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Title : COAL ASH FOAMED BRICKS STABILISED WITH HYDRATED LIME-ACTIVATED GGBS (HL-GGBS)

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Coal-fired thermal power plant produces million tonnes of coal ash as an industrial by-product and is significant to be used as raw material for fabrication of bricks. Coal ash could potentially substitute the traditional materials i.e. clay and sand that were used to produce fired clay and cement sand bricks. Clay and sand were continuously extracted from depleting and dwindling non-renewable natural resources that could gradually degrade the environment in the long run. Meanwhile, lime and Portland cement are popular binding materials that could eventually damage and pollute the environment if continually used without control. Alternatively, ground granulated blastfurnace slag (GGBS), an industrial by-product could be used as substitution. However, GGBS requires activation in an alkaline environment for self-cementitious acceleration. For now, the reliable source of alkali is lime or Portland cement. Most researchers have used either fly ash or bottom ash as raw material and either lime or Portland cement as binder. There is also less evidence in effort to lightweight the bricks that were using industrial by-products as raw materials. Therefore, the combination of fly ash and bottom ash as raw material with hydrated lime-activated GGBS (HL-GGBS) as binder and the incorporation of foam need to be investigated. In the present study, coal ash was used as raw material, HL-GGBS system was used as binder and foam was used to reduce weight for the fabrication of coal ash foamed bricks. Portland cement-activated GGBS (PC-GGBS) system was established for comparison to HL-GGBS system. The amount of water was constant at 30% of total weight of dry materials. Pre-foam foaming method was applied. The ratio of foaming agent to water was 1:30. Steel moulds size of 215 mm x 102.5 mm x 65 mm were used and the bricks were dried for forty eight (48) hours before demould and wrapped with cling film for several layers prior to air curing. The determination of compressive strength, density, flexural strength, water absorption, salt attack resistance, thermal conductivity, sound transmission loss and sound absorption were carried out. Traditional fired clay bricks and cement sand bricks were procured and underwent similar testing for comparison. It was discovered that the use of HL-GGBS and PC-GGBS system as binder increase the strength of the bricks compared to the use of hydrated lime and Portland cement alone. However, the addition of foam has resulted in decrease of compressive and flexural strength, lower density, weak salt attack resistance, high water absorption, low value in sound transmission loss and thermal conductivity but provide insignificant effect to sound absorption.