Measuring Field Performance of High-Modified Hot-Mix Asphalt Material over Rubblized Base

CTIPS-036 – UTC Project Information

Recipient/Grant Number:	North Dakota State University, University of Utah Grant No. 69A3552348308
Center Name:	Center for Transformative Infrastructure Preservation and Sustainability
Research Priority:	Preserving the Existing Transportation System
Principal Investigator(s):	Pedro Romero-Zambrana, Ph.D., P.E.
Project Partners:	USDOT, Office of the Assistant Secretary for Research and Technology – $95,000 Utah Department of Transportation – $95,000
Total Project Cost:	$190,000
Project Start and End Date:	9/15/2024 to 9/14/2026

Project Description

High-modified hot-mix asphalt mixtures (High-Mod HMA) have the potential to transform the way pavements are designed, constructed, and maintained. Trial sections have demonstrated the ability of this mix to resist rutting, cracking, and maintain a state of good repair while significantly reducing the cost of construction. A new application of this mix is being planned in Utah. This application involves rubblizing the existing concrete pavement and applying a 6-inch-thick layer of High-Mod HMA on top. This transformative approach to pavement construction repurposes existing materials while leveraging it to provide support to the new structure. However, the design specifies a relatively thin HMA layer for an interstate highway section, making it essential to properly understand and verify its actual behavior to allow for potential nationwide implementation. The expectation for the system is that the rubblized base will provide sufficient stiffness to support the pavement structure, and despite the likelihood of high strains in the asphalt mixture, the high binder content and polymer modification in the new High-Mod HMA will produce a strain-tolerant system. This proposal seeks to measure actual strains and deformation in this pavement and use those values to verify design assumptions and improve the development of a transformative pavement systems.

USDOT Priorities

The proposed project is directly linked to the **Transformation** in pavement design. A better understanding of the strains and deformations in a pavement system will allow for longer lasting design and better performance predictions capable of modernizing the transportation system of the future. A secondary benefit would be demonstrating that High-Mod HMA over a rubblized base is a viable alternative that results in resilient designs that use in-place materials, thus potentially reducing greenhouse emissions related to transporting material to the site. This will result in a sustainable system that addressed **Climate and Sustainability.**

Outputs

Technology transfer is a key component of this work. Multiple avenues for technology transfer will be incorporated throughout the project; this includes a seminars and presentations to researchers and practitioners, as well as serving as a significant step towards further development into guidelines related to the application of High-Mod HMA and novel pavement construction. The guidelines and specifications are expected to transform pavement design; that is the relevant contribution of this project.

Enhancements from the proposed project will allow the research team to disseminate the research outcomes through avenues discussed in coordination with UDOT. Thus, the outcomes of the project will have further potential to reach practitioners and researchers through the recommendations and specifications to be developed which will be directly available through a site provide by UDOT.

Outcomes/Impacts

The overall project will provide quantifiable data regarding the strains and deformations within the asphalt concrete layer caused by actual traffic loads in a novel pavement system. This information is critical for the adoption of High-Mod HMA since it will allow for significant advances in modeling, construction practices, and procedures for mechanistic pavement design and maintenance. Based on the expected results from this work, the application of novel pavement system in which rubblization and special HMA is used can be extended to projects outside the region. This will allow the project to have a greater impact.

Beyond the research report, the data from this research will promote a more economical and durable system and could produce changes to the AASHTOWare Pavement Design software (or its application). In addition to that, it will give better understanding of sensors to measure pavement data, and construction guidelines.

Final Report

Upon completion, the final report link will be added to the project page on the CTIPS website.