The Level Crossing Risk Management Toolkit

A tool to identify human factors risks and mitigations systematically at level crossings

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The problem with Level Crossings

  
  Risk associated with level crossings (excluding suicide, or suspected suicide) equates to 12.9 FWI/yr or 9.1% of the total risk to passengers, workforce and members of public

- UK has lowest risk level at level crossings amongst European member states (as indexed by NRVs, European Commission, 2010)
Crossing types

- In Britain there are 6592 level crossings
- 16 different types of crossing classified in ALCRM

Barrow (+mwl)
Station (+mwl)
Footpath (+mwl)
Open Crossing
Automatic Half Barrier
Manually Controlled Gated
Manually Controlled Barrier (+cctv)
User Worked Crossing (+mwl, +telephone)
Automatic Open Crossing, Locally Monitored
Automatic Barrier Crossing, Locally Monitored
Most accidents at level crossings involving trains are caused by user error or deliberate violation of safe crossing procedure (RSSB, ASPR, 2009/10)
In 2005, Human Engineering conducted a comprehensive study into improving road user and pedestrian behaviour at level crossings (RSSB project T335)

**Phase 1**
- Assess current knowledge of public behaviour at level crossings

**Phase 2**
- Prioritise human factors issues by risk

**Phase 3**
- Identify and evaluate new and current mitigation measures

**Phase 4**
- Develop a practical guidance toolkit for duty holders and risk assessors

**Phase 5**
- Refine and prioritise the mitigation measures by potential effectiveness

Help the industry to understand and manage user behaviour risks associated with all level crossings
The LXRMTK

- First launched in 2007 to a limited audience and minor updates made in June 2008:
  - Trialling and feedback period

- In Summer 2009 RSSB commissioned Human Engineering to conduct a program of major updates:
  - New industry regulations, standards and recommendations
  - Update of existing human factors issues and mitigation measures
  - Addition/removal of new or superceded content
  - Incorporation of issues or guidance as required by the industry
  - Review and validation of new content by industry SMEs
Using the toolkit

www.lxrmtk.com
Intended users

- **Risk specialists** – Human factors input into risk assessment process
- **Operations managers** (Network Rail) - To support risk assessment and inspection processes
- **Competent persons** - To assist in crossing inspection by providing detailed information on the relevant behavioural issues and appropriate risk reduction measures.
- **Accident/incident investigators** (Rail Accident Investigation Branch, Network Rail, RSSB) – Systematic evaluation of the factors that may have contributed to accidents or incidents at level crossings and suggests appropriate mitigation measures.
- **Level crossing designers** – The toolkit provides information on human factors issues and possible methods of risk reduction that should be taken into account during the design process.
Getting started – Home page

- Provides guidance and instructions for range of user types and objectives
Guidance

For inspections:

- Pre-Inspection familiarisation with relevant human factors issues and mitigation measures
- Post-Inspection identification of suitable mitigations against human factors issues derived from inspections

Guidance for use of the LXRMTK to support level crossing risk management.

The LXRMTK (Level Crossing Risk Management Toolkit) can be used to support level crossing risk management by suggesting appropriate risk reduction measures. The toolkit builds upon and complements existing risk management frameworks.

**How to Use the Toolkit**

The LXRMTK can be used both before and after a site inspection to identify and address human factors issues:

**Pre-inspection**

To familiarise yourself with the types of human factors issues that may be present on a site:

1. Click on **Search** in the top-level menu.
2. Select the type of level crossing you are inspecting from the drop-down list.
3. Click the **Human Factors** button.

This will generate a list of human factors issues relevant to that particular level crossing. For detailed information about any human factors issue in the list, click on its title. The summary list of human factors issues produced by your search can be further refined as required.

**Post-inspection**

When you are comfortable that you have identified all relevant human factors issues:

1. Click on **Search** in the top-level menu.
2. Select the type of level crossing you are inspecting from the drop-down list.
3. Click the **Human Factors** button.
4. Check the box next to the human factors issues relevant to your post-inspection inspection.
5. Click the **Mitigation Measures** button at the bottom of the list.

This will generate a list of risk mitigation measures to address the identified human factors issues. Consultation with Network Rail operations specialists is imperative that it will be influenced by local site conditions and a cost benefit analysis. To view detailed information about any mitigation measure in the list, click on its title to expand the detailed information.
Searching the toolkit

- Search functionality
  - Free text
  - Filtering
Human Factors Issues

- 123 human factors records
  - 14 new records
  - 1 removed

Applicable to range of user and crossing types

- Violations of warning lights
- Weather: Ice
- Age of drivers
- Regularity of trains
- Driver distractions
- Visual clutter
- Time of day
- Foreign users
- Crossing surface

- Animals: Horses
- Housing developments
- Commercial traffic
- Public houses
- Parallel running of train and tram lines
- Reflected sunlight/washout
- Distraction: Music players and handheld computers
- User mistakes the railway for a road
- Sunlight
# Human Factors Issues

## Human Factor Issue: Driver distractions

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Driver distractions</td>
<td>Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers. The behaviour and decision-making of train and vehicle drivers may be impaired by visual distractions in and around the crossing.</td>
</tr>
</tbody>
</table>

**User Behaviour**

As distractions may be seasonal (e.g., fun fairs or other similar events) site inspections should be conducted at different times of the year or stops should be taken to accommodate specific events.

