

The Study of Concrete Durability due to Climate Change

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ABSTRACT

Reinforced concrete (RC) is a versatile composite and one of the most widely used materials in modern construction. Concrete is a relatively brittle material that is strong under compression but less so in tension. To increase its overall strength, steel rods, wires, mesh, or cables can be embedded in concrete before it sets. This reinforcement, often known as rebar, resists tensile forces. By forming a strong bond together, the two materials can resist a variety of applied forces, effectively acting as a single structural element. Taking in all stages of production, concrete is said to be responsible for 4-8% of the world's CO₂. Among materials, only coal, oil and gas are a greater source of greenhouse gases. Half of concrete's CO₂ emissions are created during the manufacture of clinker, the most-energy intensive part of the cement-making process. The purpose of this research is to explore the direct effect of climate change (i.e., raise in atmospheric carbon level) to the existing concrete construction, and explore the damage possibility to the newly built concrete construction.

An experimental program will be conducted with using following setting: (1) The concrete mixture proportioning in accordance with ACI 211.1-91, (2) How to interpreting the result of concrete compression test in accordance with ACI 214.4R-10, (3) The concrete quality in accordance with ACI 301-16, (4) The curing process in accordance with ACI 308-11, (5) How the specimen was going to be tested in accordance with ASTM C39/C39M, (6) The slump test was conducting in accordance with ASTM C143/C143M, (7) The making and curing concrete specimen in laboratory in accordance with ASTM C192/C192M.

The result show that: (1) There are different properties between concrete with un-treated and treated inside CO₂ chamber, (2) The reading of rebound number (R) raised slightly for the first 7-day of treatment and then there are flat reading until 28-day of treatment and more, (3) The reading of UPV reading is conservatively flat, which give no different change between un-treated and treated specimens, (4) The compressive test gives a raised in the compressive strength between un-treated and treated specimens. The raised in the compressive strength is still being observed for 28-day and more, (5) The concrete treated with CO₂ alone, without the presence of other properties, shows only the raised of compressive strength, so that the damage possibility still far to be observed. Further work needs to be done to make observation with different type of concrete properties, various structural element, involving environmental impact, and verified by numerical investigation.

Kata Kunci: *concrete, climate change, carbondioxide*