Level crossings
Summary of findings and key human factors issues

Prepared by Davis Associates Limited
for the Health and Safety Executive 2005

RESEARCH REPORT 359
Level crossings
Summary of findings and key human factors issues

Davis Associates Limited
Wyllyotts Place
Potters Bar
Hertfordshire
EN6 2JD

Level crossings currently present the largest risk of a multi-fatality incident on the railway network. Her Majesty’s Railway Inspectorate (HMRI), a division of the Health and Safety Executive (HSE), has a role in the approval, inspection and investigation of incidents involving level crossings. To ensure risks are better controlled, HMRI are seeking to develop their understanding of human factors issues at level crossings.

This report is the first of three reports being produced by Davis Associates for HMRI’s project, ‘Level crossings: Future Human Factors Priorities, new technologies and tools for inspectors’.

This report summarises the findings from a literature review, site visits, interviews with stakeholders and a validation exercise. The findings and key human factors issues are presented in a database format for ease of use and searching using keywords. It also provides a traceable source of information for the development of Inspectors’ tools and approaches.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.
Executive Summary

Level crossings currently present the largest risk of a multi-fatality incident on the 9 railway network. Her Majesty’s Railway Inspectorate (HMRI), a division of the Health 9 and Safety Executive (HSE), has a role in the approval, inspection and investigation 9 of incidents involving level crossings. To ensure risks are better controlled, HMRI are 9 seeking to develop their understanding of human factors issues at level crossings.

This report is the first of three reports being produced by Davis Associates for HMRI’s 9 project, ‘Level crossings: Future Human Factors Priorities, new technologies and tools for inspectors’.

This report summarises the findings from a literature review, site visits, interviews with 9 stakeholders and a validation exercise. The findings and key human factors issues are 9 presented in a database format for ease of use and searching using keywords. It also 9 provides a traceable source of information for the development of Inspectors’ tools 9 and approaches.

A summary of the findings are:

- To date, 104 human factors issues have been defined.
- 94 human factors issues relate to protected level crossings.
- 51 issues relate to unprotected crossings.
- The signaller is referred to within 6 of the issues, with regard to communication, 9 contacting, detection of objects and track-side workers, camera angle and signal 9 sections.
- Groups of level crossing users have been identified as impacting on 5 of the human 9 factors issues. These refer to groups in general, position of safety, pedestrians on 9 vehicular crossings, passenger compliance with MWL, trespassers and walkers in 9 groups.
- Of particular note, pedestrian users are affected by only 49 issues, while vehicle 9 drivers (cars, vans, HGVs & motorcyclists) are affected by 80 human factors issues.
- 52 human factors issues relate to user-worked crossings, including those with 9 telephones or miniature warning lights.
- Automatic open level crossings are affected by 73 of the human factors issues.
# Contents

Executive Summary ........................................................................................................ iii

Contents .......................................................................................................................... 9

Acknowledgements ......................................................................................................... ix

Abbreviations .................................................................................................................. x

Definitions ....................................................................................................................... xi

1 Introduction9 .................................................................................................................. 9
   1.1 Background ................................................................................................................. 9
   1.2 Scope9 .......................................................................................................................... 9
   1.3 Objectives .................................................................................................................. 9

2 Method ............................................................................................................................ 92
   2.1 Introduction ................................................................................................................ 92
   2.2 Literature review ....................................................................................................... 92
   2.3 Level crossing visits9 ............................................................................................. 92
   2.4 Signal box visits9 ..................................................................................................... 94
   2.5 Level crossing training9 ........................................................................................ 95
   2.6 Interviews9 .............................................................................................................. 95

3 Database9 ....................................................................................................................... 97
   3.1 Recording the findings9 .......................................................................................... 97
   3.2 Database context9 .................................................................................................... 98
   3.3 Additional information ......................................................................................... 99

4 Findings9 ......................................................................................................................... 910
   4.1 Summary of key literature findings9 ....................................................................... 910
   4.2 Summary of main database findings9 .................................................................... 911
   4.3 Recurring HF themes9 .......................................................................................... 912
   4.4 Addressing HF issues9 .......................................................................................... 915
   4.5 Moving forward to tools and approaches for Inspectors9 .................................... 916
   4.6 Database of HF issues (pages) ............................................................................. 917-68

5 Validation ....................................................................................................................... 969
   5.1 Objective ............................................................................................................... 969
   5.2 Method9 ............................................................................................................... 970
   5.3 Findings9 .............................................................................................................. 971
5.4 Feasibility of ranking HF issues .......................... 80
5.5 Value of the validation exercise .......................... 80

References .............................................................. 81

Appendix A  Level crossing visits .............................. 9 91
Appendix B  HF issues by level crossing type ............... 9 99
# Acknowledgements

The authors would like to acknowledge the following people and organisations for their support and co-operation during the development of this report. (Presented in alphabetical order).

