World Academy of Science, Engineering and Technology
International Journal of Geotechnical and Geological Engineering
Vol:11, No:09, 2017

Experimental Studies on Stress Strain Behavior of Expanded Polystyrene Beads-Sand Mixture

Authors : K. N. Ashna

Abstract : Lightweight fills are a viable alternative where weak soils such as soft clay, peat, and loose silt are encountered. Materials such as Expanded Polystyrene (EPS) geo-foam, plastics, tire wastes, rubber wastes have been used along with soil in order to obtain a lightweight fill. Out of these, Expanded Polystyrene (EPS) geo-foam has gained wide popularity in civil engineering over the past years due to its wide variety of applications. It is extremely lightweight, durable and is available in various densities to meet the strength requirements. It can be used as backfill behind retaining walls to reduce lateral load, as a fill over soft clay or weak soils to prevent the excessive settlements and to reduce seismic forces. Geo-foam is available in block form as well as beads form. In this project Expanded Polystyrene (EPS) beads of various diameters and varying densities were mixed along with sand to study their lightweight as well as strength properties. Four types of EPS beads were used 1mm, 2mm, 3-7 mm and a mix of 1-7 mm. In this project, EPS beads were varied at .25%, .5%, .75% and 1% by weight of sand. A water content of 10% by weight of sand was added to prevent segregation of the mixture. Unconsolidated Unconfined (UU) tri-axial test was conducted at 100kPa, 200 kPa and 300 kPa and angle of internal friction, and cohesion was obtained. Unit weight of the mix was obtained for a relative density of 65%. The results showed that by increasing the EPS content by weight, maximum deviator stress, unit weight, angle of internal friction and initial elastic modulus decreased. An optimum EPS bead content was arrived at by considering the strength as well as the unit weight. The stress-strain behaviour of the mix was found to be dependent on type of bead, bead content and density of the beads. Finally, regression equations were developed to predict the initial elastic modulus of the mix.

Keywords : expanded polystyrene beads, geofoam, lightweight fills, stress-strain behavior, triaxial test
Conference Title : ICGE 2017 : International Conference on Geotechnical Engineering
Conference Location : Istanbul, Türkiye
Conference Dates : September 28-29, 2017