Reflectorization of Rail Freight Rolling Stock on Auto-Rail Crossing Accidents

AN ANALYSIS OF THE EFFECT OF IMPLEMENTATION OF 49 CFR PART 224

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2014 GLOBAL LEVEL CROSSING SAFETY AND TRESS PREVENTION SYMPOSIUM
UNIVERSITY OF ILLINOIS
RAIL TRANSPORTATION AND ENGINEERING CENTER
Typical Reflectorization Application Using **Yellow** Material
Typical Reflectorization Application Using **White** Material

Purpose:
- Save lives.
- Reduce accidents and incidents at road crossings at night and during times of limited visibility.
- By providing motorists with an opportunity to react and avoid a road crossing accident.

§ 224.1 Purpose and Scope.
The purpose of this part is to reduce highway-rail grade crossing accidents and deaths, injuries, and property damage resulting from those accidents, by enhancing the conspicuity of rail freight rolling stock so as to increase its detectability by motor vehicle operators at night and under conditions of poor visibility.
§ 224.3 Applicability

This part applies to all railroad freight cars and locomotives that operate over a public or private highway rail grade crossing and are used for revenue or work train service, except: (a) Freight rolling stock that operates only on track inside an installation that is not part of the general railroad system of transportation; (b) Rapid transit operations in an urban area that are not connected to the general railroad system of transportation; (c) Locomotives and passenger cars used exclusively in passenger service; or (d) Freight rolling stock that is subject to a reflectorization requirement promulgated by another Federal agency.
Regulations: Requirements

- All cars and locomotives to have retroreflective material.
- Devise schedule for completion.
  - Rail equipment in 10 years or by November 28, 2015.
  - Locomotives in 7 years or by November 28, 2012.
- Transport Canada adopted a similar companion rule.
Defining Retroreflection

- Dr. Paul Carlson, Texas A&M Transportation Institute, “Traffic Sign Retroreflectivity, July 24, 2013:
  - A ratio of the amount of light returned from a sign versus the amount hitting the sign.
  - A way to measure the efficiency of the material,

\[
\frac{\text{Light out of sign}}{\text{Light into sign}} = \text{Retroreflectivity}
\]
AAR Response

- Updated Field Manual
  - Incorporated FRA’s reflectorization rule in AAR Rule 66 Reflective Sheeting

- Emphasis on reflectorization has reduced highway-rail grade crossing accidents.
AAR Progress

Discrepancies between data within UMLER and that supplied to FRA.

Fleet Size, Cars, and Locomotives*

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Ownership</th>
<th>Completed</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locomotives</td>
<td>37,127</td>
<td>ALL</td>
<td>100%</td>
</tr>
<tr>
<td>Cars</td>
<td>1,027,776</td>
<td>991,034</td>
<td>96.4%</td>
</tr>
</tbody>
</table>

* Includes only the equipment reported to FRA. Source: FRA.

AAR Ownership Fleet Size**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locomotives</td>
<td>24,707</td>
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<tr>
<td>Cars</td>
<td>1,316,185</td>
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</tbody>
</table>

** Data taken from AAR 2013 Edition of Railroad Facts.
AAR Progress

- These data would indicate a good industry response to the application of the retroreflective material.
- However, the FRA database does not include all equipment reported as some owners opted to apply the material per Tables 3 and 4 of §224.107.
- The AAR is now evaluating retroreflective materials to determine an expected “life cycle” for the rail industry as opposed to the current 10 year replacement required in 49 CFR Part 224.
Vehicle Incidents: 1996 - 2013

Vehicle Incidents

Vehicle only at dark or limited visibility. Source: FRA.
Night Vehicle Incidents: 1996 - 2013

Night Vehicle Incidents

Only cross bucks, stop signs, or no signal (does not include, gates, wig-wags, signals, watchmen, or flagged by crew). Source: FRA.

2005 Rule Issued
Dark, No Stop Signals: 1996 - 2013

Only cross bucks or No signal. Source: FRA.
Conclusion

- Questions?