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Name</th>
<th>Job title</th>
<th>Interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arriva</td>
<td>Keith Stephenson</td>
<td>Section Manager</td>
<td></td>
</tr>
<tr>
<td>Arthur Mellows College</td>
<td>Fred Mann</td>
<td>Warden</td>
<td></td>
</tr>
<tr>
<td>Automobile Association (AA)</td>
<td>Andrew Howard</td>
<td>Head of Road Safety</td>
<td></td>
</tr>
<tr>
<td>British Transport Police</td>
<td>Becky Jackson</td>
<td>Acting Sergeant</td>
<td></td>
</tr>
<tr>
<td>British Transport Police</td>
<td>Dave Robertson</td>
<td>Police Constable</td>
<td></td>
</tr>
<tr>
<td>British Transport Police</td>
<td>John Thompson</td>
<td>Chief Inspector</td>
<td></td>
</tr>
<tr>
<td>Delaine Buses</td>
<td>Anthony Delaine-Smith</td>
<td>Managing Director</td>
<td></td>
</tr>
<tr>
<td>Delaine Buses</td>
<td>Mark Delaine-Smith</td>
<td>Manager</td>
<td></td>
</tr>
<tr>
<td>Health and Safety 9 Laboratory (HSL)</td>
<td>Mary Miller</td>
<td>Higher Ergonomist</td>
<td></td>
</tr>
<tr>
<td>Helpston Parish Council</td>
<td>Joe Dobson</td>
<td>Councillor</td>
<td></td>
</tr>
<tr>
<td>Helpston Parish Council</td>
<td>Kathie Rowbotham</td>
<td>Parish Clerk</td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate (HMRI)</td>
<td>Andrew Harvey</td>
<td>HM Inspector of Railways (Level Crossing section)</td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>Darren Anderson</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>John Cullen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>John Tilly</td>
<td>HM Principal Inspector of Railways</td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>Keith Shepherd</td>
<td>HM Inspector of Railways</td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>Paul Wilkinson</td>
<td>Operations Intelligence Manager</td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>Robert Beveridge</td>
<td>Railway Inspectorate</td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>Simon Smith</td>
<td>Contact Officer (RICO)</td>
<td></td>
</tr>
<tr>
<td>Her Majesty's Railway 9 Inspectorate</td>
<td>Sue Johnston</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role and Organisation</td>
<td>Name</td>
<td>Position</td>
<td>Status</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>----------------------------</td>
<td>-----------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Her Majesty’s Railway Inspectorate 9</td>
<td>Mark Whitham 9</td>
<td>Inspector 9</td>
<td></td>
</tr>
<tr>
<td>Human Engineering Ltd 9</td>
<td>Claire Turner 9</td>
<td>Senior Ergonomist 9</td>
<td></td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>Bill Dillarstone 9</td>
<td>Signaller, Helpston signal 9 box 9</td>
<td>✔</td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>David Jones 9</td>
<td>Level Crossing Engineer 9</td>
<td>✔</td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>Emma Lowe 9</td>
<td>Human Factors Advisor 9</td>
<td></td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>Gaynor Farrington 9</td>
<td>Level Crossing Risk 9 Manager 9</td>
<td>✔</td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>Gilbert Fraser 9</td>
<td>SPAD Strategy Manager 9</td>
<td>✔</td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>John Whitehead 9</td>
<td>Level Crossing Risk Control Coordinator 9</td>
<td>✔</td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>Martin Shore 9</td>
<td>Signaller, Helpston signal 9 box 9</td>
<td>✔</td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>Robert Havercroft 9</td>
<td>Level Crossing Risk Control Coordinator 9</td>
<td>✔</td>
</tr>
<tr>
<td>Network Rail 9</td>
<td>Steve Ray 9</td>
<td>Assistant Signaller Manager (Peterborough Signal Box) 9</td>
<td></td>
</tr>
<tr>
<td>Northamptonshire County Council 9</td>
<td>Robin Hodsdon 9</td>
<td>Traffic Engineer 9</td>
<td>✔</td>
</tr>
<tr>
<td>Rail Passengers Council (North West England) 9</td>
<td>Ian Watson 9</td>
<td>Safety Task Force member 9</td>
<td>✔</td>
</tr>
<tr>
<td>Rail Passengers Council (Scotland) 9</td>
<td>James King 9</td>
<td>Safety Task Force member 9</td>
<td>✔</td>
</tr>
<tr>
<td>Rail Passengers Council (East of England) 9</td>
<td>John Hawkins 9</td>
<td>Safety Task Force member 9</td>
<td>✔</td>
</tr>
<tr>
<td>Rail Passengers Council 9</td>
<td>Shelley Gould 9</td>
<td>Safety Task Team Coordinator 9</td>
<td>✔</td>
</tr>
<tr>
<td>Rail Safety and 9 Standards Board 9</td>
<td>Alan Davies 9</td>
<td>Project Manager (National 9 Level Crossing Safety Group - Secretary) 9</td>
<td>✔</td>
</tr>
<tr>
<td>Rail Safety and 9 Standards Board 9</td>
<td>Dr. Ann Mills 9</td>
<td>Principal Human Factors 9</td>
<td></td>
</tr>
<tr>
<td>Rail Safety and 9 Standards Board 9</td>
<td>Michael Woods 9</td>
<td>Head of Operations Research 9</td>
<td></td>
</tr>
<tr>
<td>Retired (Network Rail) 9</td>
<td>Harry Tabaert 9</td>
<td>Ex-Level Crossing Strategy Manager 9</td>
<td>✔</td>
</tr>
</tbody>
</table>
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA9</td>
<td>Automobile Association (UK)9</td>
</tr>
<tr>
<td>Accom.9</td>
<td>Accommodation level crossing (User worked crossing)9</td>
</tr>
<tr>
<td>AHB9</td>
<td>Automatic half barrier9</td>
</tr>
<tr>
<td>ABC19</td>
<td>Automatic barrier crossing locally monitored9</td>
</tr>
<tr>
<td>AOC19</td>
<td>Automatic open crossing locally monitored9</td>
</tr>
<tr>
<td>AOCR9</td>
<td>Automatic open crossing remotely monitored9</td>
</tr>
<tr>
<td>BS9</td>
<td>British Standard9</td>
</tr>
<tr>
<td>BTP9</td>
<td>British Transport Police9</td>
</tr>
<tr>
<td>BW9</td>
<td>Bridleway crossing9</td>
</tr>
<tr>
<td>CIRAS9</td>
<td>Confidential Incident Reporting and Analysis System9</td>
</tr>
<tr>
<td>CCTV9</td>
<td>Closed Circuit Television9</td>
</tr>
<tr>
<td>DA9</td>
<td>Davis Associates Limited9</td>
</tr>
<tr>
<td>DfT9</td>
<td>Department for Transport (UK)9</td>
</tr>
<tr>
<td>DOT9</td>
<td>Department of Transport (USA)9</td>
</tr>
<tr>
<td>DTLR9</td>
<td>Department for Transport, Local Government and the Regions (UK)9</td>
</tr>
<tr>
<td>FC9</td>
<td>Footpath crossing9</td>
</tr>
<tr>
<td>FRA9</td>
<td>Federal Railroad Administration9</td>
</tr>
<tr>
<td>HA9</td>
<td>Highways Agency9</td>
</tr>
<tr>
<td>HF</td>
<td>Human Factors9</td>
</tr>
<tr>
<td>HGV9</td>
<td>Heavy goods vehicle9</td>
</tr>
<tr>
<td>HMSO9</td>
<td>Her Majesty’s Stationery Office (UK)9</td>
</tr>
<tr>
<td>HMR19</td>
<td>Her Majesty’s Railway Inspectorate (UK)9</td>
</tr>
<tr>
<td>NR9</td>
<td>Network Rail (UK)9</td>
</tr>
<tr>
<td>HSE9</td>
<td>Health and Safety Executive (UK)9</td>
</tr>
<tr>
<td>HSL9</td>
<td>Health and Safety Laboratories 9</td>
</tr>
<tr>
<td>LC9</td>
<td>Level crossing9</td>
</tr>
<tr>
<td>MCG9</td>
<td>Manually controlled gate9</td>
</tr>
<tr>
<td>MCB9</td>
