

Prediction of Compressive Strength of General-Use Concrete Mixes with Recycled Concrete Aggregate

DOI: <https://doi.org/10.1007/s42947-021-00012-6>

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Abstract

This paper presents the mechanical behaviour of concrete mixes made with recycled aggregate by replacing the natural aggregate with crushed concrete from pavement demolition. The purpose of this study was to determine the feasibility of using recycled aggregate from pavement demolition to make new concrete for pavement applications. Considering a control mix without recycled aggregate (RCA0) designed for a compressive strength of 34 MPa, two types of concrete mixes with 50% (RCA50) and 100% (RCA100) replacement percentage of natural coarse aggregate by recycled aggregate were made. The resulting concrete specimens were tested at three different curing ages, 7, 14, and 28 days. The results of this study showed that the compressive and flexural strengths decreased for all two mixes as the recycled aggregate content increased, while the density was slightly affected. A new model based on multiple linear regression analysis of the data from this study and other 14 studies from the literature was developed. The model can be used to predict the compressive strength of general-use concrete mixes with recycled aggregate (20–40 MPa) considering both the recycled aggregate content and the curing age of concrete. A good correlation was found between the compressive strength and the two parameters investigated. Given the predictions of this model, it is recommended not to use more than 30% recycled concrete aggregate in the production of new concrete in order not to affect its strength.

Keywords

Pavement demolition, Recycled concrete aggregate, Compressive strength, Regression analysis