

UTC Project Information	
Project Title	Temperature Effects in Bridge Condition Evaluation and Capacity Rating in Oklahoma
University	The University of Oklahoma
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Funding Source(s) and Amounts Provided (by each agency or organization)	SPTC/Oklahoma Department of Transportation: \$167,968 Oklahoma Department of Transportation (match): \$17,714 The University of Oklahoma: \$53,946
Total Project Cost	\$239,628
Agency ID or Contract Number	ODOT SPR 2160(A) SPTC14.2-21
Start and End Dates	November 1, 2014 – October 31, 2016
Brief Description of Research Project	<p>PROBLEM: Oklahoma's climate ranges from humid subtropical in the east to semi-arid in the west. While summers are long and usually hot, periods of extreme cold during the winter months are infrequent. The daily and seasonal temperature variations acting on a bridge can lead to nonlinear temperature distributions through key structural elements due to low thermal conductivity of concrete and temporal/spatial variation of ambient temperature. For statically indeterminate or geometrically skewed bridges, this temperature variation may induce stresses that represent a significant percentage of the direct stress capacity of the bridge, and may lead to unacceptable performance in service.</p> <p>PROPOSED SOLUTION: Finite Element Analysis will be used to perform heat flow and thermal stress analysis. Simplified structural models will be developed in MatLab to obtain accurate and time-efficient thermal stress analysis. Daily and seasonal temperature profiles will be developed for Oklahoma counties based upon Oklahoma Mesonet data to support the consideration of temperature effect in bridge evaluation. Reliability-based assessment of thermal stress development under temperature extremes will be performed. Guidelines that are specific to Oklahoma bridge construction practices and climatology that incorporate temperature effects in bridge evaluation and capacity rating will be developed.</p>
Describe Implementation of Research Outcomes (or why not implemented)	A set of guidelines will be developed that are specific to Oklahoma. Implementation will provide: 1) an efficient method for predicting bridge temperature-induced stresses caused by daily and seasonal temperature

Place Any Photos Here	changes; and 2) guidelines to incorporate the effects of self-straining thermal actions, where necessary, in reliability-based condition evaluation and capacity rating of bridges in Oklahoma.
Impacts/Benefits of Implementation (actual, not anticipated)	The implementation of the research outcome will lead to efficient estimation of temperature-induced stresses in bridges with different construction materials, skewnesses and cross section geometries and lateral constraints.
Web Links <ul style="list-style-type: none">• Reports• Project website	