<td>Manually controlled barrier (worked from adjacent cabin/signal box)9</td>
</tr>
<tr>
<td>MCB+CCTV9</td>
<td>Manually controlled barrier protected by closed circuit television9</td>
</tr>
<tr>
<td>MWL9</td>
<td>Miniature warning lights9</td>
</tr>
<tr>
<td>NRC19</td>
<td>Network Rail Controlled Infrastructure9</td>
</tr>
<tr>
<td>OC9</td>
<td>Open crossing9</td>
</tr>
<tr>
<td>Occup.9</td>
<td>Occupation level crossing (User worked crossing)9</td>
</tr>
<tr>
<td>RPC9</td>
<td>Rail Passenger Council9</td>
</tr>
<tr>
<td>RGS9</td>
<td>Railway Group Standard9</td>
</tr>
<tr>
<td>RIDDOR9</td>
<td>Reporting of injuries, diseases and dangerous occurrences 9 regulations9</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>RSC9</td>
<td>Railway Safety Case9</td>
</tr>
<tr>
<td>RSSB9</td>
<td>Rail Safety and Standards Board9</td>
</tr>
<tr>
<td>SFX9</td>
<td>Station foot crossing9</td>
</tr>
<tr>
<td>SMIS9</td>
<td>Safety Management Information System9</td>
</tr>
<tr>
<td>TRL9</td>
<td>Transport Research Laboratory9</td>
</tr>
<tr>
<td>UK9</td>
<td>United Kingdom (of Great Britain)9</td>
</tr>
<tr>
<td>USA9</td>
<td>United States of America9</td>
</tr>
<tr>
<td>UWC9</td>
<td>User worked crossing9</td>
</tr>
<tr>
<td>UWC+T9</td>
<td>User worked crossing with telephone9</td>
</tr>
<tr>
<td>UWC+MWL9</td>
<td>User worked crossing with miniature warning lights9</td>
</tr>
<tr>
<td>www9</td>
<td>World Wide Web9</td>
</tr>
</tbody>
</table>
## Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation 9 level crossing9</td>
<td>A private vehicular level crossing connecting land 9 in the same ownership separated by a railway 9 line. Most commonly referred to as ‘User Worked’.9</td>
<td>RGS, GK/9 GN0802, 20049</td>
</tr>
<tr>
<td>Active warning9</td>
<td>A device which warns users of the imminent 9 arrival of a train. Such devices may be either 9 visible or audible.9</td>
<td>RGS GI/RT7011, 9 20029</td>
</tr>
<tr>
<td>Automatic 9 crossing9</td>
<td>A level crossing where the protective 9 equipment (e.g., barriers and active warnings) is 9 automatically activated by the approaching train9</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Barrier9</td>
<td>Any element…permanent or temporary, intended 9 to prevent people from falling, and to retain, stop 9 or guide people.9</td>
<td>DCMS, 19 89</td>
</tr>
<tr>
<td>Behaviour9</td>
<td>A manner of behaving or the response of an 9 organism to a stimulus. 9</td>
<td>Collins 9 dictionary9</td>
</tr>
<tr>
<td>Blocking-back9</td>
<td>The formation of a stationary or slow-moving 9 queue of road traffic over a level crossing causing 9 obstruction of the line.9</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Closure sequence9</td>
<td>The sequence of events, initiated by the signaller, 9 crossing keeper or the approach of a train 9 (automatically), which applies the protection to 9 the level crossing to prevent users from crossing 9 the railway.9</td>
<td>RGS, 20049</td>
</tr>
<tr>
<td>Communication9</td>
<td>The imparting or exchange of information.9</td>
<td>Collins 9 dictionary9</td>
</tr>
<tr>
<td>Crossing9</td>
<td>Used in level crossing documentation to mean 9 'level crossing', where the continued use of 'level crossing' becomes repetitive and laboured.9</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Crossing abuse9</td>
<td>Any deliberate activity by a user at a level 9 crossing which differs from the correct procedure 9 for using the crossing9</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Crossing keeper9</td>
<td>A person appointed at a permanent gate box to 9 carry out the normal operating procedure of a 9 level crossing.9</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Crossing time9</td>
<td>The time taken for a user to transverse the 9 crossing from the decision point to a position 9 of safety on the other side of the railway lines. 9 Crossing time includes time taken for the user to 9 make a decision to cross. 9</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Decision point9</td>
<td>The point at which a level crossing user makes a 9 decision to cross or wait.9</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
<td>Source(s)</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Emergency9</td>
<td>An unforeseen or sudden occurrence, especially of danger, demanding immediate action.</td>
<td>Collins 9 Dictionary9</td>
</tr>
<tr>
<td>Level crossing9</td>
<td>An intersection at the same level of a road, footpath or bridleway and one or more railway tracks</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Occupation level crossing9</td>
<td>A private level crossing which gives access between premises and a public highway. Most commonly referred to as ‘User Worked’.</td>
<td>RGS, GK/9 GN0802, 20049 HMRI, 20049</td>
</tr>
<tr>
<td>Opening sequence9</td>
<td>The sequence of events, initiated by the signaller or crossing keeper or the train clearing the crossing, which withdraws the level crossing protection, allowing users to cross the railway.</td>
<td>RGS, 20049</td>
</tr>
<tr>
<td>Phonetic Alphabet9</td>
<td>A list of words used in communications to represent the letters of the alphabet, as in E for Echo and T for Tango.</td>
<td>Collins English Dictionary9</td>
</tr>
<tr>
<td>Protected (LC)9</td>
<td>Having gates or barriers or having road traffic signals or miniature red/green lights giving a positive warning of the approach of trains.</td>
<td>HSE, 20039</td>
</tr>
<tr>
<td>Rush-hour9</td>
<td>A period at the beginning and end of the working day when large numbers of people are travelling to or from work.</td>
<td>Collins English Dictionary9</td>
</tr>
<tr>
<td>Signaller9</td>
<td>A competent person responsible for the operation of the signalling system, to safely control the passage and regulation of trains, usually located in a signal box.</td>
<td>RGS, 20049</td>
</tr>
<tr>
<td>Traffic calming system9</td>
<td>Road junction(s) strategically positioned to encourage slower and safer driving speeds by vehicle drivers.</td>
<td>nationmaster.com9</td>
</tr>
<tr>
<td>Type (of level 9 crossing)9</td>
<td>A recognised combination of control measures used at level crossings, appropriate to particular circumstances.</td>
<td>RGS, 20029</td>
</tr>
<tr>
<td>Wig-wag light9</td>
<td>1. A colloquial term for road traffic signals. 2. Light signals for the control of traffic at level crossings. The sequence for illumination: a) a single steady amber light, b) two intermittent red lights.</td>
<td>1. RGS, 20049 2. The Traffic 9 Sign Regulations &amp; General 9 Directions, 20029</td>
</tr>
<tr>
<td>Zigzagging9</td>
<td>Sharp angular movements from one side to another. In the case of level crossings, to move around the barriers at a half barrier crossing to avoid having to wait.</td>
<td>DA, 20049</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Background

