Pilot In-Service Performance Evaluation of Guardrail End Terminals

AASHTO – SCOTE Meeting
June 26-28, 2017
Prospective In-Service Performance Evaluation (ISPE)

A multi-year pilot ISPE of the most common energy absorbing w-beam guardrail end terminals currently installed in the US.
Overall ISPE Scope

• Formulate Data Collection Plan
• Identify data and measurement tolerances
• Develop data collection forms
• Collect Data and Analyze
  • Conduct data collection plan
  • Provide Weekly Reports to RD&T Management
  • Provide Quarterly Reports to OST/FHWA Management
• Provide information to NRC Committee
• Prepare Final Report
Formulate Data Collection Plan

Data Collection Process

1. **Notification Plan (state-dependent)**
   - Crash Notification to FHWA

2. **Non-qualifying crash or terminal**
   - Relevant Terminal
     - Injury?
       - Injury/Fatal
         - On-scene, such as crash scene, towyard, maintenance depot, data collection
       - No
         - Data Source, e.g., Maintenance Record, Available?
           - Yes
             - SCI Case Report
           - No
             - Safety R&D FHWA Analysis Repository

3. **FHWA Derived Variables**
   - Compromised data, absent vehicle etc.
Identify data and measurement tolerances

- Field location characteristics
  - Guardrail offset from travel way
  - Roadside slope
  - Etc.
- Type of guardrail end terminal
- Performance of the end terminal
  - Amount of rail extrusion or rail displacement
  - Kinks in rail
  - Rail intrusion into vehicle
  - Whether vehicle rolled-over after impact
  - Etc.
- Post and offset block information

See MassDOT’s Guardrail End Treatment Crash Data Form for a full list of data that is being collected
Develop data collection forms

- MassDOT Guardrail End Treatment Crash Data Collection Form
  - Adobe “fillable” PDF form
Guidance on data collection forms

- MassDOT Guardrail End Treatment Crash Data Collection Form Guidance
  - Includes guidance for taking effective photos of crash site

From MassDOT’s Guardrail End Treatment Crash Data Collection Form Guidance. Guidance on measuring rail extrusion

From MassDOT’s Guardrail End Treatment Crash Data Collection Form Guidance. Guidance on taking effective photos of crash site
Collect Data and Analyze

- MassDOT District Maintenance reports to crash site
  - Fills out form
  - Takes pictures
    - Provided with all-weather cameras with special e-compass auto leveling capabilities

- District Maintenance forwards completed form and photos to MassDOT HQ office in Boston

- MassDOT HQ forwards forms and photos to FHWA
Anticipated Limitations

• Insufficient number of crashes during 2-yr study for statistically significant findings on effectiveness of performance
  • Crashes are rare events
  • PDOs and minor crashes are harder to find
  • Sampling and non-sampling errors are likely
• Even if findings are statistically insignificant they may still be practically significant
What do we expect to learn?

- Identify current challenges to doing ISPEs
- Document good practices for
  - Real-time crash data collection
  - Interagency communications for crash reporting
  - Inventory and maintenance data management
  - Data analysis
- Insights into in-service performance relative to
  - Crash test performance criteria
  - ISPE Assessment areas
ISPE Assessment Areas

For each device, the ISPE intends to assess:

• Crash performance in terms of occupant risk
• Sensitivity to varying effects such as environmental conditions, site characteristics and impact conditions
• Degree of sensitivity to improper installation, maintenance and repair
Partners and Roles

• States: Data Collection Sites (CA, MA, MO, PA*)
• FHWA: Research, Program/Policy, and Divisions
• NHTSA: On-Scene Data Collection
• Contract Support
  o Highway Safety Information System contractors: Inventory/Reporting & Data Analysis
  o Special Crash Investigators: On-site crash investigations and case reports
  o Federal Outdoor Impact Laboratory (FOIL) contractors: Manage independent review of analysis and final report
# ISPE of GET’s Timeline

<table>
<thead>
<tr>
<th>State Agency Partner</th>
<th>Dates</th>
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<tbody>
<tr>
<td></td>
<td>Start</td>
</tr>
<tr>
<td>Caltrans</td>
<td>1/25/2017</td>
</tr>
<tr>
<td>MassDOT</td>
<td>5/24/2016</td>
</tr>
<tr>
<td>MoDOT</td>
<td>11/13/2015</td>
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<tr>
<td>PennDOT</td>
<td>2/15/2016</td>
</tr>
<tr>
<td>PTC</td>
<td>7/1/2016</td>
</tr>
<tr>
<td>Final Report</td>
<td>late 2019</td>
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# Data Collection Tallies To Date

