

WORK PLAN

To better address the objective of this endeavor, the project is to be split into two phases. Phase I will include the literature and engineering review, and computer simulation of a T-intersection guardrail system under NCHRP Report 350 TL-2 conditions, and a possibility for a TL-2 crash test for the provided system.

Phase II of the project will consist of engineering design, numerical simulation, and subsequently full scale crash testing of a promising system using NCHRP Report 350 TL-3 test conditions and evaluation criteria. This proposal addresses Phase I effort. Phase II will be funded in the next fiscal year.

Task 1 – Literature Review and Engineering Review of Tested Systems.

One series of tests that was conducted using the 1989 AASHTO Bridge Rail Guide Specification for Yuma County, AZ can possibly be considered to be equivalent to NCHRP Report 350 TL-2 guidelines. In one critical test, a 2450 kg (5400 lb) truck traveling at 72.1 km/hr (44.8 mph) impacted the curved section of the rail at 20.1 degrees from the roadway. NCHRP Report 350 TL-2 conditions involved a 2000 kg (4409 lb) truck traveling at 70 km/hr impacting the rail at 20-25 degrees from the roadway depending on whether the short radius system is classified as an attenuator or longitudinal barrier.

Other tests conducted at TTI and MwRSF per NCHRP 230 or NCHRP 350 will be reviewed to quantify the demand on the guardrail from various impact conditions and to understand the problems and inadequacies of current systems in regard to compliance with NCHRP Report 350.

Then a critical review will be conducted to determine if one or more of the previously crash tested systems can be considered equivalent in terms of impact severity to that of NCHRP Report 350 TL-2. This approach should result in a cost-effective system that utilizes standard hardware components. TTI will provide a letter summarizing this review in order to obtain FHWA approval for such a system. If this review process is not adequate to obtain FHWA approval, then a full scale computer simulation of the given system will be conducted in Task 2.

Task 2 – Perform Computer Simulations

The LS-DYNA computer program will be used to evaluate the performance of the proposed guardrail design when tested per NCHRP Report 350 TL-2 conditions.

The simulation task will consist of the following subtasks:

- 1- Establish the validity of the model by simulating one or more previously conducted crash tests. In this item, needed simulations will be conducted to establish satisfactory confidence in the finite element models of the components and the overall short radius guardrail system. Moreover, this exercise may give the researchers insight into different potential solutions that were not evident in previous full-scale crash tests.
- 2- Conduct simulation of a design modification as a TL-2 system if deemed necessary. In this step, the performance of the short radius system will be evaluated per NCHRP

Report 350 TL-2 impact conditions. This step will be conducted since there is a need or desire to develop a separate TL-2 system or simply obtain a TL-2 letter of acceptance on an existing system.

Again, TTI will provide a letter summarizing the numerical simulation in order to obtain FHWA approval for the system. If the numerical analysis is not adequate to obtain FHWA approval, then a full scale crash test of the system will be conducted in Task 3.

Task 3 – Conduct Full Scale Crash Test

This task is contingent upon previous tasks outcome. If a crash test is recommend and approved by the pool fund technical review, then the researchers will perform test 2-11 of NCHRP Report 350 (2000P vehicle, 70k/hr, 25 deg.) on the selected design. Test 2-31 of NCHRP Report 350 (2000P vehicle, 70k/hr, 0 deg.) may be substituted for test 2-11 if the short radius is to be considered a crash cushion. TTI will provide the test facility, test vehicle, instrumentation of the vehicle, high-speed film, video, still photographs, and a final report suitable for submittal to Federal Highway Administration (FHWA)