Pooled Fund Post

The Newsletter of the Roadside Safety Pooled Fund Program

http://www.roadsidepooledfund.org

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What's Inside

About Pooled Fund Program

The Pooled Fund Program was formed by representatives from participating states to identify common research needs, select projects for funding and oversee implementation of results. Research activities include the design, analysis, simulation, testing and evaluation of roadside safety features, development of guidelines, and selection and placement of these features. Roadside safety features addressed include bridge rails, guardrails, transitions, median barriers, portable concrete barriers, end treatments, crash cushions, culverts, breakaway support structures, and work zone traffic control devices.

Research is also performed on highway features such as driveways, slopes, ditches, shoulders, medians, and curbs. The features are addressed through performance evaluation studies, computer simulation, full-scale crash testing, clinical analyses of real world crash data, and benefit cost analyses.

The objective of the Pooled Fund Program is to establish an ongoing roadside safety research program that meets the research and functional needs of participating states in a cost-effective and timely manner.

> *"I am exciting to be a pooled fund member(…) The TTI folks have been extremely helpful in aiding me in my quest to raise guardrail in Florida. We are nearing our first release of revised standards to incorporate 31" height guardrail with 8" block-outs.*
>
> *- John Mauthner, P.E. (FDOT)"*

A joint meeting was hosted recently by TTI Roadside Safety and Physical Security at the Riverside Campus. Participants included members of AASHTO and Task Force 13.

The following projects were selected by Pooled Fund Members:

- Feasibility Study for Addressing Extreme Site Constraints at Bridge Ends
- Design and Finite Element Analysis of a MASH 31" W-Beam Guardrail System for Placement on 3:1 Sloped Terrain Configuration
- Barrier Deflection Characteristics of 31" W-Beam Guardrail Systems with 8" Blockouts
- MASH Testing of 31" W-Beam Guardrail System with 8" Blockout in critical Installation Configuration
- MASH Test Level 2 Compliant W-Beam Guardrail System with Double Post Spacing
- Development of Drawings and Specifications for Flared and Parallel MASH Terminals
- Prestressed Concrete Beam Type TL-2 Guardrail System at 31" Rail Height
- W-Beam Guardrail Placement on 1H:1V Slope

Pinned F-Shaped Temporary Barrier

Tech Representative: Paul B. Fossier

TTI Researcher: Nauman Sheikh

A pinned F-shaped temporary concrete barrier system was developed through a program of finite element simulation analysis and full-scale vehicle crash testing. The design uses pins to restrain the barriers in a manner that is easy to install, inspect, and remove, and limits dynamic deflection. The Federal Highway Administration issued eligibility letter B206A for the pinned temporary concrete barrier permitting its use on the National Highway System.

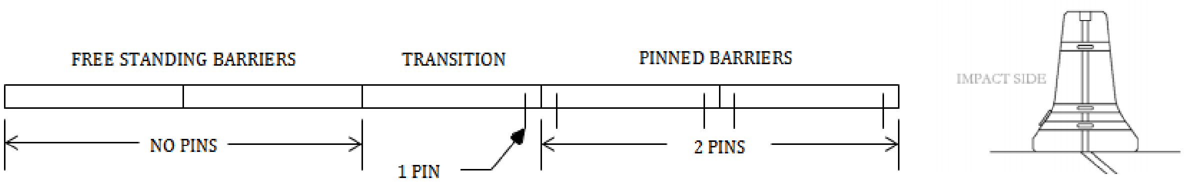
Temporary Barrier on Concrete after Crash Test

BARRIER ON CONCRETE

The design uses steel pins which are simply dropped into inclined holes that pass through the toe of the barrier and continue a short depth into the bridge deck or the concrete pavement underneath. The F-shaped barrier requires two pins per segment to install the barrier on concrete. The F-shaped barrier successfully passed the NCHRP Report 350 Test Level 3 requirements.

TRANSITION DESIGN FROM FREE STANDING TO PINNED BARRIER ON CONCRETE

Researchers developed a transition from the free-standing to the pinned F-shaped barrier placed on concrete. Full-scale finite element vehicular simulations were used to evaluate design alternatives and determine the critical impact point (CIP) of the transition design. The design was successfuly crash tested in accordance with MASH TL 3-21 criteria.



