

UTC Project Information	
Project Title	Impact of Extreme Summer Temperatures on Bridge Structures
University	University of Arkansas
Principal Investigator	PI: W. Micah Hale, Ph.D., P.E., University of Arkansas Co-PI: Royce W. Floyd, Ph.D., The University of Oklahoma
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Total Project Cost	\$107,888
Agency ID or Contract Number	DTRT13-G-UTC36 SPTC14.1-21
Start and End Dates	August 1, 2014 – July 31, 2016
Brief Description of Research Project	<p>PROBLEM: Research has shown that heat waves affect thermal expansion joints, accelerate material degradation, and increase stresses in prestressed concrete girders. Specifically, experimental and analytical investigations indicate a significant increase in stresses at both the tension and compression regions of structural members exposed to extreme summer temperatures. The increase of stresses may widen current cracks and create new cracks that accelerate concrete and steel deterioration. In other words, the effects of extreme temperatures may reduce the durability, serviceability, and stability of bridge structures.</p> <p>PROPOSED SOLUTION: This research project will investigate the effects of extreme temperatures on prestressed concrete bridges. The project includes three primary parts: (i) a laboratory and experimental investigation, (ii) development of a computer program, and (iii) finite element modeling of the stress distribution due to temperature variations. The laboratory and experimental investigation will measure temperature distribution in two full-scale sections of a BT-72 bridge girder. A computer program will be developed to determine the temperature distribution and the corresponding thermal stresses in the girder cross sections. This program will be validated through the evaluation of six AASHTO I girders and three AASHTO-PCI Bulb-Tee sections. Finite element modeling will be developed to include two-dimensional and three-dimensional models. The two-dimensional model will be used to determine the temperature distribution within the girder cross-sections. The two-dimensional model will be used to investigate the global behavior of the girders including the bridge deck. The project will also propose a new thermal gradient model that will account for the</p>

	<p>effects of extreme temperatures. A computer program will be developed to assist users with the quantification of the thermal stress distribution within prestressed concrete bridge girders. The minimum reinforcement ratio and placement of non-prestressed reinforcement will be refined based on the research findings.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project website 	