Davis Associates Limited (DA) has prepared this document for Her Majesty’s Railway 9 Inspectorate (HMRI). This report represents the first of three deliverables to be 9 produced by DA as part of the HMRI project ‘Level crossings: Future human factors priorities, new technologies and tools for inspectors’. 9

DA proposed the following scope of work to be delivered, broken down into a number 9 of tasks. This deliverable is highlighted in orange (figure 1). 9

![Figure 1](image.png)

Scope of work divided by tasks and deliverables

1.2 Scope

This report identifies human factors issues at level crossings and summarises the 9 findings of the literature review, site visits and training undertaken by DA and the 9 findings from the interviews with stakeholders. It also includes the results from the 9 validation exercise. 9

1.3 Objectives

The objectives of this report are to: 9

- define a list of human factors issues at level crossings. 9
- summarise the findings from the literature review, sites visits and interviews, which 9 support the identified issues. 9
- validate a method for assigning HF issues to level crossings. 9
- capture findings so as to support the development of tools and approaches for 9 Inspectors. 9
2  Method

2.1  Introduction

The following section briefly describes the methods employed for identifying human factors issues for inclusion within the database. 9

2.2  Literature review

A review of key literature from rail, road, user risk perception and behaviour was undertaken, using a variety of search methods. These included using the in-house catalogue and journal search facilities of the Transport Research Laboratory and the British Library. 9

A review of literature was made from the following sources and research areas:9

- RSSB research
- HMRI incident reports
- RSSB and Network Rail Standards & Guidance notes
- Ergonomics Information Analysis Centre (EIAC) 9
- The findings of research commissioned by Network Rail
- The findings of research commissioned by HSE 9
- The findings of research commissioned by road transport bodies, e.g., TRL 9
- Human behaviour, e.g., human error, risk taking behaviour, human reliability 9
- Trespass & vandalism at level crossings 9
- European and world-wide level crossing research and incidents 9

2.3  Level crossing visits

To date, a total of 45 site visits to key examples of level crossing types have been undertaken to build a greater understanding of the issues first-hand. Still photographs and video recordings were taken at each of the site visits. 9

