

Request for Research Funding for FY 2022-2023

SPR Subpart B Project: GEO-23-04

Requesting Office	Geotechnical	Priority	4 of 4
Proposed Title	Vibrations and ground deformations due to road compaction		
Justification	<p>Typical roadway construction activities involve the use of vibratory compaction equipment such as rollers. These tools generate compression and shear waves (among others) and generally result in a re-arrangement of the soil mass in the vicinity of construction activities. The re-arrangement of the material is colloquially referred to as densification, and is directly related to the reduction in void ratio that results from the repeated impact of the equipment and the waves generated by that operation. Those waves extend outward from the source and can have an effect on the soil volume. The reduction in void ratio as a function of distance from the source is what will determine the settlement profile in the vicinity of construction operations. In the past, the Department has dealt with claims involving either real or perceived damage to structures from typical roadway construction methods. What this project aims to achieve, is a better computational model to assess the magnitude and geometry of the settlement profile when vibratory rollers are used.</p>		
Impact	The proposed work will be useful in developing monitoring requirements to ensure construction operations do not negatively affect the public, and to protect the Department from frivolous claims.		
Affected Offices	Design and Construction		
Existing Work	<p>Examples of work on similar topics:</p> <p>The compaction of coarse fills. Sparks, G.H. (1983)</p> <p>Sheetpile induced vibrations at the Lurie excavation project. Glass et al. (2004)</p> <p>Effect of pile driving-induced vibrations on nearby structures and other assets. Athanasopoulos-Zekkos et al. (2013)</p>		
Keywords Used In Existing Work Search (Cannot leave blank)	Vibratory roller & settlement, vibratory hammer & settlement, vibration induced settlement		
Related Contracts (Give contract numbers)	<p>BDV24 TWO 977-33: Prediction Model of Vibration-Induced Settlement due to Pile Driving</p> <p>BDB-11: Use of non-destructive techniques to estimate the allowable compaction level during construction</p> <p>BDK80-977-22: Evaluation of vibration limits and mitigation techniques for urban construction.</p>		
Funding Request	Estimated cost: \$250,000	Anticipated Duration	24 months
Project Manager	Larry Jones	Contracting Method	Direct contract with the University of Central Florida. Dr. Luis Arboleda-Monsalve
Equipment	\$50,000	Details to be determined with the researcher	
Urgency	3	The project is required to have a model that estimates the potential zone of influence of activities typically associated with roadway construction	
Implementability	1	Results of the effort would likely result in updates to the Specifications for Roadway and Bridge Construction, and Soils and Foundations Handbook	

Project Benefits (Succinct, complete explanation)

The benefits of having a model that estimates the potential zone of influence of activities typically associated with roadway construction in terms of settlement include the proper allocation of funds for monitoring purposes. In addition, it will allow designers to make better estimates of the number of structures that require monitoring depending on the anticipated equipment, soil profile and structure type, enabling them to make more informed decisions.

Project Benefits (Select all that apply and explain)	Quantifiable Benefits (units, dollars, etc...if applicable)	Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits
<input type="radio"/> Materials Enhancement		
<input type="radio"/> Materials Savings	Beneficial	The model will help to reduce the conservative limits often chosen by designers and reviewers for vibration monitoring during protection of existing structures.
<input type="radio"/> Time Savings	Beneficial	The model that will be developed by the project should assist designers in making decisions in a timely manner during the preparation of the project documents and Plans, as well as potential time savings during construction given that a more accurate estimate of the radius of required monitoring will be available.
<input type="radio"/> Lives Saved/Injuries Prevented		
<input type="radio"/> Other (Explain)	Advancement of the state-of-practice	This project will provide a computational framework that is currently unavailable to designers. In addition, it will help advance the efforts the Department has devoted research funds in the past in order to establish a solid background of understanding of the relationship between construction equipment and the effect on the immediate surroundings.

*Comments should explain and support urgency, financial benefit, and implementability scores