ABSTRACT

Suitability of a stabilized low lime fly ash as construction material in civil engineering applications is studied in this investigation. A low lime fly ash was stabilized with lime alone or in combination with gypsum. The lime content was varied from 0% to 10% and the gypsum contents were 0.5% and 1.0% by the dry weight of fly ash. Hydraulic conductivity characteristics of the compacted stabilized fly ash was studied for 7 days and 28 days cured samples. Effluents emanating from the hydraulic conductivity mould were analysed for Cd, Cr, Cu, Fe, Mg, Ni, Pb and Zn as well as for As and Hg, and Ca by appropriate methods. The hydraulic conductivity and the concentration of metals in corresponding leachate were coupled together to get the total amount of metal emanating from fly ash fill. The effect of stabilization on leachate characteristics of metals was studied through leachate load ratio defined as the ratio of total amount of metal emanating from unstabilized specimens to that of stabilized specimens.

Strength and deformation characteristics of the stabilized fly ash were studied through unconfined compressive strength, undrained triaxial strength with pore pressure response, CBR, Brazilian tensile strength and flexural strength. To study long term effect on strength specimens were cured up to 90 days in most of the tests mentioned. Unconfined compression tests were conducted for both soaked and unsoaked specimens. Pore pressure response of the stabilized fly ash cured for 7 days and 28 days was studied in detail. Durability of this stabilized material was studied through slake durability indices commonly used for rock materials. An attempt was made to understand the mechanism of lime-fly ash and lime-fly ash-gypsum interaction through physicochemical and microstructural development study. X-ray diffraction analysis and thermal analysis of powdered samples were

conducted to identify the new crystals formed as pozzolanic reaction products. Energy dispersive X-ray microanalysis was conducted to identify the chemical composition of the pozzolanic reaction products at the grain boundary. The effect of lime, gypsum and curing period on microstructural development was studied through scanning electron micrographs. Because of slow pozzolanic reaction the specimens were cured up to 10 months for microstructural development study. It is revealed from the test results and analysis that stabilization of low lime fly ash with proper proportioning and curing enhances the strength and durability while reducing negative environmental impacts.