Photographs from each crossing visited can be found in Appendix A. 9

<table>
<thead>
<tr>
<th>Nearest Town</th>
<th>Level Crossing Name</th>
<th>Level Crossing Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedford</td>
<td>Kempston Hardwick Station</td>
<td>ABCL</td>
</tr>
<tr>
<td>Bedford</td>
<td>Millbrook Station</td>
<td>MCG</td>
</tr>
<tr>
<td>Bedford</td>
<td>Stewartby Brickworks</td>
<td>Private Gatekeeper</td>
</tr>
<tr>
<td>Bedford</td>
<td>Stewartby Green Lane Station</td>
<td>MCG</td>
</tr>
<tr>
<td>Nearest Town</td>
<td>Level Crossing Name</td>
<td>Level Crossing Type</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Bedford</td>
<td>Wootton Broadmead Station</td>
<td>ABCL</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Arksey*</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Creykes</td>
<td>UWC+MVL</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Daw Lane*</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Dockhills</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Eggborough Ings</td>
<td>Footpath</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Fields Lane</td>
<td>AOCL</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Hensall</td>
<td>MCB</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Joan Croft*</td>
<td>MCG</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Kirton Lane*</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Marsh Lane</td>
<td>Footpath</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Moathills*</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Snaith Road*</td>
<td>AHB</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Snaith Station</td>
<td>AOCL</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Snaith &amp; Pontefract</td>
<td>AHB</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Stainforth Road</td>
<td>AHB</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Thorpe</td>
<td>AOCL</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Thorne Moorends*</td>
<td>AHB</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Thorpe Road*</td>
<td>AHB</td>
</tr>
<tr>
<td>Doncaster</td>
<td>Whitley</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Hertford</td>
<td>Roydon</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Hertford</td>
<td>St. Margarets Station (figure 4)</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Hertford</td>
<td>Ware Station</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Hertford</td>
<td>Ware (a), (figure 5)</td>
<td>Footpath</td>
</tr>
<tr>
<td>Hertford</td>
<td>Ware (b)</td>
<td>Footpath</td>
</tr>
<tr>
<td>Middlesbrough</td>
<td>Long Beck</td>
<td>MCB</td>
</tr>
<tr>
<td>Middlesbrough</td>
<td>Redcar Lane</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Middlesbrough</td>
<td>Westside Road</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Milton Keynes</td>
<td>Berry Lane, (figure 2)</td>
<td>UWC+T</td>
</tr>
<tr>
<td>Milton Keynes</td>
<td>Bow Brickhill Station</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Milton Keynes</td>
<td>Woburn Sands</td>
<td>Footpath</td>
</tr>
<tr>
<td>Milton Keynes</td>
<td>Woburn Sands Station</td>
<td>MCB</td>
</tr>
<tr>
<td>Milton Keynes</td>
<td>Leighton Buzzard</td>
<td>National Heritage Railway Open Crossing</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Bainton Green</td>
<td>AHB</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Bainton Village</td>
<td>AHB</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Ballast Pits</td>
<td>UWC+T</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Fox Covert Road</td>
<td>Footpath</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Greatford</td>
<td>MCB CCTV</td>
</tr>
</tbody>
</table>

Figure 2
*Barry Lane user-worked level crossing*

Figure 3
*Lolham Bridges CCTV level crossing*

Figure 4
*St. Margarets Station CCTV level crossing*

Figure 5
*Ware footpath crossing (a)*
### 2.4 Signal box visits

Visits were made to Peterborough and Helpston signal boxes. At each signal box, the process for operating the closing and opening sequence of each crossing was observed for a period of time. In addition to this, a detailed explanation of the process was provided by the signaler as they progressed through the sequence for each crossing.

Signallers were also asked about the effectiveness of the equipment to detect objects on the crossing and their own experiences of the behaviour of different level crossing users.

#### 2.4.1 Peterborough

At Peterborough (figure 6), the panels are arranged to control the movement of trains as well as for monitoring and controlling five local level crossings. Two signallers operate the level crossing control panel at all times, and their position supports communication with and a view of the work of other signallers controlling the movements of trains via the main control panel.

#### 2.4.2 Helpston

Helpston signal box (figure 9) is a dedicated level crossing box. Two signallers control the closing and opening sequence of four CCTV, one manned gate, and the Helpston MCB crossing, positioned on the Stamford and/or East Coast mainline train routes. The control panel mimics the order of the crossings on the rail infrastructure and also shows an additional four crossings, not controlled by the signallers.

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterborough</td>
<td>Helpston</td>
<td>MCB</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Lolham Bridges, see figure 3</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Lolham</td>
<td>Footpath</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Maxey</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Tallington</td>
<td>MCB CCTV</td>
</tr>
<tr>
<td>Peterborough</td>
<td>Woodcroft</td>
<td>Manned gates</td>
</tr>
</tbody>
</table>

*Figure 6*

Peterborough signal box. The level crossings control panel is positioned with views of the main panel.

*Figure 7*

The level crossing control panel mimics the order of the crossings on the rail infrastructure.

*Figure 8*

Monitors for each crossing are positioned directly above the crossing on the panel.

*Figure 9*

The order of the closing procedure control buttons require the signaler to double check the crossing is clear prior to completing the closing.
Following the signal box visit, brief visits were made to six of the crossings in the 9 Helpston area. 9

![Figure 11](image1.png) The level crossing control panel mimics the order of the crossings on the rail infrastructure.

![Figure 12](image2.png) The view of the Helpston crossing from the signal box.

![Figure 13](image3.png) The signalers receive calls from crossing users, track-side workers and the crossing keeper at Woodcroft.

