RUTGERS
Center for Advanced Infrastructure and Transportation

Project Overview Report

1. UTC Identifying Number
   DTRT13-G-UTC28
2. Center Identifying Number
   CAIT-UTC-NC11
3 Project Title
   Development of Protocols and Instrumentation Plan for Accelerated Structural Testing Facility
4. Principle Investigator & Contact Information
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7. Project Description
   CAIT anticipates completion of an innovative, full scale load testing laboratory for evaluation of new and advanced materials and devices. This instrument will allow, for the first time, the scientific study of deterioration processes on full-scale bridges. While the merits of the equipment are well documented, until recently there has been little discussion pertaining to the development of experimental protocols, instrumentation and specimen design. With the dawn of accelerated structural testing within the horizon, it is imperative for the development of these key elements be initiated and completed. The objectives of this research is threefold:
   1. develop experimental protocols for conducting accelerated structural testing in the new laboratory,
   2. design an initial instrumentation plan to validate the laboratory's performance metrics, and
   3. establish baseline acceleration time factors.
8. Implementation of Research Outcomes (or why not implemented)

This research project serves as step 1 in the master plan to retrieve critical, quantitative bridge deterioration data. The infusion of NDE, temperature, strain, and other critical data that will be borne out of this program will serve to inform, in a rapid manner, bridge managers and modelers in the development of increasingly accurate deterioration algorithms. Corrections will be made, which will refine the models and funding charts relied-upon by decision-makers to maintain their bridge inventory.

Initially, the team will focus on calibrating and validating the equipment. As a one-of-a-kind, no where in the world, world class facility; it is expected that the initial run will require tweaking and modification in order to optimize system performance. While the goal of the initial test specimen isn't explicitly to serve as a validation; the slab is envisioned to carry similar properties to those used in the equipment design. critical characteristics include the 50-foot span, 20-foot width and 3-foot deep rolled girders. Beyond these characteristics, the team has a wealth of freedom to experiment within the slab to introduce interesting features that undoubtedly will produce realistic and valuable data. One Initial thought includes building-in poor construction practices that lead to underperforming decks. Through this type of experiment, the team can illustrate how evident poor practices can be in the early-age deterioration of bridge decks.

These early results will re-emphasize quality control practices, as well as potential improvements in construction practices. future field implementation may concentrate on material optimization, improved detailing, new construction techniques and further quality control recommendations. The laboratory will reflect bridges in a real-world environment viewed through the prism of compressed time. Researchers will develop innovations directly tied to the harsh environment practicing engineers are required to consider in their designs. The team envisions this approach as a superhighway for technological bridge engineering advancement.

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

   TBD

10. Dates and Budget

    Start Date: 8/1/2014
    End Date: 12/31/2014
    UTC (CAIT) Dollars: $ 63,900
    Cost Sharing: $ 0
    Total Dollars: $ 63,900

11. Keywords

    Accelerated structural testing, state of good repair, superstructure analysis, deterioration modeling, bridge management, structural analysis, finite element method, corrosion, reinforcement, rebar, concrete, bridge deck, nondestructive evaluation

12. Web Links (Reports and Project Website)

    https://cait.rutgers.edu/cait/research/development-protocols-and-instrumentation-plan-accelerated-structural-testing-facility