

The Effects of Recycled Clay Brick (RCB) content on the Engineering Properties, Weathering Durability, and Resilient Modulus of Recycled Concrete Aggregate (RCA).

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Abstract:

This research project presents a laboratory investigation of Recycled Clay Bricks (RCB) from demolished building when mixed with Recycled Concrete Aggregates (RCA) as an unbound base course in road construction. The hydraulic properties (saturated and unsaturated) of 100% RCB, 30%RCB, 15%RCB, 5% RCB and 100% RCA were determined at the optimum water content and 95% of dry density using rigid-wall hydraulic conductivity test and multi-step outflow respectively. The drying path of Soil-Water Characteristic Curves (SWCCs) was measured using hanging column tests. They are used for the estimation of unsaturated hydraulic conductivities and pores size distribution (pores diameter occupied by free water). Results show that the drainage of water is faster when the percentage of RCB increases due to larger pores.

The effects of weathering (Wet and Dry cycles W-D, Freeze and Thaw cycles F-T) and abrasion (Micro-Deval and Los Angeles tests) were performed on the materials to see the stiffness changes with the number of cycles and the effects of abrasion on particle degradation of the specimens. Micro-Deval (MDE) and Los Angeles (LA) increases with the percentage of RCB on the specimen because they have low particle density and great porosity compared to natural aggregates. The W-D cycles results show that the durability of the material is affected by the number of W-D cycles and an increase in the percent fines is observed.

The Summary Resilient Modulus (SRM) was calculated using the Power function model developed by Moosazedh and Witczak and the National Cooperative Highway Research Program NCHRP model under 1-28A procedure. The trend show that the SRM decreases when the percentage of brick and the number of F-T cycles increase.

The optimum moisture content of the specimens combined with the variation of temperature may influence the characteristics of the unbound road base pavement made by recycled aggregates by the action of wet-dry or freeze-thaw cycling. The durability of a pavement can be influenced by repeated freeze-thaw cycles, wet-dry cycles, or a combination of both. During the thawing period, the melting of ice on the specimens lead to an unsaturated materials, inducing an important bearing capacity loss.

Keywords: Recycled Clay Bricks, Durability, Recycled Concrete Aggregates, Resilient Modulus, Base Course.