UTC Project Information	
Project Title	MPC-546 – Field Performance of Asphalt Pavements at Low and Intermediate Temperatures
University	University of Utah
Principal Investigator	Pedro Romero
PI Contact Information	Associate Professor University of Utah Phone: (801) 587-7725 Email: pedro.romero@utah.edu ORCID: 0000-0002-9446-4556
Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT, Research and Innovative Technology Administration $60,000 Utah Department of Transportation $120,000
Total Project Cost	$180,000
Agency ID or Contract Number	69A3551747108
Start and End Dates	November 15, 2017 to July 31, 2022
Brief Description of Research Project	Within its current practice, state transportation agencies are using aggressive rutting and stripping testing to qualify asphalt mixes for use in highway construction. This practice was in response to the typical distresses found in pavements from the late 1980s and early 1990s. In most states, this has generally resolved rutting issues, but has led to a detrimental effect on cracking and raveling behavior in the pavements. This one-dimensional approach has been recognized as a challenge to be addressed within the mix design process and highway agencies have been looking for practical tests to provide a performance balance and increase mix durability. Asphalt mixes now contain Recycled Asphalt Pavement (RAP) and less asphalt binder, both virgin and total, in an attempt to resist rutting and save on materials. Furthermore, with the high cost of asphalt binder and the increase in available substitutes and modifiers, asphalt binder testing alone is no longer adequate to predict pavement performance thus mix performance testing at all temperatures is becoming increasingly important. Building a mix to avoid both rutting and cracking requires a balance of priorities because these behaviors are often in direct conflict with each other. However, in the absence of practical tests, mix design and acceptance programs currently favors rutting resistance, leaving a clear imbalance and skewed performance. As the practice continues, these effects are becoming more pronounced; should current practices continue without adjustment for durability performance, constructed pavements will continue to exhibit early age cracking (both thermal and fatigue) and the performance of the pavements will be significantly affected, leading to a significant loss of investment by highway agencies.

	A new test to evaluate low temperature performance of asphalt mixtures was developed with previous funding assistance from the MPC. This test uses the existing Bending Beam Rheometer (BBR) to test asphalt mixes. Test protocols were created for both cores and laboratory compacted samples and the relation to pavement performance was determined. This test was voted as an AASHTO provisional specification (TP-125) and could soon be adopted as a requirement for asphalt mix design. In a parallel effort, the Semi-Circular Bending/Fracture Energy test (SCB) was determined as a feasible test for intermediate temperature performance and was also voted as an AASHTO provisional specification (TP-126). By using these two tests (BBR and SCB) mixes can be evaluated for cracking potential in regards to RAP content, asphalt binder content, binder modification, etc., resulting in a complete performance-related specification. However, adoption of any pavement performance specification requires an understanding of ALL aspects of mixture design including factors like: How will the new requirement affect the binder content? How will the new requirement affect the durability of asphalt pavements? How will the requirement affect current rutting tests (i.e., Hamburg WTD results)? How do all of these tests complement each other? This research will attempt to answer these questions by evaluating selected asphalt mixtures for low temperature cracking, intermediate temperature fracture energy, and high temperature deformation (rutting) to ensure that the addition of a low temperature test will not affect the high temperature performance or the durability of pavements. This work will allow for better optimization of mixes and reduction of poor performance potential of highway assets. Therefore, this work will have relevance at a regional and national level. Research Objectives: 1. Determine the intermediate temperature properties of representative asphalt mixtures produced in the state of Utah 2. Determine the low temperature properties of representative asphalt mixtures produced in the state of Utah 3. Compare the laboratory measured properties of asphalt mixtures and their material design to their corresponding short-term field performance 4. Present results at a national level The overall objective of this work is to determine if the BBR and the SCB test, based on AASHTO TP125 and 126, respectively, can be used to predict the short-term (first year) low- and intermediate-temperature field performance of asphalt mixtures (i.e., cracking). At the conclusion of this project, we will be able to know if these tests could be used as practical alternatives to screen, or even eliminate,

	asphalt mixtures that result in poor cracking performance once placed in the field.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	
Impacts/Benefits of Implementation (actual, not anticipated)	
Web Links • Reports • Project Website	