Title:	Establish Performance-Based Acceptable Lab-Molded Density Range for Mix Design and QC/QA
The Problem:	Lab-molded density of asphalt mixes is a critical factor for asphalt mix performance. Too high or too low lab-molded density often leads to rutting or cracking/raveling problems. Prior to Superpave, lab-molded density could vary from 95 to 97 percent. Since implementation of Superpave in the 1990s, every state, including TxDOT, has used a lab-molded density of 96 percent for mix design. The selection of 96 percent density assumed that asphalt mix density would ultimately become 96 percent at the end of its life from the initial 92 to 93 percent construction density after years of traffic densification. NCHRP 09-09(1), Verification of Gyration Levels in the Ndesign Table, discovered that most Superpave mixes never reached 96 percent density. Furthermore, various field test sections designed with density ranging from 96.5 to 98 percent were constructed under various TxDOT sponsored research projects, and they performed well. Currently, TxDOT is moving toward implementing balanced mix design, which relies more on performance tests rather than lab-molded density alone to ensure good field performance. Accordingly, lab-molded density of the balanced mix design (BMD) mixes may vary from one mix to another. Thus, the fixed lab-molded density of 96 percent becomes a barrier for BMD implementation. In addition, if the lab-molded density during mix design can vary, then what is the acceptable range of lab-molded density and pay factor during plant production in terms of quality control and quality acceptance (QC/QA)? This warrants a study to re-evaluate the fixed lab-molded density of 96 percent requirement and to establish a performance-based acceptable lab-molded density range for mix design and QC/QA.
Technical Objectives:	This research shall re-evaluate the fixed lab-molded density requirement of 96 percent and establish a performance-based acceptable lab-molded density range for mix design and QC/QA. The work to be performed shall include: 1. Conduct a literature review of current and past practices and research related to lab molded density and associated lab mix properties and field performance. 2. Determine the impacts of lab-molded density on laboratory asphalt mix engineering properties considering typical mix types, binder sources, aggregates and gradations, and additives. 3. Plan test section construction and develop construction specifications. 4. Construct and monitor test sections. 5. Develop a performance-based acceptable lab-molded density range for mix design and QC/QA and pay factors. 6. Recommend construction specification changes. The expectation of the project end product(s) shall attain a Technology Readiness Level of 7.
Anticipated Deliverables:	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; <u>not a stand-alone deliverable</u>. 4. Research report documenting the findings of the research, including laboratory test results, construction of test sections, filed performance, and new construction specifications. 5. Recommended construction specification changes. 6. Project Summary Report
Proposal Requirements:	1. Utilize the "Proj/Agre" and "PA_Form" templates located at the <u>TxDOT RTI website</u>. 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 <u>University Handbook</u>, 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 <u>TRL</u>, click.