



Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Jamey Tesler, Secretary & CEO



2023 RESEARCH PROJECT STATEMENT

Research Topic:

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

Research Budget and Timeline:

- \$200,000
- 24 months (of which final 3 months are for review)

Problem Statement and Objectives

Bridge bearings are installed between the bridge substructure and the superstructure to transfer loads and allow controlled translations to reduce stresses in the structure. The aging deterioration bearing system having an increased need for costly replacements. Recent progress in 3D printing applications through MassDOT research examined a new promising, customizable design for typical bridge bearings and isolation bearings. This project will develop a prototype architected bearing system and aspire to manufacture and test the 3D printing bearing systems. Research will involve the design of architected lattices which will serve as the reinforcement of the rubber elastomer, and reinforced lattice is intended to replace the undesirable lead core (for environmental reasons) in the traditional isolation bearings. The research objective is to manufacture the prototype through cost effective processes and test the composite bearings for a variety of loading conditions.

Anticipated Outcomes and Deliverables:

Outcomes: The research will include new 3D printed bridge bearing concepts which will be designed, tested, and manufactured. These new bearing systems will be more efficient, easy to replace, and customizable instead of one fit all size. The research will also showcase the potential of 3D printing for transportation. The research team will conduct research meetings with technical committee, and seminars to MassDOT personnel.

Deliverables:

1. Recommendations regarding the technoeconomic decision making process (including cost models) informing how to apply the new prototype, and identification of the technical capabilities to achieve a cost-effective solution that can be implemented in the field
2. A synthesis of results from experimental testing of the developed product in terms of *strength in vertical, transverse*, and other load conditions
3. Final presentation
4. A seminar that will be organized to disseminate the findings to MassDOT personnel
5. Final report summarizing research activities, results, and recommendations