Transition Design from Free Standing Barriers to Temporary Pinned Barrier

BARRIER ON ASPHALT

Since many situations require pinning the barrier on asphalt, this part of the project focused on adapting the existing anchoring system to permit its use on asphalt pavement in addition to concrete.

The barrier was pinned using three 1.5 inch diameter, 48 inch long steel pins per barrier segment. Results of the FE analysis showed slightly better performance when three pins per segment are used to anchor the barrier. Using three anchor pins per segment provided a greater factor of safety against failure or cracking of asphalt, as well as variability in soil and asphalt properties in the field. The barrier was successfully tested following MASH Test 3-11 criteria.

Installation Before Crash Test

Installation after Crash Test

Pins after Crash Test

TRANSITION DESIGN FROM FREE STANDING TO PINNED BARRIER ON ASPHALT

Researchers are currently working on developing a transition design from free standing barriers to pinned barriers on asphalt.

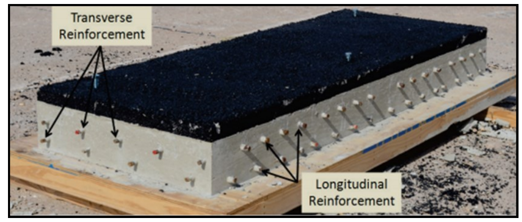
For complete results and reports visit: http://www.roadsidepooledfund.org/

Rebar Locator for Pinned Precast Barrier Application

Tech Representative: Paul B. Fossier

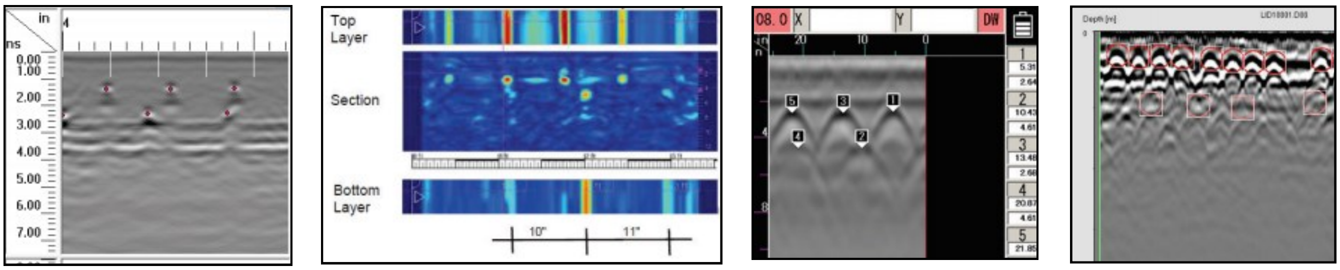
TTI Researcher: Chiara Silvestri Dobrovolny

The objective of this study was to evaluate the current Non Destructive Testing (NDT) methods available for detecting the location of reinforcing steel in bridge decks. Using NDT methods, contractors can locate the reinforcing steel in pinned concrete barriers. Different devices were evaluated and compared in terms of a manner that minimizes conflicts with accuracy in detecting rebar location and concrete coverage, ease of use, and training required to operate.



Reinforced Concrete Specimen With Asphalt Cover

The researchers evaluated cover meters and ground penetrating radars (GPRs). Four off the shelf GPR devices were used to scan reinforced concrete specimens and test the capabilities of each device in terms of accurately locating steel reinforcing bar in both the top and bottom reinforcement layers. The specimens varied according to concrete thickness, rebar size, rebar spacing, and thickness of asphalt layer on top.



Screen shots of GPR Methods including GSSI, HILTI, JRC/Proceq, and IDS/Olson

For complete results, visit: http://www.roadsidepooledfund.org/files/2012/08/405160-32_Final-2012-08-31.pdf

Determining a Field Inspection for Guardrail Beam Integrity

Tech Representative: Dave Olson

TTI Researcher: Nauman M. Sheikh

In this research, the following non-destructive inspection method was developed for evaluating the structural integrity of installed weathering steel W-beam guardrail without requiring disassembly:

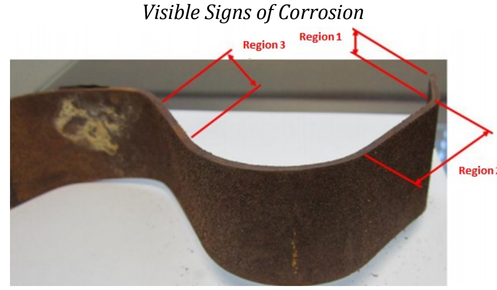
Visible Signs of Corrosion

Visual Inspection

1. If there are visible signs of advanced corrosion such as tears or holes in the rail, the affected parts should be identified as having inadequate structural integrity.