### 2.5 Level crossing training

DA attended the HSE two-day level crossing training course, held in Doncaster in July 9 2004. The course covered the following level crossing issues:9

- Basic legislation
- Network Rail’s level crossing risk assessment process
- Level crossing orders
- Normal operation and failure modes
- Investigating level crossing accidents
- HSE level crossing strategy and intervention plan

The two-day training course also included level crossing visits in and around the 9 Doncaster area. 9

### 2.6 Interviews

Level crossing stakeholders were interviewed regarding their particular experience and knowledge of crossings and user behaviour. A complete list of all stakeholders interviewed can be found in the ‘Acknowledgements’ section at the beginning of this 9 report. 9

Interviews were carried out at the respondent’s place of work or over the telephone. 9 Interviews lasted between 1 and 3 hours. 9

Each interviewee was provided with an agenda and letter of authority prior to the 9 meeting or telephone interview taking place. Each interview agenda followed a similar 9 format, however the questions were tailored to each respondent’s area of expertise.9

The agenda format was as follows:9
• Introduction to project9
• Role of Davis Associates9
• Aim of project and how outputs from work will be applied9
• Personal experiences of observing level crossing users9
• Behaviour patterns of level crossing users9
• Characteristics of crossings or surrounding environment that do not support or 9  
influence the way the user behaves 9

Documents provided by some of the respondents to support their comments were 9  
for internal use only. Therefore these have been referenced as an internal document 9  
within the database, however no references to names or locations contained within 9  
these documents have been included. 9

2.6.1 Interview boundaries
To help define a list of suitable stakeholders, both Network Rail and HMI 9  
recommended a cross-section of individuals to support the interview stage of this 9  
project. Although there are many more potential stakeholders within the rail industry 9  
with extensive knowledge of level crossings, once commonalities of human factors 9  
issues were identified between individuals this was taken as the point at which 9  
additional stakeholders were not included.9
3 Database

3.1 Recording the findings

The findings were recorded in a database, created by DA for the purpose of this project. A database was used as the most efficient way of recording the human factors issues because:

- the findings were not necessarily unique to one piece of research or respondent and the database allowed this to be conveyed easily and without duplication;
- the database allowed identification of many variables associated with a single issue, such as the level crossing type or the specific user;
- the database will be the primary source of information for developing Task 6, ‘Inspectors’ tools and approaches’. This will allow the developed tools and approaches to be traceable to a source of information; and
- the database allows for easy searches to be made of its contents, by choosing the required data entry fields (e.g., level crossing type or user details) or using keywords for extracting the relevant human factors issues. A listing of identified HF issues by level crossing type has been compiled in Appendix B. This search function will also support the development of Inspectors tools and approaches.

Each database entry has a set of data fields, allowing a range of information to be recorded against each human factors issue. Table 2 describes the type of information recorded in each data entry field.

<table>
<thead>
<tr>
<th>Data entry field</th>
<th>Information recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref.</td>
<td>A unique number for each database entry</td>
</tr>
<tr>
<td>Creation date &amp; Last Modified date</td>
<td>For effective management of data input and changes</td>
</tr>
<tr>
<td>Issue</td>
<td>Brief title of the human factors issue</td>
</tr>
<tr>
<td>Level crossing type</td>
<td>Identifies the type of level crossing which are relevant to the human factors issue</td>
</tr>
<tr>
<td>User details</td>
<td>Identifies the users which are relevant to the human factors issue</td>
</tr>
<tr>
<td>Issue at a level crossing</td>
<td>An example of the identified issue at a UK level crossing</td>
</tr>
<tr>
<td>Description of issue</td>
<td>A concise description of the human factors issue</td>
</tr>
<tr>
<td>User behaviour</td>
<td>Identifies the behaviour of the level crossing users as a result of the issue</td>
</tr>
<tr>
<td>Sources of information</td>
<td>Identifies the source(s) of information for each issue</td>
</tr>
<tr>
<td>Failure type</td>
<td>Identifies the type of failure committed by the user as a result of the issue. See section 3.2.2 for further clarification</td>
</tr>
</tbody>
</table>
3.2 Database content

3.2.1 Sources of information
Each database entry indicates the sources of the information. Where a reference to a particular piece of research has been made in the ‘User behaviour’ section, the 9 document code can be found in section ‘6.4 Document details’. An explanation of how 9 the coding applies and the list of references it refers to are provided on page 91 of this 9 report.9

3.2.2 User failure classification
The database has a data entry field for the type of failure committed by the user as 9 a result of the human factors issue. This human failure has been classified into two 9 error modes, ‘Error’ and ‘Violation’, [re/hu] & [HSE/re]. Both ‘Errors’ and ‘Violations’ 9 are normally subdivided to identify the users preceeding cognitive processes. For 9 the purposes of this report a simple error classification has been used, because it has 9 not been within the scope of the report to analyse the detailed cognitive mechanisms 9 involved in each of the human behaviours for all HF issues. 9

The human failure types have been defined as follows:9
- ‘Error’ is an unintentional act by a user, however it deviates from the correct user 9 behaviour. For example, poorly written signage information may result in the user 9 misinterpreting the instructions and undertaking the incorrect crossing procedure.9
- ‘Violation’ refers to an intentional act on behalf of the user. The user knowingly 9 undertakes a particular behaviour, that deviates from the correct user behaviour. 9 For example, the user does not want to be held at the crossing and therefore they 9 choose to pass through the activated warning information. 9

Identifying the type of user error committed as a result of the HF issue will support 9 the correct application of measures to help control the level of risk at the crossing. 9

8
Violation behaviour is addressed through emphasising the consequences, while slips, lapses and mistakes are addressed by designing out the reason for the error.

3.3 Additional information

To maintain a useable database, only information on the user behaviour (i.e., the user’s actions) that is a direct result of the identified human factors issue have been included. Detailed findings that describe the underlying theories behind user behaviour and risk perception are recorded separately of the database in section 4.3.9.
4 Findings

4.1 Summary of key literature information

A total of 105 documents were reviewed as part of Task 1, Literature review. A complete list of these are provided in the references section of this report.

Of particular note are the following documents, which provide an overview of the range of literature reviewed.

