Exhibit D

Research Project Requirement Template

Use of Distributed Acoustic Sensing (DAS) For Structural Health Monitoring of Asphalt Pavements

Recipient/Grant (Contract) Number: 69A3552348306 (CY1-UTEP-01)

Center Name: Southern Plains Transportation Center (SPTC)

Research Priority: Improving the Durability and Extending the Life of Transportation

Principal Investigator(s): Cesar Tirado, The University of Texas at El Paso; Soheil Nazarian, The University of Texas at El Paso

Project Partners: The University of Texas at El Paso

Research Project Funding: The University of Texas at El Paso: $65,000 (Federal) and $65,000 (Match)

Proposed Start and End Date: 10/01/2023 to 9/30/2024

Project Description: The main objective of this research is to understand and develop tools to use Distributed Acoustic Sensing (DAS) technology for monitoring the performance of pavement layers under traffic conditions. This technology steps beyond the traditional methods for the characterization of in-situ materials that make use of embedded sensors such as strain gauges, geophones, or accelerometers to obtain point measurements at specific locations by allowing significantly improved spatial coverage and refined resolution for capturing responses of pavement materials under traffic loadings without the need for traffic control. This research project will include laboratory-scale testing of pavement sections including DAS to produce data for analysis and development of a data reduction tool. The applicability of this tool will then be expanded using data collected from large test sections at Turner-Fairbanks Highway Research Center. The results from this study will lead to the development of best practices to implement this innovative technology that will give pavement engineers insight into the pavement condition. Region 6 DOTs can potentially use the outcomes of this technology for more effective asset management.

US DOT Priorities: The technology explored in this project aligns with the USDOT's Research Priority "D: Improving the Durability and Extending the Life of Transportation Infrastructure" and USDOT's Strategic Plan goals related to Safety and Economic Strength and Global Competitiveness by contributing to tools that will provide real-time data on pavement condition to inform and allow timely maintenance and repair decisions, which in consequence will lead to improved road safety. For the same reason, this research aligns well with the SPTC's integrated research topic 2 "Leveraging Novel Materials and Emerging Technologies to Enhance Durability, Sustainability, and Extend Infrastructure Life." Regarding the goals of Equity, Climate and Sustainability, Transformation, and Organizational Excellence, using data-driven decision-making, one of the outcomes of this project, will potentially help transportation agencies allocate resources efficiently, monitor the lifespan of pavements, and provide a means to eventually build more resilient pavements and reduce inequities in the US highway network.

Outputs: The following outputs are anticipated from this project: (1) Comprehensive report documenting the best practices in data collection and reduction, ease of use and limitations of Distributed Acoustic Sensing (DAS) technology, and practical recommendations to facilitate its implementation; (2) Short educational videos that can be used to educate students, associates, and potential graduate students and engineers with topics at different levels, ranging from the basics behind the technology to the techniques

to operate, acquire, and reduce data using the DAS; (3) A 3- to 5-minute video to disseminate the findings of this study and inform pavement engineers and managers on the benefits of the technology, and how they may potentially impact Region 6 DOTs pavement evaluation operations.

Outcomes/Impacts: The study aims to gain an understanding and develop tools to use DAS technology for monitoring the performance of pavement layers under traffic conditions. DOTs are expected to implement DAS in their management systems for more effective asset management plans. For this purpose, the developed tools are expected to effectively reduce and visualize the DAS data and help facilitate determining pavement conditions. The findings of this study are expected to lead to the development of best practices for providing pavement engineers insight into pavement performance, distress, and deterioration.

Final Research Report: