

ABSTRACT:

Class F fly ash and bottom ash are the solid residue by-products produced by coal-burning electric utilities. They are usually disposed of together as a waste in utility disposal sites with a typical disposal rate of 80% fly ash and 20% bottom ash. Reutilization of these waste materials in civil engineering applications that require large volumes of fill or back-fill materials, such as embankments and retaining structures, is beneficial. The literature contains only limited information on the use of mixtures of fly and bottom ash in these types of applications. This paper presents a laboratory investigation on the physical properties (grain sizes and specific gravity test), morphology, mineralogy, chemical properties and Mechanical properties (Standard compaction, hydraulic conductivity and strength test) of Tanjung Bin class-F fly and bottom ash mixtures. Six mixtures of fly and bottom ash with different mixture ratios (i.e. 0%, 30%, 50%, 70%, 90% and 100% fly ash content by weight) were prepared for testing. Strength properties of coal ash mixtures are carried out by conducting direct shear test and unconfined compression test. Besides, chemical properties are carried out by XRF analysis. Morphology and mineralogy of coal ash mixtures are studied using scanning electron microscope (SEM) analysis and x-ray diffraction (XRD) analysis. The coal ash mixtures were compacted at 95% of maximum dry density. Morphological analysis showed that the number of irregular shaped particles increased confirming change in material type with different mixture ratios. From mineralogical analysis, the crystalline compounds present in Tanjung Bin coal ash mixtures were quartz, mullite, magnetite, hematite, and calcium oxide. From chemical analysis, Tanjung Bin fly ash is classified as class F in which fly ash has low lime, less than 10%. Its low specific gravity, freely draining nature, ease of compaction, good frictional properties, high shear strength and low compressibility can be gainfully exploited in the construction of embankments, roads, reclamation and fill behind retaining structures.