High-speed Rail Development & Crossing Safety

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U.S. Department of Transportation
Federal Railroad Administration
ADVANCING H.S.R. IN THE U.S.A.

- the U.S. market
- grade crossing projects
- design criteria
Why HSR in the US?

population growth

Today – 315 million people
+ 100 million people by 2050
2 Why HSR in the US? congestion & mobility
Why HSR in the US?

energy & environment
Where are the key US markets?
What is the FRA doing today in the development of Grade Crossing Technology?

Implementing Connected Vehicles Highway-Rail Feasibility Study and Proof of Concept
Objectives

- Feasibility Study
- Crash Analysis
- Concept of operations

- Basic Research
  - Evaluate DSRC in rail environment
  - Conduct proof of concept
  - Support OEM and aftermarket industry to implement capabilities in production vehicles
Description of Project

1. Approaching train communicates to crossing gates.

2. Activated gates transmit a crossing status signal.

3. Drivers approaching the crossing receive an in-car warning.
Team Effort

- **Project Partners:**
  - Intelligent Transportation Systems (ITS) Joint Program Office
  - Research and Innovative Technology Administration (RITA)
  - Volpe Center

- **Other Involved Stakeholders:**
  - Transport Canada
  - Federal Highway Administration (FHWA)
  - Federal Motor Carrier Safety Administration (FMCSA)
  - Federal Transit Administration (FTA)
## Operational Scenarios

<table>
<thead>
<tr>
<th>Operational Scenario</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Vehicle</td>
<td>Vehicle approaching a crossing will be alerted to the status of the crossing and approaching trains</td>
</tr>
<tr>
<td>Trucks and Commercial Vehicles</td>
<td>Vehicle approaching a crossing will be alerted to the condition of the crossing (steep hump or sharp turns)</td>
</tr>
<tr>
<td>First Respondent &amp; Emergency Vehicles</td>
<td>Vehicle approaching a crossing will be alerted to the status of the crossing closure to find alternative route</td>
</tr>
</tbody>
</table>
Rail-Highway Connected Vehicle

Timeline

2012
Crash Analysis, ConOps

2013
Proof of Concept

2014
Dark Territory Research

2015

2016

2017

2018

2019

2020

2021

2022

2023

2013 National Highway-Rail Grade Crossing Safety Training Conference
Fort Worth, Texas

FRA Total Funding: $425K

Technology readiness level

TRL 9
TRL 8
TRL 7
TRL 6
TRL 5
TRL 4
TRL 3
TRL 2
TRL 1
Key Success Factors

- Reduce grade crossing accidents
- Reduce emergency vehicle response time
- Enable cost effective active warning at dark territory crossings
# Appendix: Potential Tier Structure for Passenger Systems

## Highway-Rail Grade Crossings

<table>
<thead>
<tr>
<th>Tier</th>
<th>0</th>
<th>IA</th>
<th>IB</th>
<th>IC</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Regional Rail</td>
<td>Conventional</td>
<td>Emerging HSR</td>
<td>HSR Regional</td>
<td>HSR Mixed Operations</td>
<td>HSR Mixed Passenger</td>
<td>HSR Dedicated</td>
<td>HSR Express</td>
</tr>
<tr>
<td>Max. Speed mph</td>
<td>0-65</td>
<td>0-79</td>
<td>80-110</td>
<td>111-125</td>
<td>126-150</td>
<td>0-150</td>
<td>0-150</td>
<td>0-200/220</td>
</tr>
<tr>
<td>Other traffic on same track</td>
<td>None (or temporarily separated)</td>
<td>Mixed passenger and freight</td>
<td>Mixed passenger and freight</td>
<td>Mixed passenger and freight</td>
<td>Mixed passenger and freight</td>
<td>Conventional passenger only</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Closures</td>
<td>Consolidation encouraged in regional and conventional service; funding condition if part of HSR corridor</td>
<td>Demonstrated effort and results required as part of funding process. No crossings above 125 mph</td>
<td>See IC</td>
<td>See IC</td>
<td>None above 125 mph</td>
<td>See IC</td>
<td>None above 125 mph</td>
<td>None above 125 mph</td>
</tr>
<tr>
<td>Public highway-rail grade crossings, generally</td>
<td>Automated warning; supplementary measures where warranted</td>
<td>Automated warning; supplementary measures where warranted</td>
<td>Sealed corridor; evaluate need for presence detection and PTC feedback</td>
<td>Barriers above 110, see §213.247</td>
<td>Presence detection tied to PTC above 110 mph</td>
<td>None above 125 mph</td>
<td>None at any speed</td>
<td>None at any speed</td>
</tr>
<tr>
<td>Private highway-rail grade crossings, generally</td>
<td>Automated warning or locked gate preferred; cross-buck and stop or yield sign where conditions permit</td>
<td>Automated warning or locked gate preferred; cross-buck and stop or yield sign where conditions permit</td>
<td>Automated warning with gates; or locked gate (interlocked with signal system at higher speeds)</td>
<td>None or as above</td>
<td>None above 125 mph</td>
<td>None above 125 mph</td>
<td>None at any speed</td>
<td>None at any speed</td>
</tr>
<tr>
<td>System Safety Programs</td>
<td>Crossing safety and trespass prevention issues included in SSP process.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Plus FRA reviews management decisions and may disapprove.</td>
</tr>
</tbody>
</table>
What does the FRA look for in crossing design??

- Non-traversable Medians
- Gate orientation
- Cantilevers
Gates with 100’ non-traversable medians
Skewed Crossings

Acute Angled

Less 90°

Obtuse Angled

Greater 90°
Acute Angled

AREMA Part 3.1.36B

Bad

Good
Obtuse Angled

Good

Good
Cantilevers
The best grade crossings are...
Thank you!

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