- Railway Safety Principles and Guidance, part 2, section E: Guidance on level crossings (HS(G)153/6) [HSE/ra]
  The RSPG provides guidance and advice to those persons involved in the provision and maintenance of the protection arrangements at level crossings. It is also a benchmark for compliance by the Inspectorate. The guidance book details the conditions of suitability for particular types of crossings to the general description, method of operation, railway signalling and control for each crossing type. It also provides a diagram showing the typical layout for each crossing type.

- Requirements for level crossings, issue 1 [GI/RT7012]
  The Railway Group Standard mandates the requirements for all aspects of level crossings, including the design, construction, inspection, maintenance, operation and decommissioning, for all Railway Group members. This document supercedes 10 separate level crossing RGP documents, and provides a complete listing of the crossing control measures.

- Provision, risk assessment and review of level crossings, issue 1 [GI/RT7011]
- Guidance on provision, risk assessment and review of level crossings [GI/GN7611]
  The guidance note for Railway Group Standard GI/RT7011, details factors to be included as part of a level crossing risk assessment. Some of the factors identified are similar to those within the HF issues database, however, they do not detail the behavioural traits of users as a result of the identified factors.

- Determining the final decision point at user worked crossings [hu/de]
- Human Factors assessment of the risks associated with MWL crossings [hu/hu]
  This research was carried out by Human Engineering, on behalf of RSSB. The research details user behaviour at user worked crossings, and draws conclusions on risk perception of crossing users and the reasons for user violations. These documents provide a source of information for the types of errors committed by users and may support the appropriate selection of risk control measures.

- Road vehicle level crossings special topic report [rssb/ro]
  This report provides a detailed review of the numbers of different level crossing types and the numbers of incidents involving road vehicles and trains at crossings. It also identifies the high level causes of collision risk, of which road vehicle driver error is
the most common cause and violations the second most common. This report differs 9 from the road vehicle report, in that it provides information about detailed human 9 factor issues that can lead to incidents at all types of crossings.9

- Reducing error and influencing behaviour [HSE/re]

This document guides those with responsibilities for workplace health and safety 9 to consider the benefits of human factors. It defines the impact of human error and 9 behaviour on health and safety, the types of human error and methods for reducing 9 them and the improvement of health and safety through appropriate application of 9 tasks, equipment, procedures and warnings.9

Many of the documents reviewed provided useful human factors information, yet focus 9 on limited crossing types or users. This report brings together the human factors 9 information from all the references reviewed.9

4.2 Summary of main database findings

Below is a summary of the main findings from the database. 9

- To date, 104 human factors issues have been defined.9
- 94 human factors issues relate to protected level crossings.9
- 51 issues relate to unprotected crossings.9
- The signaler is referred to within 6 of the issues, with regard to: communication 9 (107), contacting (68), detection of objects (101) and track-side workers (9), camera 9 angle (84) and signal sections (68).9
- Groups of level crossing users have been identified as impacting on 5 of the human 9 factors issues. These refer to: groups in general (13), position of safety (35), 9 pedestrians on vehicular crossings (76), passenger compliance with MWL (85), 9 trespassers (94) and walkers in groups (100). 9
- Of particular note, pedestrian users are affected by only 49 issues, while vehicle 9 drivers (cars, vans, HGVs & motorcyclists) are affected by 80 human factors issues.9
- 52 human factors issues relate to user-worked crossings, including those with 9 telephones or miniature warning lights. 9
- Automatic open level crossings are affected by 73 of the human factors issues.9

4.3 Recurring HF themes

A range of recurring HF themes have been identified from the database. These themes 9 briefly describe the reasons for user behaviours as a result of the human factors 9 issues. 9

4.3.1 Competence

Competence theme explains the behaviours of users as a result of the user not being 9
aware of or failing to fully understand the correct rules and procedures for using level 9 crossings. An example of a database issue which demonstrates this competence 9 theme, is issue 82: Highway Code: the highway code currently contains 275 rules for 9 vehicle drivers. Due to the current method for learning the code and its depth and 9 complexity of legal requirements, not all vehicle drivers are fully aware of the exact 9 procedures for responding correctly to level crossings. 9

The competence theme differs from compliance, which is addressed fully in section 9 4.3.4. Compliance is associated with user behaviour that results from being aware 9 of the rules and procedures for correctly using level crossings, however choosing not 9 to comply with these legal requirements for various reasons, for example, passing 9 through the activated warning system so as to avoid having to wait. 9

4.3.2 Distraction
Distraction has also been identified as a HF theme throughout the database. An 9 example HF issue, 95: Noise: noisy surroundings may impair the performance of the 9 users to detect trains at level crossings. Noisy surroundings close to the crossing can 9 distract the level crossing user from assessing for the presence of a train. 9

4.3.3 Inadequate design
In many areas of the UK, level crossings have been established for some time. The 9 development of areas to include more homes and larger road infrastructures has been 9 accommodated through changes to the level of protection at crossings. However, the 9 continued increases in development will mean that at some point the extent of change 9 to level crossing protection is inadequate and unable to keep pace. 9

The inadequacy of level crossing design is a feature of some of the HF issues. For 9 example, issue 63: Housing developments: increases road traffic and level crossing 9 use. 9

4.3.4 Behaviour arising from risk
An outline of each type of risk behaviour is provided with a summary of supporting risk 9 perception research, which frames the background to the resultant user behaviours 9 within the database. 9

The HSE document, ‘Reducing error and influencing behaviour’ [HSE/re] provides 9 practical guidance to many of the following risk themes. 9

4.3.4.1 Type of risks
Risks can be experienced through a physical or psychological way. A level crossing 9 user may experience a physical risk through the potential of being hit by a train. A 9 psychological risk may be experienced through the potential of being caught by the 9 police for passing through the activated warning lights. 9

