

Geotechnical Properties of Innovative, Synthetic Lightweight Aggregates

Ola C. Holmstrom¹ and Christopher W. Swan²

¹ Project Engineer, Haley & Aldrich, Inc., 465 Medford Street, Suite 2200, Boston, MA 02129-1400, ² Assistant Professor, Department of Civil and Environmental Engineering, Tufts University, Medford, MA 02155

KEYWORDS: lightweight aggregate, coal fly ash, high density polyethylene, consolidation, shear strength

ABSTRACT

Geotechnical tests were performed on innovative synthetic lightweight aggregates made from compounded coal fly ash and recycled high-density polyethylene (HDPE). Two aggregates were developed; one consisting of 70% fly ash 30% HDPE (70:30 aggregate) by weight, the other 80% fly ash 20% HDPE (80:20 aggregate). Test results were compared to results for a normal-weight aggregate (sand) and expanded clay shale lightweight aggregate (LWA). Test results show that the loose density of the synthetic aggregates, which ranged from 0.93 to 1.06 g/cc, was between that of the sand (1.44 g/cc) and LWA (0.75 g/cc). However, the synthetic aggregates and sand have a much lower absorbancy to water; an approximate 2% water absorbancy compared to 19% for the LWA. Compression tests showed the sand to be much stiffer than either the synthetic aggregate or LWA, which have similar compression behaviors. Strength test results for the three aggregates were similar ($\phi = 46 \pm 2^\circ$). Based on an overall evaluation these test results, the synthetic aggregates may be a good substitute for normal weight or natural LWA's where well-draining and/or lightweight geotechnical fills are required.