Private Crossing Treatments on the North Carolina Sealed Corridor

Patrick Bien-aime
2013 National Highway-Rail Grade Crossing Safety Training Conference
November 05, 2013

U.S. Department of Transportation
Research and Innovative Technology Administration
John A. Volpe National Transportation Systems Center

Advancing transportation innovation for the public good
Agenda

- Background
- Study purpose
- Research Methods
- Results
- Study Findings/Conclusions
Background

Mandate

FRA was directed to provide a report by January 31, 2001 to the House and Senate Committees on Appropriations that documents the success of the sealed corridor project, including a scientifically valid estimate of the lives saved by the improvements that have been installed and an evaluation of whether the resulting reduction in accidents is sustainable.

Studies

- Study I: Phase I Report to congress in 2001
- Study II: NC DOT “Sealed” High Speed Rail Corridor Phase I-III assessment in 2004
- Study III: NC “Sealed Corridor” Phase IV assessment-private crossings in 2008

I will be giving an overview of the entire study with emphasis on the final phase – treating private crossings
Study Purpose

- Document the potential lives saved and result of the State of NC’s Private grade crossing “Sealed Corridor” Program
- Document improvements completed through December 2008 at highway-rail Private grade crossing
- Determine whether the resulting reduction in accidents is sustainable through the year 2010

Proposed Southeast High Speed Rail Corridor
Study Purpose

The Corridor was divided into four different phases, based on location over 173.3 track miles.

Public Crossings

Phase 1: Charlotte to Greensboro
103 grade crossings

Phase 2: Greensboro to Cary
96 grade crossings

Phase 3: Cary to Raleigh
9 grade crossings

Private Crossings

Phase 4: Charlotte to Raleigh
46 grade crossings
NC DOT “Sealed” Corridor, 233 Public and Private Treated Crossings as of December 2008
Private Crossings Treatment Types

- Closure - CL
- Xbucks/stop/pvt x sign
- Gates with locking mechanisms – G&L
- Gates and flashing lights– G&F
- Cross bucks – Xbucks
- Cross bucks and Stop – Xbucks/stop
- None – NA
Example 1 - Treated Crossings

Crossing Closure Treatment, Lexington
Example 2 - Treated Crossings

Private Grade Crossing Stop and Cross Buck Sign Treatment
Example 3 - Treated Crossings

Private Grade Crossing Gate with Locking Mechanism, Davidson Co.
Example 4 - Treated Crossings

Robert Ranking Fryar Road - Cross Buck Sign, Guilford County, NC
NC DOT “Sealed” Corridor Number of Crossings Treated and Untreated

<table>
<thead>
<tr>
<th>Year</th>
<th>Phase</th>
<th>Total crossings</th>
<th>Total treated</th>
<th>Total not treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2004</td>
<td>I - III</td>
<td>208</td>
<td>189</td>
<td>19</td>
</tr>
<tr>
<td>2000-2008</td>
<td>IV</td>
<td>46</td>
<td>44</td>
<td>2</td>
</tr>
<tr>
<td>1990-2008</td>
<td>Total</td>
<td>254</td>
<td>233</td>
<td>21</td>
</tr>
</tbody>
</table>
Research Methods

Fatal Crash Analysis
- Analyze pre and post-treatment fatality-rate for each crossing

Fatal Accident Prediction Model
- Used the Modified US DOT Fatal Accident Prediction Model to predict future accident
  - Differentiates between freight and passenger train operations
  - Accounts for higher train speeds
  - Accounts for vehicle type mix
Fatal Crash Analysis

- All crashes were used for the analysis of the “Sealed Corridor”, but only crossings with fatal crashes were selected.

- From 1990 to treatment, a **fatality-rate** (holding the warning device constant for pre-treatment period) was calculated using the crash history for each of the crossings.

