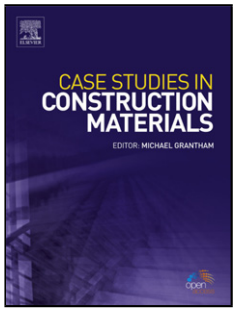

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Authors: Sallal R. Abid, Ali H. Nahhab, Husam K.H. Al-aayedi, Athraa M. Nuhair

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Expansion and Strength Properties of Concrete Containing Contaminated Recycled Concrete Aggregate

Sallal R. Abid [1*], Ali H. Nahhab [2], Husam K. H. Al-aayedi [1], Athraa M. Nuhair [1]

[1] Wasit University, College of Engineering, Civil Engineering Department, Iraq
[2] Babylon University, College of Engineering, Civil Engineering Department, Iraq

Abstract

In the Middle East region, interior walls of buildings are mostly plastered with gypsum. Thus, the demolition wastes are probably gypsum contaminated, which may lead to internal sulfate attack in new concretes containing recycled concrete. This study gives the findings of an experimental investigation on concrete made with recycled concrete aggregates contaminated with construction gypsum (unhydrous calcium sulfate). For this, four groups of mixes were prepared. In the first group, the natural sand was partially and totally replaced by contaminated fine recycled concrete aggregate. In the second group, the natural gravel was partially and totally substituted by contaminated coarse recycled concrete aggregate. In the third group, both sand and gravel were substituted by contaminated recycled concrete aggregate, while the fourth group was directed to investigate the effect of silica fume on concrete made with recycled concrete aggregate. The measured properties were expansion, compressive strength, splitting tensile strength and modulus of rupture. The results showed that the higher the percentage level of contaminated recycled aggregates the lower the strength and the higher the expansion. The best results were recorded for the second group of mixes. In all cases, the expansion did not exceed the limit of 0.05%.

Keywords: Contaminated aggregate; recycled aggregate; expansion; strength; gypsum; silica fume

1. Introduction

The output of huge amounts of solid wastes is one of the most unfavorable consequences of the global population and economy growth. Construction and Demolition Wastes (CDW) are one of the most common and largest municipal wastes that impose enormous costs of landfill management and transportation besides their negative impact on the environment. In Europe for example, 34% of more than 2500 million tons of annual solid wastes is CDW [1]. On the other hand, the huge construction works lead to consume huge quantities of natural fine and coarse aggregates. The demand of natural aggregate for construction industry has been doubled during the last 10 years reaching an annual of 40 billion tons [2]. A remedy solution to these problems is the recovery and the recycling of old concretes to produce concrete aggregates. The annual global CDW output