

Research in Progress

3D-Printed Lattice-Based Structures for Next Generation Bridge Bearings and Bridge Isolation Bearings

Research Need

Bridge bearings are installed between the bridge substructure and the superstructure to transfer loads and allow controlled translations to reduce stresses in the structure. In deteriorated and aging bridges, the old bearing system commonly needs to be replaced, and these replacements are currently very costly. Recent progress in 3D printing applications through a recent Phase I MassDOT research project examined a new promising, customizable design for typical bridge bearings and isolation bearings. The current project will develop a prototype bearing system using concepts from architected lattice materials and aspire to manufacture and test the 3D printing bearing systems.

Goals/Objectives

The objectives of the proposed research include computational and experimental work to develop a new architected material bridge bearing product and test it for vertical, transverse, and other load conditions. In addition, the proposed research will aim to develop recommendations regarding the techno-economic decision-making process (including cost models) informing how to apply the new prototype and identify the technical capabilities to achieve a cost-effective solution that can be implemented in the field.

Project Information

This project is being conducted as part of the Massachusetts Department of Transportation (MassDOT) Research Program with funding from Federal Highway Administration (FHWA) State Planning and Research (SPR) funds.

Principal Investigators:

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Performing Organization:

University of Massachusetts Amherst

Project Champion:

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Project Start Date:

April 2023

Expected Project Completion Date:

May 2025

Methodology

The research will include new 3D-printed bridge bearing concepts that will be designed, tested, and manufactured. These new bearing systems will be more efficient, easy to replace, and customizable instead of the current one-fit-all constraints. Beyond the specific application, the research will also showcase the potential of 3D printing for the transportation sector. The research team will conduct research meetings with the technical committee and seminars for MassDOT personnel.