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EFFECT LEVELS OF REPLACEMENT RATIO AND SPECIMEN AGE ON THE MECHANICAL PROPERTIES OF MORTARS CONTAINING WASTE BOTTOM ASH

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Abstract

The coarse solid residue formed at the bottom of combustion boilers is called waste bottom ash (WBA). The most important difficulties that can arise when storing WBA are the potential for leaching of hazardous substances and the high space requirement. For these reasons, there is an urgent need to investigate alternative materials capable of substituting for sand, a natural mineral extensively used in concrete and mortar production. This study aimed to evaluate the feasibility of changing the amount of WBA in concrete and mortar formulations in order to reduce sand consumption in the construction industry and transform WBA into a valuable economic resource for the sector. For this purpose, bottom ash was taken from a landfill in Thrace, an industrially dense region. Effects of the variables of the replacement ratio (B) of WBA in mortar mixtures and the sample age (A) of the formed mortar on the ultrasonic pulse velocity (V), flexural strength (f_f), and compressive strength (f_c) of mortar were determined using analysis of variance (ANOVA), and models were created for V, f_f, and f_c. Notably, there was no decrease in the f_c value at 25% B, while an increase in the fc value was achieved at 15% B. The R^2 values for the models were 0.99, 0.92, and 0.95 for V, f_f, and f_c, respectively. The study concludes that WBA can effectively serve as a substitute for standard sand in mortar mixtures at specific ratios.

Key words: compressive strength, flexural strength, mortar, sand, waste bottom ash

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