- From time of “Sealed Corridor” treatment through December 2008, actual experience was compared with the **pre-treatment fatality rate** to determine potential “Lives Saved”.
### Summary of Estimated “Lives Saved” by Treatment Type Results Phase IV Private Crossings

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Crossing Name</th>
<th>Pretreatment</th>
<th>Post-treatment</th>
<th>Analysis of Lives Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fatalities</td>
<td>Timeframe (months)</td>
<td>Fatalities</td>
</tr>
<tr>
<td>CL</td>
<td>8400 Old Concord Rd.</td>
<td>1</td>
<td>193</td>
<td>0</td>
</tr>
<tr>
<td>Gate/Flashing Lights</td>
<td>Byrdsville Rd.</td>
<td>1</td>
<td>142</td>
<td>0</td>
</tr>
<tr>
<td>CL</td>
<td>IP Merryhue Farms LLC</td>
<td>1</td>
<td>193</td>
<td>0</td>
</tr>
<tr>
<td>Cross bucks</td>
<td>NW Tree &amp; Stone Co.</td>
<td>1</td>
<td>154</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>4</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

CL = closure
Summary of Estimated “Lives Saved” by Treatment Type Results Phase I-IV Public and private Crossings

<table>
<thead>
<tr>
<th>Warning Device Improvement</th>
<th>Fatalities</th>
<th>Ave Time Frame (Months)</th>
<th>Fatalities</th>
<th>Ave Time Frame (Months)</th>
<th>Analysis of Estimated &quot;Lives Saved&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closure Subtotal</td>
<td>17</td>
<td>142</td>
<td>0</td>
<td>68</td>
<td>9</td>
</tr>
<tr>
<td>4-Quadrant Gate Subtotal</td>
<td>14</td>
<td>139</td>
<td>2</td>
<td>49</td>
<td>6</td>
</tr>
<tr>
<td>Long Gate Subtotal</td>
<td>16</td>
<td>135</td>
<td>1</td>
<td>36</td>
<td>4</td>
</tr>
<tr>
<td>Median Barrier Subtotal</td>
<td>3</td>
<td>157</td>
<td>0</td>
<td>51</td>
<td>1</td>
</tr>
<tr>
<td>Gate/Flashing Lights</td>
<td>1</td>
<td>142</td>
<td>0</td>
<td>82</td>
<td>1</td>
</tr>
<tr>
<td>Crossbucks</td>
<td>1</td>
<td>154</td>
<td>0</td>
<td>94</td>
<td>1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>52</strong></td>
<td><strong>145</strong></td>
<td><strong>3</strong></td>
<td><strong>21</strong></td>
<td></td>
</tr>
</tbody>
</table>

Closure - CL
Four Quadrant Gate – 4Q
Long Gate – LG
Median Barrier – MB

Volpe
Modified US DOT Fatal Accident Prediction Model

- The model calculates the effect of the five-year actual incident history for prediction of future incidents
- Estimated five year pre-and post-treatment periods for warning device effectiveness calculations
- Populated year-by-year input variables from both the FRA Inventory and NCDOT data into the model

Volpe Assumptions

- In the model after the year 2008, we assumed 2% per year growth in Annual Average Daily Traffic (AADT) and Train Frequency
- For 2010 only, two main track, and train speeds increase to 79 and 110 mph respectively per NC DOT plans.
Estimated Risk Reduction through the year 2010 (Phase IV)

Estimated risk reduction is approximately 56 percent
Estimated Risk Reduction through the year 2010 (Phase IV)

Estimated risk reduction is approximately 57 percent.
By 2010, the fatality rate resulting from full implementation would be:

- **52 percent lower** than no implementation (110mph)
- **50.9 percent lower** (79 mph)
- **46 percent lower** (no speed increase)
Study Findings/Conclusions

Fatal Crash Analysis
- An estimated **1.5 lives** saved through 2008 in all private crossings
- An estimated **21 lives** have been potentially saved since the implementation of the “Sealed Corridor” program through 2008 in all public and private crossings

Risk Reduction
- Model predicted Approximately **44%** of the 1991 risk was eliminated by 2010 in all private crossings, and **52%** in all public and private crossings

General
- Treatments were effective and effectiveness has been sustained
- NC DOT “Sealed Corridor” should be used as standard for High Speed Rail implementation
For additional information, please contact

*Patrick Bien-Aime, Mechanical Engineer*

U.S. Dept. of Transportation/RITA/Volpe Center
Systems Engineering and Safety Division, RVT-62
55 Broadway, Cambridge, MA 02142
Email: [patrick.bien-aime@dot.gov](mailto:patrick.bien-aime@dot.gov)
Tel.: (617)494-3907
Fax: (617) 494-2596
Cell: (857) 998-3299