



UTC Project Information – Project 3.5	
Project Title	Prevention of Stressed-Induced Failures of Prestressed Concrete Crossties of the Railroad Track Structure: Phase I
University	Western New England University
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Funding Source(s) and Amounts Provided (by each agency or organization)	UTC-TIDC: Fast-Act (federal): \$192,500 WNE University (match): \$192,713
Total Project Cost	\$385,213
Agency ID or Contract Number	ORCID.org ID Number: <ul style="list-style-type: none"> • 000-0001-9153-6000 (Moochul Shin) • 0000-0001-7209-5203 (ChangHoon Lee; co-PI)
Start and End Dates	10/01/2018~09/30/2022
Brief Description of Research Project	The problem we are trying to solve is to understand and mitigate premature failures of prestressed concrete crossties (PSCCs), which are an essential structural component of a railroad track structure. The objectives of the project are to identify the main mechanisms of splitting cracks upon de-tensioning prestressing wires with respect to various geometrical/mechanical parameters and to develop more durable bonding mechanism between concrete and prestressing wires using engineered cementitious materials (ECM).
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	A 12,000 psi compressive strength ECM has been developed by using locally available resources including aggregates. It provides higher bonding strength and higher corrosion resistance. An in-house code using a parallel computing algorithm was successfully deployed to analyze large-scale numerical 3D PSCC models. Numerical models of the 100~145 million DoFs were analyzed with 1000 cores and the analysis time was between 5 minutes ~ 25 minutes. The results indicate that tension damage is more dominant than compression damage. The damage upon prestressing release tends to be concentrated at the end of the crossties.
Impacts/Benefits of Implementation (actual, not anticipated)	This proposed study aims to improve the durability and the life-extension of the railroad track structure by improving material properties, design practices, and identifying failure mechanisms.
Web Links <ul style="list-style-type: none"> • Reports • Project website 	https://www.tidc-utc.org/kb/project-3-5-prevention-of-stress-induced-failures-of-prestressed-concrete-crossties-of-the-railroad-track-structure/