

Research Summary

Live Load Effect in Reinforced Concrete Box Culverts under Soil Fill

FHWA currently requires the load rating of all culverts (with a minimum span length of 20 feet measured along center line of roadway) with fill less than the culvert span lengths up to 45 feet of fill. This is a requirement that must be met to comply with National Bridge Inspection Standards. This requirement was generally considered overly conservative, but prior to this project there was no way to prove this to be the case.

The Live Load Effect in Reinforced Concrete Box Culverts under Soil Fill research project load tested box culverts under soil fills between 2.5 and 13.5 feet to determine the level of fill in which live load becomes negligible in comparison to dead load. These load tests utilized a loaded dump truck parked at specific locations to maximize strains on the culvert. The effects of these loadings were recorded via strain transducers, LVDT displacement transducers, and an accelerometer attached to the culverts.

Tests were conducted in two rounds. The first round tested five culverts with similar geometrics but greatly varying fill heights. The second round focused on various cell sizes, arrangements, and design loads at depths near where live loads became negligible during the



first round of testing. In addition to field tests, computer models of each culvert were created to fully analyze and understand the results.

The results of this project showed live loads become less than 10% of the dead load at fills above six foot, at which point load rating will no longer be necessary. In addition to this, the study showed current design methodology is much more conservative for live loads than previously believed.

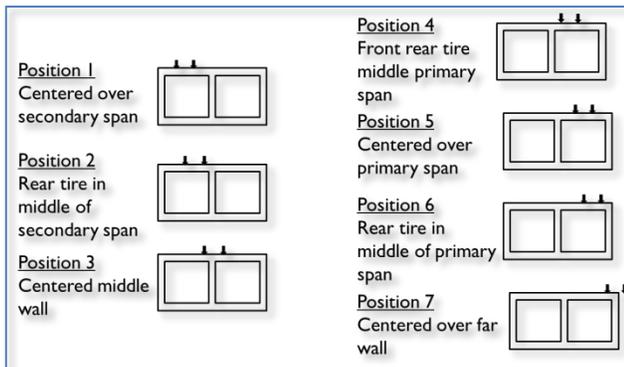
As a state with over three thousand NBI length box culverts, the impact of this study could be a significant reduction of man-hours to load rate culverts with adequate fill to negate this requirement. In addition, due to the conservative nature of our current culvert design and load rating methods, there was potential that this unnecessary load rating could result in posted culverts with minimal live load effects.

Depending on the location of needlessly posted culverts, the economic impact could potentially be tremendous.





Culvert Live Load Testing



Live Load Testing Positions

*Live loads become **less than 10%** of the dead load at fills above six foot -- at which point load rating would no longer be necessary.*

Project Information

PROJECT NAME: Live Load Effect in Reinforced Concrete Box Culverts under Deep Fill

PROJECT START/END DATE: August 17,2012-August 31, 2013

PROJECT COST: \$80,000

LEAD CONTRACTOR: University of Missouri-Columbia

PRINCIPAL INVESTIGATOR: Dr. Sarah Orton

REPORT NAME: *Live Load Effect in Reinforced Concrete Box Culverts under Soil Fill*

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