Roadside Safety Pooled Fund

Research Problem Statement

Project Title:	**Assessment of Bike Pedestrian railings attached to crashworthy barriers – Phase I (2023-03-BR)**
Project Synopsis:	Evaluating the effect of adding bike pedestrian railing on the crashworthiness of various barrier systems under different test levels and providing design recommendations pertaining to crashworthiness and barrier design implications. The intent is to find the most significant modification which if it passes can validate the less significant modifications. While it is written from a WSDOT perspective currently multiple states will be quarried with unified or representative details moved forward. The project should address the zone of intrusion (ZOI) implications from the AASHTO Roadside Design Guide, 4th Edition, Chapter 7.3.
Project Goal(s):	Test or justify the use of steel or aluminum rails for bike pedestrian concerns not adversely affecting the crashworthiness of the barriers. The addition of the pedestrian rail could improve the crashworthiness of the barrier and this will be considered for the barrier selected for this project. Provide recommendations for various configurations and test levels using the standard details provided by WSDOT in the Project Background below. TTI will evaluate the two Bicycle Pedestrian rail systems (1'-10" and 1'-0" high) on two selected barriers provided by WSDOT, a 34" tall Pedestrian barrier paired with the 1'10" BP rail and a 42" single slope paired with the 1'0" BP rail for crashworthiness and implications on barrier design forces.
Project Background:	WSDOT has been using a Bike Pedestrian Rail (BP-rail) either in a 12" or a 22" configuration for multiple years with the same or similar detailing. They built them out of either aluminum or steel, the basic structures are the same, and the detailing changes are associated with the availability of parts, welding, etc. WSDOT has provided a link to their common types of BP-rails to consider for this project. These designs have been used for years by WSDOT. These designs have been an integral part of their suite of standards to address current and future needs for BP-rails in Washington State. These two standards are provided as follows in the links below. WSDOT also has an 18" version that may be preferred over the 22" BP-rail design shown here. https://wsdot.wa.gov/publications/fulltext/Bridge/Web_BSD/10.5_A3_1.PDF https://wsdot.wa.gov/publications/fulltext/Bridge/Web_BSD/10.5_A3_2.PDF https://wsdot.wa.gov/publications/fulltext/Bridge/Web_BSD/10.5_A6_2.PDF https://wsdot.wa.gov/publications/fulltext/Bridge/Web_BSD/10.5_A6_1.PDF Historically, WSDOT has treated the addition of these BP-rails as being "non-significant" to the crashworthiness of the bridge railings they are attached to. Their assessment/classification of these designs are as follows. 1. The BP rail does not project, in the direction where traffic passes, past the safety shape. 2. The strength and stiffness of the BP rail does not significantly affect load path or force transfer (per judgment using the strength of materials reasoning). 3. There have not been documented in-situ issues with the details we employ. 4. The BP rail is employed on otherwise crashworthy barriers determined through crash testing. 5. The BP rail is designed for pedestrian loads from AASHTO chapter 13. It is not designed to resist crash loadings. 6. The above aligns with May 2018 #3 from "Clarifications on implementing AASHTO MASH, 2016 update November 15, 2021."

Proposed Work Plan:	1.) Task 1 – Literature Review and State Survey The research team reviews previous relevant research projects and sends out a survey to identify the common practice in the DOTs and prioritize selected systems/variations to be evaluated. 2.) Task 2 – Engineering Evaluation of Selected Systems The research team will use a combination of approaches including computer simulation to evaluate the prioritized systems. The number of systems and Test Levels to be evaluated depends on the time and budget of the project. Designs developed for this project will meet the requirements of the LRFD Section 13 Specifications for Pedestrian railings. The research team provides recommendations for the systems/configurations that need to be evaluated through crash testing. 3.) Task 3 – Reporting The research team will document the effort on the evaluation of the systems/configurations and will provide recommendations.
Deliverables:	A range of applications of Bike Pedestrian railings that can be used on crashworthy barriers as well as implications and recommendations on barrier and barrier connection design associated with the addition of Bike Pedestrian railings.
Urgency and Expected Benefit:	This is currently common practice in Washington, any issues with current detailing or conversely validation of existing details would be iterated through the system.
Problem Funding and Research Period:	**Total Estimated Cost = $90,000** **Timeframe = 12 months**
Developer(s) of the Problem Statement:	Name: Patrick O'Neill, SE, WSDOT Email: oneilpa@wsdot.wa.gov Phone: 360-705-7189