

PROJECT OVERVIEW REPORT

1. UTC Identifying Number
DTRT13-G-UTC28
2. Center Identifying Number
CAIT-UTC-NC48
3. Project Title
Long-term evaluation of prestress losses in concrete bridges using long-gauge fiber optic sensors
4. Principal Investigator & Contact Information
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7. Project Description
The overall objective of this research is the creation of a comprehensive suite of methods for the so-called Level III SHM of prestressed concrete structures, where Level III SHM includes detection (Level I), localization (Level II) and quantification (Level III) of unusual structural behaviors (e.g. prestress loss, or other damage or deterioration, such as crack opening), that can serve as the basis for the evaluation of structural health condition (Level IV SHM). This study will monitor long-term prestress losses as an indicative parameter for structural performance and condition. The particular attention to long-term prestress losses stems from (1) the steady increase in the use of prestressed concrete in bridge construction in recent years (46% of bridges less than five years old), (2) the fact that they account for 42% of deficient bridges built five years ago or less, and (3) the adverse effect of prestress losses on the performance and integrity of a prestressed concrete structure.

8. Implementation of Research Outcomes (or why not implemented)

The intended outcome of the project will be (1) the methodology for determination of long-term prestress loss using long-gauge fiber optic sensors, and (2) validation method for long-term temperature and strain measurements used for the analysis.

Potential future implementations of this methodology include: (1) an integrated monitoring system for bridges and other structures with prestressed elements, and (2) a research tool for better understanding of prestress losses in new concrete mixes (such as high performance concrete, "green" concrete, non-cementitious concrete, etc.). Professional development opportunities and training include presentations, seminars, and on-site visits and demonstrations at the Streicker Bridge.

9. Impacts/Benefits of Implementation (actual, not anticipated)

To Be Determined

10. Dates and Budget

Start date: 7/1/2016

End date: 1/31/2018

UTC (CAIT) Dollars: \$74,609

Cost Sharing: \$74,609

Total Dollars: \$149,218

11. Keywords

Structural health monitoring, long-gauge fiber optic sensors, prestressing force, prestressed concrete, prestress loss

12. Web Links (Reports and Project Website)

<https://cait.rutgers.edu/cait/research/long-term-evaluation-prestress-losses-concrete-bridges-using-long-gauge-fiber-optic-se>