**Relevant to LX Types**

ABC, AHB, AOC, MCB, MCBdw, MCG, GC, UWC, UWCmdw, UWCtw

**Relevant to User Types**

Car driver, Cyclist, Farmer, HSV driver, Mobility scooter user, Motor cyclist, Van driver

**Behavioural Influencing Factor**

- User is distracted

**Environmental Influencing Factor**

**Related Mitigation Measures:**

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Description</th>
<th>Category</th>
<th>Cost</th>
<th>Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>Improve sighting distance. Remove foliage and other obstructions</td>
<td>By cutting back vegetation and removing obstructions the sighting distances for users up and down the track and to signs/warning lights are lengthened. ORR emphasises the importance of...</td>
<td>Enabling</td>
<td>Low (£60 - £10k)</td>
<td>A</td>
</tr>
<tr>
<td>73</td>
<td>Optimise position of warning lights</td>
<td>Optimise the position of the crossing warning lights to ensure that they are clearly visible to all road traffic approaching the level crossing. Two wig-wags must be provided on each approach.</td>
<td>Engineering</td>
<td>Low (£60 - £10k)</td>
<td>B</td>
</tr>
</tbody>
</table>
Mitigation measures

103 mitigation measure records
- 38 new records
- 7 removed

Applicable to range of user and crossing types

- Gate counters
- Non-slip surface retrofit
- Retrofit of audible alarms to MWLs
- Addition of half barriers to AOCLs (stubby barriers)
- ‘Dogs on Leads’ signs
- Addition of a spoken alert to the ‘Another Train Coming’ alarm

- Review of lighting levels at crossings
- Installation of ‘approach locking’
- Provision of self-illuminating signs
- Installation of queue detection loops
- Snow clearance and gritting at UWCs
- Improve signage at UWCt
## Mitigation Measures

**Mitigation Measure: Improve sighting distance: Remove foliage and other obstructions**

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<tr>
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<tr>
<td>Category</td>
<td>Enabling</td>
</tr>
<tr>
<td>Cost</td>
<td>Low (£0 - £10k)</td>
</tr>
<tr>
<td>Cost Notes</td>
<td>Costs are dependent upon the scale of the foliage or obstructions and could range from low to medium.</td>
</tr>
<tr>
<td>Description</td>
<td>By cutting back vegetation and removing obstructions the sighting distances for users up and down the track and to signs / warning lights are lengthened. ORR emphasises the importance of optimum sighting distances, regardless of the protection provided at a crossing.</td>
</tr>
<tr>
<td>Relevant to LX Types</td>
<td>ABC, A-B, AOCL, Barrow, Barrow - mwl, FP, FPMwl, MCB, MCBccv, MCG, OC, Station, Station - mwl, UMC, UWCmwl, UWCt</td>
</tr>
<tr>
<td>Suitability Criteria (any restrictions on applicability)</td>
<td>The removal of foliage must be performed with respect to Tree Preservation Orders, environmental legislation, bird nesting etc.</td>
</tr>
<tr>
<td>Responsibility for Implementation (who will implement the mitigation?)</td>
<td>Network Rail maintenance / off track teams are responsible for the lineside foliage. Local highway authorities (roadside) are responsible for the roadside foliage. The type of obstruction and land ownership issues would have to be considered.</td>
</tr>
<tr>
<td>Implementation Instructions (e.g., existing Guidance, Standards, Regulations, etc)</td>
<td>Must consider all relevant regulations for Manual Working alongside the railway. Refer to Network Rail Level Crossing Sighting Best Practice when making potential changes to sighting distance.</td>
</tr>
<tr>
<td>Case Studies (examples of locations where mitigation has been implemented previously)</td>
<td>Numerous throughout the network.</td>
</tr>
</tbody>
</table>
## Mitigation Measures

### Evidence Of Success

**Established**

Yes.

Established, the success of this measure is enhanced by joint inspections.

**Published/ongoing or planned research**

None.

**Wider Implications of Mitigation (e.g. noise/light pollution, transfer of risk elsewhere)**

Potentially a noisy activity.

**Maintenance: Who will maintain it?**

Network Rail Maintenance / local highway authority.

**Maintenance: How much will maintenance cost?**

Unknown.

### Related Human Factors:

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<td>15</td>
<td>Visual clutter</td>
<td>Superfluous information and roadside structures on the approach to a crossing may impair the user’s ability to detect level crossing information and warning signs.</td>
<td>A</td>
</tr>
<tr>
<td>23</td>
<td>Sunlight</td>
<td>Sunlight shining through lines of trees positioned to the side of the road produces a strobing effect for the driver, this may either act as a distraction or reduce the visibility of visual features.</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Direct glare from sunlight can also temporarily 'blind' a driver on approach to a crossing and reduce the conspicuity of crossing warning signs and signals.</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

- Updates reflect latest good practice and research in crossing safety and management
- Provides a systematic method of managing risk from:
  - User behaviour
  - Local features
  - Crossing design
Thank you

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