First Level Inspection

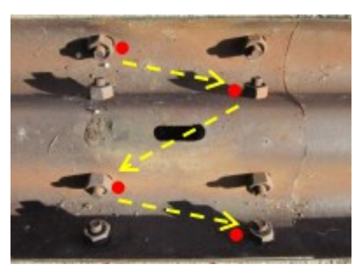
2. First-level inspection should be performed at the lapped splice nearest to the point determined from the inspection interval. At each splice, two bolt holes should be checked, one from the traffic side of the rail and the other from the field side. Spots that show visual signs of deterioration, should be measured in those areas in addition to the required two spots per splice. Thickness in the mid span sections of guardrail are checked only if there are visual signs of advanced corrosion.



Regions Where Thickness is Measured

Second Level Inspection

3. Second level inspection is performed when visual inspection determines a region has failed or if a spot fails to meet the first level inspection thickness measurements. In checking the thickness of the rail elements in the overlapped splice region, four spots near bolt hole locations should be measured on the traffic side rail and four spots should be measured on the field-side rail element. Measurements should be taken in a zigzag manner covering all bolt locations.



Zigzag Measurements

For the complete Inspection method, visit: http://www.roadsidepooledfund.org/files/2013/03/405160-29-Final-Report-Final.pdf

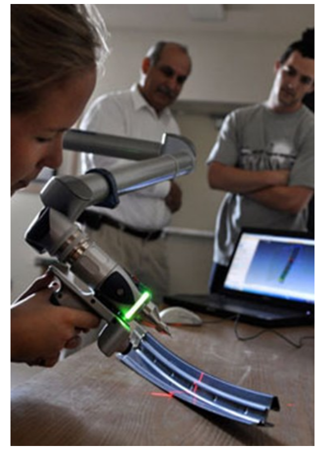
Participating Partners

ALASKA DOT and Public Facilities	MINNESOTA DOT	WASHINGTON STATE DOT
CALIFORNIA DOT	PENNSYLVANIA DOT	WEST VIRGINIA DOT
FLORIDA DOT	TENNESSEE DOT	FEDERAL HIGHWAY ADMINISTRATION
LOUISIANA DOT and Development	TEXAS DOT	TEXAS A&M TRANSPORTATION INSTITUTE

Did you Know...

...that TTI has acquired a computer-modeling scanning system that ensures the Institute's stature as one of the premier crash-testing facilities in the world?

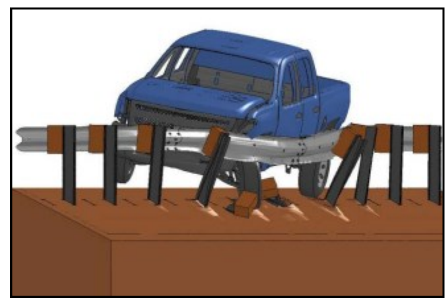
The three-dimensional scanning device, called a FARO® Edge, allows TTI to scan vehicle parts and components of roadside safety and perimeter security devices for use in computer modeling to predict how they might react in a crash.



TTI Proving Grounds Research Facility

Crash Testing

Bogie Test Vehicle



Finite Element Analysis Simulation

The Proving Grounds Research Facility, a 2,000 acre complex, enables researchers to conduct experiments and testing with the ultimate goal of improving transportation safety. This site has large expanses of concrete runways and parking aprons well suited for experimental research and testing in the areas of vehicle performance and handling, vehicle-roadway interaction, durability and efficacy of highway pavements, evaluation of roadside safety hardware, and connected and automated vehicles.

TTI Proving Ground is an International Standards Organization (ISO) 17025 accredited laboratory with American Association for Laboratory Accreditation (A2LA) Mechanical Testing Certificate 2821.01.

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