



## Recycled Materials Resource Center



University of New Hampshire



Federal Highway Administration

## Research Project 6

# Evaluation of Tests for Recycled Material Aggregates for Use in Unbound Applications

### Project Objectives

- To evaluate critical aggregate testing procedures in the context of recycled material aggregates for use in unbound granular applications.
- To begin developing a database of material properties for use as inputs into the AASHTO 2002 Design Guide.

### Project Description

The need for a review of testing procedures was required because some recycled aggregates may not perform well using traditional characterization procedures, even though the aggregate performs well in the field. During the literature review, it became evident that there were questions about the appropriate compaction of recycled materials and the relevance of traditional methods such as the Modified Proctor and vibratory table tests. Most of the work of this project has subsequently focused on modifying a demolition hammer for use in vibratory compaction and creating a corresponding specification.

Graduate student Tom Morgan and Dr. Melton spent most of the past year working with Dr. Pedro de Alba of UNH, Mr. Jeff Farrar of the U.S. Bureau of Reclamation and Dr. Vincent P. Drnevich of Purdue University to refine a draft specification for compaction of granular materials using a vibratory hammer. The specification was based on work done by Dr. Drnevich using a hammer smaller than the one at UNH, so both research teams have been working to determine how the energy imparted to the sample by the respective

systems may affect the results. At UNH, the research has concentrated on collecting the data required to determine the actual energy transferred into the material by the hammer as the material is compacted. This requires the ability to rapidly sample the acceleration and displacement of the tamper foot as well as the force applied to the sample. Displacement of the tamper foot was measured using an LVDT, with the initial level corresponding to the start (uncompacted) position of the tamper foot for each lift. An accelerometer is already mounted on the tamper foot and strain gauges have been mounted on the shank to measure the dynamic load. Once the installation is complete it will be possible to measure acceleration, load and displacement simultaneously. Using this data, it should be possible to make a recommendation as to how much power is required to reach a certain level of compaction. The materials being evaluated are glass cullet, crushed concrete, limestone, quartz monzonite and washed sand as a control. When the system is complete, the maximum dry density and particle degradation will be compared to other compaction tests.



Demolition hammer used for vibratory compaction of granular aggregates.

### Project Partners

New Hampshire DOT, Purdue University, United States Bureau of Reclamation

### End Products

One end product will be guidance on testing recycled materials to evaluate their potential for use as an unbound aggregate. Additionally, a database will list material properties gathered during a literature search and measured at the RMRC for use in the *AASHTO 2002 Design Guide*. The end users of this research will be State DOTs and the FHWA.

### Further Information

The Recycled Materials Resource Center (RMRC), a cooperative agreement between the University of New Hampshire and the Federal Highway Administration, is a national center that promotes the appropriate use of recycled materials in the highway environment. Its focus is on the long-term performance and environmental implications of using recycled materials.

For detailed quarterly progress reports for Project 6, as well as all RMRC-funded research projects, please see: <http://www.rmrc.unh.edu/Research/researchlevel2.asp>.

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#### RMRC

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