure leading to better curing.

The compressive strength for the internally cured concrete resulted in values 3.83% higher when compared to the plain concrete with an replacement of LWA by an 10%.

The improved hydration also reduce micro cracking as a result of the lower shrinkage tendency of concrete with lightweight aggregate (Expanded clay) used for internal curing.

Flexural strength results have fairly comparable patterns to those of compressive strength as increased doses yield lower strength.

For 10% replacement by LWA is the optimum percentage to yield the strength.

The split tensile strength for the internally cured concrete resulted in values 12.78% higher when compared to the plain concrete with an replacement of LWA by an 10%.

## REFERENCES

- [1.] Khokrin, N. K. (1973). "The durability of lightweight concrete structural members," Kuibyshev, USSR (in Russian)
- [2.] Hoff. G.C. (2006), "Internal Curing of Concrete Using Lightweight Aggregates", American Concrete Institute, Volume 234, March 2006, P621-640.
- [3.] Briatka P.(2010), "Internal Curing of Concrete Using Lightweight Aggregate", Proceedings of Conference on Design,Preparation and Execution of Constructions, Bratislava, March 2010.
- [4.] ACI Committee 213. (2003). Guide for structural lightweight aggregate concrete. Farmington Hills, MI: American Concrete Institute.
- [5.] P. Briatka, P. Makys,(2011) "Desorption and use of Saturated lightweight Aggregate in internal Curing" Slovak Journal of Civil Engineering, 2011, Vol XIX, No.3,31-38.
- [6.] SemionZhutovsky, Konstantin Kovler.(2012), "Effect of internal curing on durability- related properties of high performance concrete", Cement and Concrete Research, Volume 42, Issue 1, January 2012, Pages 20–26.
- [7.] Ryan Henkensiefken, Javier Castro, Haejin Kim, Dale Bentz, and Jason Weiss "Internal Curing Improves Concrete."



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