

UTC Project Information	
Project Title	Performance evaluation of porous asphalt mixture containing recycled concrete aggregate
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Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT: \$90,000 University of South Florida: \$45,000
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Start and End Dates	<div style="display: flex; flex-direction: column; gap: 5px;"> <div> Start date: 10/01/2021</div> <div> End date: 09/30/2022</div> </div>
Brief Description of Research Project	<p>Concrete is one of the most widely used building materials, which creates a large amount of debris during demolition and/or reconstruction of infrastructure facilities (1). The recent U.S. Environmental Protection Agency statistics show that concrete accounted for 67.5 percent of the 600 million tons of construction and demolition debris in the U.S. in 2018, and 74.3 percent of the concrete debris was reused as aggregate (2). The recycled concrete aggregate (RCA) from construction and demolition waste helps to reduce the environmental impact and improve the sustainability of infrastructures by diminishing the waste sent to landfill areas, reducing the need for aggregate mining from natural resources, and eliminating the carbon dioxide (CO₂) emission that would be released during portland cement production (3).</p> <p>Pavement is one major consumer of aggregates because of the vast area of pavement networks and the high proportions of aggregates in all pavement structural courses. Promoting the use of RAC in pavements is one major approach to achieve sustainability and environmental protection goals. Currently,</p>

most RCA use in pavement projects is limited to the base and subbase courses due to the lower quality of RCA in comparison to virgin aggregates and the less strict specifications for aggregates in the base and subbase courses. The use of RCA in the upper course, primarily dense-graded hot mix asphalt, is still limited due to the concern that RCA may significantly impact the performance of hot mix asphalt in terms of moisture susceptibility, tensile strength, and volumetric properties (4, 5). Meanwhile, porous asphalt mixture, which features a high air-void content and high permeability, has gained significant attention in recent years in the pavement industry due to its contributions to storm water runoff volume control and quality improvement, traffic noise reduction, driving safety enhancement, and other environmental and safety-related benefits (6, 7). The high porosity of porous asphalt mixture limits its applications to scenarios where either it is not treated as a structural course or the traffic volume, load, or speed is low (e.g., shoulder, parking lot, low-volume roads). These scenarios have less strict requirements on asphalt mixtures, so can be appropriate for the use of RCA in asphalt mixtures. Currently, only a very limited number of studies have explored the utilization of RCA in porous asphalt mixtures (8). There is a need to further investigate the feasibility and method of incorporating RCA in porous asphalt mixture.

The main objective of this proposed project is to investigate appropriate methods to incorporate RCA in porous asphalt mixture, evaluate the performance of porous asphalt mixture with RCA and other necessary additive, and provide recommendations on test procedures and mixture design.

Specifically, the following tasks are planned:

- (a) Perform a comprehensive literature review of RCA characteristics, porous asphalt mixture design and performance, and the use of RCA in asphalt mixtures;
- (b) Develop and execute a laboratory experimental plan to design and evaluate porous asphalt mixtures containing RCA and other necessary additives; and
- (c) Investigate the mechanism of RCA impact on porous asphalt mixture performance and recommend test and design procedures/guidelines for porous asphalt mixtures containing RCA.

Collaborators

The following collaborators will be involved in this project:

- (a) Tampa Pavement Constructors / Lakeland Paving. This paving company is based in Tampa, Florida and will

	<p>provide paving materials and share their experience of asphalt mixture production for use in this study.</p> <p>(b) Associated Asphalt. This is an asphalt producer based in Tampa, Florida. This collaborator will mainly supply asphalt binder samples to be used in this study.</p> <p>(c) Recycled concrete aggregate suppliers to be determined during the course of the study.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	
<p>Impacts/Benefits of Implementation (anticipated)</p>	
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project website 	<p>https://ctech.cee.cornell.edu/final-project-reports/</p>