

LABORATORY TESTING OF RAILROAD FLATCARS FOR USE AS HIGHWAY BRIDGES ON LOW-VOLUME ROADS TO DETERMINE ULTIMATE STRENGTH AND REDUNDANCY

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ABSTRACT

Railroad flatcars (RRFCs) are a convenient option to replace existing deteriorating bridge structures on low-volume roads. They are typically used as the bridge superstructure by placing two or more flatcars side-by-side to achieve the desired bridge width. Utilizing RRFCs as a bridge allows for rapid construction and greater cost savings compared to traditional practices. These benefits make them an attractive solution for rural communities in Indiana, as well as other states.

Uncertainty remains about the response under higher loads than could be easily achieved in the field and the level of redundancy of railroad flatcar bridges. Using RRFCs as bridges becomes less economical for counties if they do not display adequate load-path redundancy and are labeled “fracture critical.” If labeled as such, life-cycle costs would rise due to increased inspection intervals and the requirement of an arms-length inspection for each 24 month inspection period. Laboratory testing of a RRFC bridge with two flatcars side-by-side will allow for experimental testing under higher loads, as well as increased amounts of instrumentation to better understand the behavior of the RRFCs.

As a result of the experimental data, load rating guidelines were developed for RRFC bridges constructed with a fully composite concrete deck. The research also focused on the level of system redundancy in a RRFC bridge after failure of one of the two main box girders. Procedures were developed to estimate whether the remaining longitudinal members provide sufficient available capacity to carry traffic loads.