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<thead>
<tr>
<th>State</th>
<th>Coordinating Agency</th>
<th>Serious/Fatal</th>
<th>PDO/Minor</th>
<th>Pilot Study Start Date</th>
<th>Full Study Start Date</th>
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</thead>
<tbody>
<tr>
<td>California</td>
<td>Caltrans</td>
<td>1</td>
<td>21</td>
<td>7/1/2016</td>
<td>1/25/2017</td>
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<tr>
<td>Missouri</td>
<td>MoDOT</td>
<td>31</td>
<td>78</td>
<td>11/13/2015</td>
<td>11/13/2015</td>
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<tr>
<td>Pennsylvania</td>
<td>PennDOT</td>
<td>3</td>
<td>49</td>
<td>2/15/2016</td>
<td>2/15/2016</td>
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<tr>
<td>Pennsylvania</td>
<td>PTC</td>
<td>3</td>
<td>11</td>
<td>5/1/2016</td>
<td>5/1/2016</td>
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<tr>
<td><strong>Totals [by Severity]</strong></td>
<td></td>
<td>40</td>
<td>206</td>
<td></td>
<td></td>
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<tr>
<td><strong>Aggregate Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>246</strong></td>
</tr>
</tbody>
</table>
Crash Severity Breakdown To Date

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>Trinity Highway Products, LLC</th>
<th>Road Systems, Inc.</th>
<th>Lindsay Corporation</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>ET-2000 ET-Plus Unk. ET-Plus 4&quot; ET-Plus 5&quot; Soft Stop</td>
<td>FLEAT SKT X-Lite X-Tension</td>
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<td></td>
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<tr>
<td>PDO</td>
<td>11 11 61 15 5</td>
<td>9 36 31 0</td>
<td></td>
<td>179</td>
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<tr>
<td>Minor</td>
<td>3 3 7 0 1</td>
<td>0 5 8 0</td>
<td></td>
<td>27</td>
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<tr>
<td>Serious</td>
<td>6 0 8 1 3</td>
<td>0 7 4 0</td>
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<td>29</td>
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<tr>
<td>Fatal</td>
<td>0 1 4 0 0</td>
<td>2 2 2 0</td>
<td></td>
<td>11</td>
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<tr>
<td>Total</td>
<td>20 15 80 16 9</td>
<td>11 50 45 0</td>
<td></td>
<td>246</td>
</tr>
</tbody>
</table>

**Note:** Serious/Fatal crashes are disaggregated as fatal until the final crash report is produced. The will account for crash-related fatalities occurring within 30-days.
ISPE of GET’s Contact Information

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MASH Implementation Plans
What is MASH?

• The *Manual of Assessing Safety Hardware* (MASH) presents uniform guidelines for crash testing permanent and temporary highway safety features and recommends evaluation criteria to assess test results.

• MASH replaces NCHRP 350 as the crash test standards for roadside safety hardware.

• In December 2015, the AASHTO/FHWA joint implementation agreement for AASHTO MASH was successfully balloted by AASHTO's Standing Committee on Highways and approved by FHWA.
MASH Implementation

MASH Implementation Timeline
(January 1, 2009 – January 1, 2020)

- 2009: MASH Published
- 2015: MASH 2016 Finalized/Published
- 2016: W-Beam Barriers
- 2017: Cast-in-place Concrete Barriers
- 2018: June 30, 2018
- 2019: Bridge Rails
- 2020: W-Beam Terminals

States May Adjust

- Cable Barriers
- Cable Terminals
- Crash Cushions
- All Other Barriers/Portable
- All Other Terminals
- Sign Supports
- Other Breakaway Hardware
Responsibilities – March 2017

The AASHTO/FHWA joint implementation agreement will help encourage the application of the newest and safest generation of roadside hardware. Per the agreement:

"AASHTO Technical Committee for Roadside Safety (TCRS) will continue to be responsible for developing and maintaining the evaluation criteria adopted by AASHTO."

"FHWA will continue its role in issuing letters of eligibility of roadside safety hardware for federal-aid reimbursement."

Source: FHWA Memorandum HAS-1 (03/28/2017)
Where are we now as of May 26th?

• FHWA clarified that the Federal-aid eligibility letters are provided as a service to the States and are not a requirement for roadside safety hardware to be eligible for Federal-aid reimbursement.

• Furthermore, in order for manufacturers and States to qualify for a FHWA Federal-aid eligibility letter, all roadside hardware devices must complete the full suite of recommended tests as described in AASHTO MASH.

• FHWA will no longer provide Federal-aid eligibility letters for modifications made to an AASHTO MASH-crash tested device.

• This equals a lot of uncertainty for industry and States.
State Implementation Efforts

• How involved are you as the State Traffic Engineer in the MASH Implementation effort?

• Has your State adopted a sequential process for implementation based on the established compliance dates?

• Or, is your State moving more rapidly to make MASH devices your standard?

• Are you having issue with product availability?
Temporary Traffic Control Devices

- Temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2016 Edition of MASH.

- Such devices manufactured on or before this date, and successfully tested to NCHRP Report 350 or the 2009 Edition of MASH, may continue to be used throughout their normal service lives.

- What issues does this introduce?