Time & Location: October 25, 2013 at 2:00 PM in Engineering 2 211P  
Title: Evaluating the Use of Recycled Concrete Aggregate in French Drain Applications

Recycled concrete aggregate (RCA) is often used as a replacement or partial replacement of "virgin" aggregate in geotechnical and pavement applications such as road foundations (base course), embankments, hot-mix asphalt, or Portland cement concrete. In the state of Florida, however the use of RCA in exfiltration drainage systems, such as French Drains, had been prohibited until the modification of Section 901 of its Standard Specifications for Road and Bridge Construction. The primary concerns with using RCA as a subdrainage media are the fines content and the precipitation of calcium carbonate to cause a reducing the permeability of filter fabric. Additional concerns include the potential for rehydration of RCA fines.

The performance of RCA as subdrainage material has not been well documented and the limited information restricts its reuse. A literature review has been conducted on the available information related to RCA as drainage material. A survey was issued to the state highway agencies (SHAs) across the nation in regards to reusing the RCA in French Drains. Some state highway agencies have reported the use of RCA as base/subbase course; however, no state reports the use of RCA in subdrainage systems especially exfiltration trench. This thesis describes the testing methods used to evaluate RCA as pipe backfill materials in French Drain systems. The French Drain collects water runoff from the road pavement and transfers it to slotted pipes underground and then filters through coarse aggregate and geotextile.

The RCA was tested for its physical properties including, specific gravity, unit weight, percent voids, absorption, and abrasion resistance. RCA cleaning/washing methods were also applied to evaluate the fines removal processes. The potential for RCA rehydration was evaluated by means of heat of hydration, pH and compressive strength, and setting time tests. The permeability of RCA was also tested using the No. 4 gradation. Long term testing was conducted to evaluate the tendency for geotextile clogging from RCA fines. Calcium carbonate precipitation was also evaluated and a procedure to accelerate the precipitation process was developed.

The results show that RCA has a high abrasion value, that is, it is very susceptible to break down from abrasion during transportation, stockpiling, or placing. The most effective cleaning method was found to be washing by means of agitation and pressure washing. RCA has not demonstrated the tendency to rehydrate and harden when mixed with water. The permeability tests show that the No. 4 gradation does not restrict the flow of water; however the flow rate is highly dependent on the hydraulic system itself. However excessive fines can cause large reductions in permeability over time. It has been determined that No. 4 gradation of RCA can provide a suitable drainage media if the RCA is properly treated (fine removal) before its use.

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Approved for distribution by Boo Hyun Nam, Committee Chair, on January 1, 2015.
The public is welcome to attend.