Florida Department of Transportation Research

Concrete Debris Assessment for Road Construction Activities

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Current Situation

Liquid concrete is a remarkably alkaline material. Fortunately, once concrete has set, its alkaline components are stabilized within its solid structure so it is has only a small impact on Florida's environment, which averages slightly acidic. The situation is reversed when reclaimed concrete is pulverized for use in roadway foundations or during grinding operations that prepare a road for restoration, which produces concrete powder. By breaking the chemical bonds that hold concrete together, there is a potential that its alkalinity and other chemical constituents, such as heavy metals or trace metals, might enter the environment.

Grinding grooves into concrete pavement prepares it for a new top layer, but it generates tons of residual powder that must be properly disposed of.

Research Objectives

University of Florida researchers studied the possible impact of recycled concrete aggregate (RCA) used in roadway base layers on the acid/base balance of the subsurface environment. They also examined a related issue: management of concrete grinding residuals that result from grooving and grinding operations on Portland cement concrete pavements.

Project Activities

For these studies, RCA samples were gathered from five Florida sites, and limerock control samples from three Florida sites. RCA was processed into aggregate, randomly sampled, and then homogenized to provide an average sample for each RCA site. Moisture content of the samples was measured. Oven-dried samples were sieved to determine size distributions. A standard EPA method was used to determine the pH and conductivity of RCA-equilibrated water. The pH of the water in these tests varied from 10.5 to 12. Control samples were below ph 9. Alkalinity was measured by standard titration. Digested samples of RCA were measured for trace metals.

Nine soil samples were collected from various locations for studies of RCA-soil interactions. Florida soils tend to be acidic to slightly alkaline (ph 3.1 to 8.8). Soil samples were characterized by moisture content, pH, extractable acidity, and EPA leaching tests. The soils neutralized the alkalinity of RCA somewhat, but how this might change over time or how it might work in an actual soil environment requires further research.

In the second phase of the project, concrete grinding residue (CGR) was studied. When mixed with water, CGR produces high pHs in the range 10 to 12.5, raising the question of proper disposal of CGR wastes. Heavy metals and trace metals are also a concern. The researchers reviewed extensive studies of CGR, its composition, and disposal methods used in the U.S., and they developed a set of best practices for handling CGR.

Project Benefits

The findings of this project will assist in protecting Florida's environment through a better understanding of the impact of using recovered concrete as well as by providing better guidance for disposal of CGR wastes.

For more information, please see dot.state.fl.us/research-center