Title:	Evaluation of Seamless Bridges
The Problem:	In certain environments in Texas, bridges have early age deterioration. Traditional bridges contain joints to facilitate deck expansion and contraction; unfortunately, joints also allow water to flow from the roadway to the bridge substructure. This ingress causes accelerated corrosion of reinforcing steel and deterioration of bearings, bent caps, girders, and columns. TxDOT is currently looking into integral and semi-integral abutments, in which joints are moved from the end of a bridge to the ends of the approach slabs. The concept of seamless bridges eliminates bridge joints altogether using a heavily reinforced transition slab that integrally connects each end of a bridge deck to CRCP. This research has the potential to eliminate joints from bridges where CRCP is used. Eliminating joints will keep water and chlorides away from bridge superstructures and delay, or even prevent degradation from corrosion. This could add decades to the time periods between major maintenance activities. Seamless bridges have been used successfully in Australia since 2004. Australian researchers have reported reduced maintenance as well as improved rideability, reduced noise, and simplified construction. Seamless pavements can reduce costly bridge maintenance, but TxDOT needs to evaluate this technology before deployment is considered in the field.
Technical Objectives:	Evaluation will begin with a rigorous investigation of how to design the transition slab. There are three main parameters at play: length of transition slab; amount of reinforcement in transition slab; and coefficient of friction between transition slab and subgrade. This research has three primary objectives: 1. Quantify the coefficient of friction that can be expected when the transition slab expands or contracts. Consider a variety of commonly available bond breakers: select fill without bond breaker, woven geotextile, non-woven geotextile. Also consider multiple commonly used base materials from Item 247, Flexible Base. This will account for typical CRCP/subgrade interface conditions through multiple strain ranges, and may require specialized pullout and/or large-scale direct shear testing. 2. Select or develop an appropriate modeling technique to optimize the reinforcement and length of transition slabs. The optimal design will depend on factors that include bridge length (thermal expansion/contraction), CRCP thickness, bond breaker, and base and/or subgrade. The modeling technique will incorporate strain-dependent bond breaker properties and soil-structure interaction (i.e., load shedding). 3. Identify design issues associated with TxDOT's standard prestressed TxGirder bridges and CRCP details that would require additional analytical effort or revised details in order to be compatible with this seamless bridge concept. 4. Design and instrument seamless bridge transitions for a bridge where full-depth CRCP is already being constructed. Use instrumentation (strain gages) to monitor performance. Refine design procedure based on field observations. During the course of this research, the research team shall the address the following: 1. Review existing literature. 2. Analyze frictional resistance provided by common bond breakers and base materials under CRCP. 3. Develop and evaluate model parameters. 4. Develop design recommendations and provide design examples that address all findings from Objective #3. 5. Develop instrumentation plan.
Desired 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. 4. Research report documenting the findings of the research, including documentation of design and performance and final design recommendations to support implementation. 5. Project Summary Report.

Proposal Requirements:	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.