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Utilization of fly and bottom ashes as aggregates in the manufacturing of concrete wall panels

Abstract: The escalating demand for construction aggregates in Vietnam has led to a significant depletion of natural sand resources, adversely affecting the cost, quality, and performance of concrete materials. Concurrently, the expanding energy sector necessitates the research, treatment, recycling, and utilization of substantial quantities of coal ash produced by thermal power plants. Investigating the use of coal ash (fly ash and bottom ash) as a substitute for natural aggregates in concrete holds both scientific and practical significance, addressing the dual challenges of diminishing natural sand supplies and coal ash disposal.

This study presents findings on the utilization of coal ash from thermal power plants as a replacement for natural aggregates in semi-dry concrete mixtures used to produce precast hollow wall panels via extrusion technology. Experimental results indicate that substituting 20% of natural aggregates with coal ash enhances the concrete mixture's strength by up to 15%. Complete substitution of natural aggregates with coal ash results in a 20% reduction in unit weight, accompanied by a 50% increase in water absorption. Despite these changes, the concrete mixture with up to 100% coal ash substitution meets the strength requirements outlined in TCVN 11524:2016 for precast concrete hollow wall panels manufactured using extrusion technology.