

Title:	Synthesis for Quantification of Binder Availability in Recycled Materials
The Problem:	<p>The design of asphalt mixtures with recycled materials, including reclaimed asphalt pavement (RAP) and/or recycled asphalt shingles (RAS) assumes that 100 percent of the recycled binder is available to blend with virgin binder in the mixture, and the virgin binder content is reduced to account for this contribution. In reality, the amount of recycled binder available is somewhere between 0 percent availability (i.e., recycled material acting as "black rock") and 100 percent availability, with lower availability for heavily aged RAP binder or RAS binder.</p> <p>The assumption of 100 percent availability leads to total binder contents less than those specified as optimum during mix design, yielding a dry mixture with insufficient coating and inadequate durability and cracking performance in-service. In addition, binder availability in recycled materials can be utilized to assess their aging state and preclude the use of large quantities of recycled materials with limited binder availability.</p>
Technical Objectives:	<p>The researchers shall address the following:</p> <ol style="list-style-type: none"> 1. Develop a methodology to quantitatively estimate binder availability and associated aging state of recycled materials. Important variables that will be considered include mixing time and temperature; recycling agent addition and method of addition; virgin binder source; and source of recycled materials. 2. Conduct an evaluation of the coatability and rutting and cracking potential of typical dense-graded mixtures considering the two extremes, 100 percent recycled binder availability and 0 percent recycled binder availability ("black rock"), to measure the impact on mixture performance. 3. Complete a review of the specification for recycled materials to tie binder availability and associated aging state to recycled binder ratio limits for these materials. <p>The expectation of this project is that the end product will obtain a TRL level 7.</p>
Desired Deliverables:	<ol style="list-style-type: none"> 1. Technical memorandum for each task completed. 2. Monthly progress reports. 3. Value of Research (VoR) that includes both qualitative and economic benefits, to be included in the final research report. 4. Research report documenting the findings of the research, including revisions to TxDOT specifications with adjustments to allowable recycled binder ratios for recycled materials, as needed. 5. Project Summary Report.
Proposal Requirements:	<ol style="list-style-type: none"> 1. Utilize the "Proj/Agre" and "PA_Form" templates located at the TxDOT RTI website. 2. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in RTI's University Handbook, which is also located at the RTI website. 3. Proposals should be submitted in PDF format, 1 PDF file per proposal. File name should include project name and university abbreviation. 4. This project will be tracked during the life of the project using a Technology Readiness Level (TRL) scale. For more information about the use of a TRL, click.