

Identify the Potential of Applying Rice Husk Ash and Fly Ash for Cement-Based Grout

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Rice husk ash (RHA) is a fine agricultural by-product and commonly the brick industry in Sri Lanka produces a significant amount of RHA as a waste. Similarly, Fly Ash (FA) is resulted as a byproduct of coal power plants (CPP). In Sri Lanka, Nuraichcholai CPP generates about 200,000 MT/year of FA. Previous studies have reported that both RHA and FA have pozzolanic reactivity. Cement-Based Grout (CBG) used in geotechnical and other engineering aspects is expensive since the cost of Portland cement and grout additives. Therefore, the present study aimed to introduce RHA and FA to the CBG as a partial replacement for cement. FA and RHA samples were collected from Nuraichcholai CPP and brick industrial sites respectively. After initial purification, 63-150 μm sieve fraction of both FA and RHA were selected. Cement, FA, and RHA were thoroughly mixed in a small grinder to prepare different grout mixtures. Initially, phase analysis for FA and RHA was conducted by X-ray Diffraction (XRD). Before the solidification, each grout mixture was analysed with the Standard Flow Cone (FC) test and then Compression Strength (CS) test during the curing period of 7th, 28th, and 45th days was conducted. XRD analysis has shown that FA and RHA have the crystalline and amorphous form of SiO_2 respectively. FC efflux time in each combination is in the range of 14.1-17.5 sec. (FC efflux time < 15 sec. ASTM-C939-02). FC efflux time has increased with the increment of RHA amount. This may be due to the porous nature of RHA, which tends to reduce the quantity of free water and increase water demand. Except for the FA+cement combination others have CS less than 20 MPa (CS > 20 MPa BSEN 12390-3:2002). The increment of RHA tends to decrease the CS. Hence, the application of FA as an additive for CBG is favourable than the RHA or combination of FA+RHA.

Keywords: Rice husk ash, Fly ash, Cement-Based Grout, Compressive Strength