Roadside Safety Pooled Fund

Research Problem Statement

2019-35-LCB REV

Project Title:	Equivalent Static design Forces Due to Lean of a Tractor Trailer Unit
Project Synopsis:	*AASHTO LFRD Bridge Design Specifications Chapter 3.6.5 states that a 42" barrier (TL-5) placed such that there is 3.25 feet the top edge of the barrier and the column face cab be used to redirect the vehicular collision load. However, there is no guidance for what load to design for when you are within this distance.* *The AASHTO LFRD Bridge Design Specifications provides vehicle collision forces in Section 15.8.4 for sound walls. There are 4 different cases that have been developed based on the wall offset. These loads were based on limited data and engineering judgement.* *In some cases, the sound wall starts and ends behind the wall, so if the rail is impacted prior to the beginning of the wall, the lean of the vehicle could cause the upper portion to impact the end post of the wall creating a lateral load instead of the transverse loads covered by the specification (as shown below).* *This research would be to use computer simulations to provide collision forced to consider when an object (such as sound wall ends and bridge columns) is placed within the zone of influence due to the lean of a box or tractor trailer. In addition, this research could be used to update the loads and heights of applications 15.8.4.*   *9-ft diameter*
Project Goal(s):	1.) Update Section 15.8.4 of the *AASHTO LFRD Bridge Design Specifications* 2.) *Provide loading for objects behind the barrier but within the Zone of Influence.*

Project Background:	*Background is covered in the project synopsis.*
Proposed Work Plan:	• Build a confidence level (validation) of the simulation model of the of heavy vehicles into sound walls / objects by simulating updated versions of TL-5 vehicle models into tested systems with a relatively tall barrier. • Conduct literature review to define the state of practice of common sound walls configurations and installations details. • Define critical configurations for evaluation such as offset distance from the barrier or exposed end dimensions (assume fully rigid barrier of 42” or taller) • Conduct impact simulations of the selected configuration to determine the impact force • Process the impact force profile into a design table format
Deliverables:	1/ A report describing the process and the results of the project 2/ A table describe loading profile for both vertical and longitudinal directions and the selected critical impact conditions 3/ The equivalent static force exerted on these profiles due to the trailer impact given in lb/sq-ft. The typical profiles are concrete columns from 24-in to 4-ft in diameter and 12-in walls.

Urgency and Expected Benefit:	*The expansion of highways and high-speed roadways into more residential areas resulted into more sound wall applications that are not designed to withstand vehicular impact. This trend is not going to stop and there is a benefit to user agencies to identify design load so that they can ensure the integrity of these sound walls. The urgency stems from the risk of having these wall exposed to impact loads that they cannot withstand. Hence, there is a safety and labiality risk by having these under designed walls next to the driving public and the residential population .* *The desire to retrofit vehicle collision protection onto existing bridges with limited clearance has generate a need to be able to use a combination of redirection with the column design needing to account for the load due to the lean.*
Problem Funding and Research Period:	*The cost of conducting the research is $89,559, it is expected to span over 14 months duration*
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