Enhancing the TAMU Model for Predicting Buckling in Rails

Exhibit D

Research Project Requirement Template

Recipient/Grant (Contract) Number: University of Texas Rio Grande Valley (UTRGV), Texas A&M University (TAMU)/Grant No. 69A3552348340

Center Name: University Transportation Center for Railway Safety (UTCRS)

Research Priority: Promoting Safety

Principal Investigator(s): Dr. David Allen (PI, TAMU), Dr. Yong-Rak Kim (Co-PI, TAMU)

Project Partners: MxV Rail, BNSF

Research Project Funding: $199,954.32 (Federal), $102,518.41 (Non-Federal Cost Share)

Project Start and End Date: 06/01/2023 to 08/31/2024

Project Description: It is well-known that track buckling is one of the most commonplace causes of train derailments. Accordingly, with partial funding provided by our previous USDOT UTC and the Technology Transportation Center, Inc., we have begun developing a Beta-version track buckling model for deployment by U.S. Railroad Companies as a tool for predicting track buckling. A significant advancement over currently deployed track buckling models, our technology includes an open-source nonlinear finite element algorithm that is user-friendly. Briefly, our track buckling model accounts for the effects of the following on track buckling: both longitudinal and lateral track walk; rail neutral temperature (RNT); both lateral and longitudinal crosstie-aggregate interfacial friction; track modulus; nonlinear track liftoff; and broken spikes. In addition, it is sufficiently robust to be capable of accounting for additional environmental causes to be described herein and in a companion proposal. Given these advanced capabilities, track engineers will be able to dramatically improve track safety.

US DOT Priorities: This project aligns with the following USDOT strategic goals, as established in the USDOT Strategic Plan for FY2022-FY2026: **(a) Safety:** The project directly addresses a major safety concern, rail buckling. **(b) Economic Strength:** This tool will improve the accuracy and cost effectiveness of rail inspections and reduce the economic impacts of unplanned stoppages and derailments.

Outputs: Our research will result in the following during the initial contractual year:

a. The validation of our developed advanced track buckling model.
b. The creation of a user-friendly track buckling predictive tool for use by on-site track engineers.
c. The experimental determination of track modulus and ballast-crosstie coefficients of friction for various track base constituents.

Outcomes/Impacts: The primary long-term impact of this project is improved rail safety and efficiency by providing railway engineers with accurate, user-friendly models enabling quantifiable decision making about track replacement.

Final Research Report: Upon completion of the project, a URL link to the final report will be provided.