

# COMPARATIVE STUDY OF LIGHTWEIGHT AGGREGATES

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## ABSTRACT

The objective of this study is to compare the chemical, physical, mineralogical and microstructural characteristics of Versalite™ with those of other commercial lightweight aggregates, including pumice, expanded shale and bottom ash. The characteristics of these lightweight aggregates are correlated with thermal conductivity and resistance of concrete slabs made with the lightweight aggregates. Versalite™ is a manufactured lightweight aggregate, which is currently produced from spray dryer ash (SDA) in King George, Virginia. The thermal conductivity and resistance of the concrete slab specimens were determined in accordance with ASTM C177-04.

Mineralogical composition, microstructure or porosity, chemical and physical properties are relevant to thermal conductivity and resistance of aggregate and aggregate products. Mineralogical and chemical characterization results indicate that all four lightweight aggregates fall into the category of complex aluminosilicates. The Versalite™ lightweight aggregate has amorphous aluminosilicate as a major component similar to the other commercial lightweight aggregates. In addition, the Versalite™ lightweight aggregate has calcium silicate hydrate as a significant component. Aluminosilicate and calcium silicate hydrate have low thermal conductivity and high thermal resistance. The porosity characterization results indicate that the Versalite™ lightweight aggregate has a moderate total porosity and a high proportion of micropores in comparison to those in pumice, expanded shale and bottom ash. Physical properties including relative density (dry and saturated surface dry or SSD conditions), apparent specific gravity and water absorption are consistent with the porosity study of all four lightweight aggregates

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