

Effect of Intermittent Curing on Compressive Strength of Concrete

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Abstract— Curing is essential if concrete is to perform the intended function over the design life of the structure while excessive curing time may lead to the escalation of the construction cost of the project and unnecessary delays. The parameters of the study include the curing period [7, 14, 21 and 28 day], curing method [Atmosphere curing, Membrane curing, Fulltime curing, without curing, under water] and the type of cement [Portland pozzolo Cement(PPC) 43 grade,].In this study specimens i.e. cube were cast and cured under different conditions before testing. The study demonstrates that the method and duration of curing greatly affects the strength characteristics of concrete. Hence quality control for proper field curing is of the almost importance. Studies of the effects upon strength of the various curing periods of alternate dry and wet curing at different air temperatures were done.

Keywords— Curing, Compressive strength, OPC, Casting.

Introduction: Concrete is a composite material formed by combination of cement, fine aggregates, coarse aggregate and water together in a suitable proportion. This mix form easily workable paste known as plastic wet or green concrete. After mixing and placing the concrete in position the cement and water undergoes hardening, the cement paste in this way bind the aggregate like hard mass, which is called concrete. Now a days concrete is used most commonly as a building material because of its high strength, durability and low cost. Concrete is the only building material which gains strength in presence of water while other decayed. Due to property of concrete it is widely used in modern engineering construction. For economical preparation of the high quality concrete mixes, it is essential to study the design of such concrete mixes by various methods and then adopt one which is most economical and durable. Concrete is a construction material composed of cement (commonly Portland cement) as well as other cementitious materials such as fly ash and slag cement, aggregate (generally a coarse aggregate such as gravel, limestone, or granite, plus a fine aggregate such as sand), water, and chemical admixtures. The word concrete comes from the Latin word "concretus" (meaning compact or condensed), the past participle of "concreto", from "com-" (together) and "Cresco" (to grow). Concrete solidifies and hardens after mixing with water and placement due to a chemical process known as hydration. The water reacts with the cement, which bonds the other components together, eventually creating a stone-like material.

Concrete is used to make pavements, pipe, architectural structures, foundations motorways/roads, bridges/overpasses, parking structures, brick/block walls and footings for gates, fences and poles.

Types Of Concrete: There are many different types of concrete including Mix design, Regular concrete, High-strength concrete, Stamped concrete, High-performance concrete, Self-consolidating concretes, Vacuum concretes, Pervious concrete, Cellular concrete, Cork-cement composites, Roller-compacted concrete, Glass concrete, Asphalt concrete, Rapid strength concrete, Rubberized concrete, Polymer concrete, Geo polymer or green concrete, Lime concrete, Refractory Cement, Concrete cloth, Innovative mixtures and Gypsum concrete.

Characteristics of Good Concrete: A good concrete is obtained by careful selection of its ingredients i.e. well grading of aggregate, suitable proportioning, adding sufficient water and adopting good workmanship. Though the freshly prepared concrete remains plastic only temporarily but, it should fulfill certain characteristics in this state because the quality and the cost of the hardened concrete are much affected by the characteristics of freshly prepared concrete. The desired properties of good concrete in plastic and the hardened stage are below.

1 Merits of Concrete:

The various advantages of concrete as construction materials are as below:

- Concrete gains strength in presence of water, where as the material other than concrete decay when they are exposed to water.
- Insect does not attack concrete.
- Concrete can be moulded at any shape at normal temperature and pressure.

Concrete is fire proof and sound proof.

Demerits of Concrete:

- Concrete has low tensile strength therefore, it cracks under tensile load. But this can remove by reinforcement or prestressing.
- Concrete expands and contract due to temperature variation. To overcome this difficulty expansion joint are provided.

Objective:

- I. To achieve the maximum strength or durability.
- II. To make the concrete in the most economical manner.
- III. The test is required to determine the strength of concrete & therefore its suitability for the job.

Methodology/ Planning Of Work

The common method of expressing the proportions of ingredients of a concrete mix is in the terms of parts or ratios of cement, fine and coarse aggregates. For e.g., a concrete mix of proportions 1:2:4 means that cement, fine and coarse aggregate are in the ratio 1:2:4 or the mix contains one part of cement, two parts of fine aggregate and four parts of coarse aggregate. The proportions are either by volume or by mass. The water-cement ratio is usually expressed in mass. IS 456-2000 has designated the concrete mixes into a number of grades as M10, M15, M20, M25, M30, M35 and M40. In this designation the letter M refers to the mix and the number to the specified 28 day cube strength of mix in N/mm². The mixes of grades M10, M15, M20 and M25 correspond approximately to the mix proportions (1:3:6), (1:2:4), (1:1.5:3) and (1:1:2) respectively. Cement is always measured by weight. Mostly it is used in terms of bags. One bag of cement weighs 50 kg and has a volume of 35 litres (or, 0.035m³). A gauge box is used (as shown in the picture) for batching of fine and coarse aggregate by volumes.

Conclusion Concrete structures should be designed for 7 days strength and not for 28 days strength since actual curing of structures is done only for 7 days at mostly used in the field, so as to be in safer side and the Bureau of Indian Standard should recommend the design based on 7 days strength. The Effect of intermittent curing on compressive strength of concrete like one-two or three times in a day, it is clear that, water is most important phenomenon to achieve the compressive strength of concrete. As per IS 456 recommendation that 28 days curing is necessary for better strength of concrete. The overall performance of this project shown by graphical representation, the greater strength is achieved only by the full time curing than membrane curing, but full time curing is not practically possible on site due to insufficient quantity of water. Hence membrane curing is the cheapest and best solution for optimum strength specially where availability of water is minimum.

Scope for Further Studies

this project deals with the compressive strength of concrete and its properties only so for further studies we can consider shear strength, bond strength and tensile strength of concrete with intermittent curing and membrane curing so that there can be further study on “effect of intermittent curing” not only on compressive strength of concrete but also on tensile strength, shear strength and bond strength of concrete.

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