Abstract

Pavement distress caused by sulfate soils, when chemically treated with lime and fly ash stabilizers is major problem to highway agencies and can reduces the overall lifespan of the pavement structures. These distresses are caused due to the formation of an expansive mineral ettringite, which can absorb water molecules in between its column like structure. This research is oriented towards identifying the feasibility of using water content higher than optimum moisture content (OMC) at the time of compaction to reduce post stabilization expansion in the soil matrix. Soil available locally at IIT Kanpur was used in the study and optimum levels of fly ash and lime for soil were estimated based on ASTM recommended practices. Soil did not contain detectable levels of sulfates and hence spiked with concentration of 2000, 5000, 8000 and 10000 parts per million (ppm) of soluble sulfates. Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD) were used to verify the presence of ettringite in soil-lime mixtures. Samples were tested for unconfined compressive strength (UCS) and 3-D swell tests. Samples with sulfate content above 8000 ppm showed significant expansion during swell testing. Differential Scanning Calorimetry (DSC) was used to quantify the amount of ettringite formed in lime soil mixtures. Samples compacted at water content equal to 1.1 times OMC and when compacted using normal compaction energy showed a significant reduction in swelling as compared to samples prepared at optimum moisture content. Though, these samples showed reduction in compressive strength achieved, observed strength were above minimum strength criteria set for lime treated soils.