



Recycled Aggregate Self-curing High-strength Concrete

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Abstract

The use of recycled aggregates from demolished constructions as coarse aggregates for concrete becomes a need to reduce the negative effects on the environment. Internal curing is a technique that can be used to provide additional moisture in concrete for more effective hydration of cement to reduce the water evaporation from concrete, increase the water retention capacity of concrete compared to the conventionally cured concrete. High strength concrete as a special concrete type has a high strength with extra properties compared to conventional concrete. In this research, the combination of previous three concrete types to obtain self-curing high-strength concrete cast using coarse recycled aggregates is studied. The effect of varying water reducer admixture and curing agent dosages on both the fresh and hardened concrete properties is studied. The fresh properties are discussed in terms of slump values. The hardened concrete properties are discussed in terms of compressive, splitting tensile, flexure and bond strengths. The obtained results show that, the using of water reducer admixture enhances the main fresh and hardened properties of self-curing high-strength concrete cast using recycled aggregate. Also, using the suggested chemical curing agent increased the strength compared to conventional concrete without curing.

Keywords: Self-Curing Concrete; High-Strength Concrete; Recycled Aggregate; Polyethylene Glycol PEG 400; Super Plasticizer.

1. Introduction

Recycled aggregates are those aggregates produced from the demolished constructions. The utilization of recycled aggregate in concrete production increases due to environmental and economic considerations to produce recycled aggregate concrete (RAC) [1, 2]. RAC is the concrete, which made with recycled aggregate as partially or fully replacement from natural coarse aggregate. Since recycled aggregate produced from different sources with an occupation of around 75% of the concrete volume, it is necessary to obtain suitable recycled aggregate with sufficient quality. This requires advancing processing techniques using special facilities to control the quality of recycled aggregate [3-5].

Curing is the process of controlling the rate and extent of moisture loss from concrete during cement hydration processes to provide time for the hydration of the cement to occur [6]. Self-curing concrete (SC) is the concrete which able to cure itself by retaining its moisture content by adding curing admixtures or by the application of curing compounds [7-10]. Self-curing concrete caused in better hydration along time under drying condition compared to conventional concrete [8]. SC has good durable characteristics that water transport through SC is lower than air-cured conventional concrete [11, 12]. Also, it performs efficiently under elevated temperature such as conventional concrete [15]. Combining the use of recycled aggregate with SC concrete provides satisfactory characteristics [16].

High-strength concrete (HSC) is widely used in the construction industry, like tall buildings and bridges due to it is increased strength, higher stiffness, higher durability, reduced creep, economical cost, good impact resistance, drying shrinkage and resistance to abrasion. HSC is achieved by adding different mineral materials like fly ash, silica fume,

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