4.3.4.2 Individual perceived control
People adopt their own levels of risk orientation, and these are generally defined by the 9 following factors: 9
- An individual’s own personality characteristics. Those that seek out risk are 9
  often referred to as sensation seekers and have a need for much higher levels of 9
  stimulation (we/ri & ad/ri).9
- The social affect on a person’s behaviour, e.g., through approval or disapproval by 9
  others.9
- Their own locus of control, which determines how in control an individual feels 9
  about their own behaviour (bu/ri).9

The level of perceived risk can change dependent upon the user’s situation. Violations 9
 can be explained by an understanding of how people assess the perceived risks. For 9
 example, HF issue 43: Time of day: risk-taking behaviour at level crossings increases 9
 during rush-hours, at midday and at the beginning and end of the school day. A 9
 vehicle driver calculates the perceived risk of crossing illegally when having to wait 9
 at the crossing, compared with the risks of other things, such as being late for an 9
 appointment. The benefit of crossing illegally is obvious to the driver; not having 9
 to wait at the crossing and reaching their desired destination on time. If this risk 9
 outweighs their assessment of the potential costs of being hit by train, then the user is 9
 likely to cross. 9

4.3.4.3 Risk compensation
People respond to or compensate for perceived changes in the dangers to which 9
 they are exposed, by adapting their behaviour. People adopt cognitive strategies for 9
 coping with their behaviour when within risk exposed environments. It is based on a 9
 ‘risk thermostat’ model that defines each of our own level of risk, mainly from one’s 9
 personality. It must be noted that the risk compensation theory has strong arguments 9
 both for and against. 9

An individual’s propensity to take risks is influenced by their own experience and that 9
 of others and this model assumes that the degree to which we take risks varies from 9
 one individual to another. An individual’s target risk level changes dependent upon 9
 the positive (i.e. saving in time) or negative (i.e. injury) gains with which risky behaviour 9
 achieves. Therefore if a person’s target risk level is low and their perception of risk is 9
 high, then that person will behave in a cautious manner. However, if the target level 9
 remains the same, but the perception of risk is also low, then it is suggested that the 9
 person will behave in a more risky manner.9

Recent RSSB unprotected crossing research advises against lowering the user’s 9
 perception of risk at a crossing, without actually increasing the protection at the level 9
 crossing. It suggests that this could potentially lead to an increase in accidents (this 9
 view could also be applied to protected level crossings), however this recommendation 9
 has yet to be validated. HF issue 33: Sighting distance: good sighting distance should 9
 indicate the level crossing as high risk, is an example of user risk compensation. 9

4.3.4.4 Familiarity
A person’s familiarity with a task can also affect their behaviour. Habits form over a 9
 period of time to help people cope with regular situations and environments, through 9
applying behaviours that require minimal ‘thinking’. The resultant behaviour in a known situation (which will ultimately be influenced by one’s personality) will be as an “implementation intention” (bu/ri), where an action is carried out in response to a situation. This enables people to undertake particular tasks (and many tasks at once) without having to concern themselves with the finer details of how that task is actually formed, thus allowing them to concentrate less.

The finer details that people gradually fail to take into account when undertaking a regular task can be explained as all the information presented to us from the environment, which we process to determine the most suitable behavioural response.

However, by not thinking about these finer details of a task, users tend to miss the “external cues” from the environment that would normally inform them whether the behaviour they are undertaking is appropriate (bu/ri).

For example, HF issue 85: Passenger compliance with MWL: the red light of a MWL is associated with the train passengers have alighted from. A passenger using a station foot crossing with miniature warning lights, on a regular basis, may exhibit this familiarity behaviour. They may cross against a red light, unaware of the information requesting them to stop, because the situation has triggered an habitual response. They have failed to take into account the situational and environmental information before they have acted.

Familiarity also presents other problems. Continued implementation of a task, which does not present dangers on a regular basis can lead a user to think they are never going to be exposed to the risk, therefore they behave less cautiously in these circumstances. For example, HF issue 05: Frequency of trains: crossings with low frequency of trains are likely to increase the risk-taking behaviour of regular users. A vehicle driver using a crossing that has only a few trains passing each day may reduce their level of caution. The combination of continued use and only ever seeing a few or possibly no trains during this period of time, removes the individuals “ability to think logically and rationally about their behaviour” (bu/ri).

4.3.4.5 Complacency

It could be suggested that users take a “it won’t happen to me” approach while crossing. Known as the “influence of attributional biases on people's comparative risk evaluation” (we/ri), people will perceive to be at a lesser risk than others, often related to judging themselves as being more skilled, and therefore leading to reduced levels of caution.

RSSB research identified a weak correlation between a users’ perception of how risky a situation was and their knowledge of level crossings with previous near-misses or accidents. It points out how this complacency of crossing users is in contrast to the road safety ‘black-spot’ theory used by the Government, to identify to vehicle drivers previous areas of high accidents, therefore drivers adjusting their behaviour to reduce risk to themselves. In some of the cases observed, users that confirmed they knew of a previous incident, continued to leave gates open at a footpath crossing.
4.3.4.6 Mental Models

Users form mental models of situations to help them make sense of and put structure into the world around them. However, if the model does not contain all the correct information or they have misrepresentations of the environment, the user may perceive themselves as safe when undertaking tasks, when in fact they are exposing themselves to danger (we/ri).9

In the context of level crossings, users often have an incorrect mental model of train speed and distance. HF issue 25: User perception of train speed and distance: train speed and distance is underestimated by users, which may result in increased decision making errors by level crossing users. Their model is based upon road vehicle speed, which exposes them to increased risk when judging train movement. 9

4.4 Addressing HF issues

The database has identified the type of user failure as a result of each HF issue. The type of failure committed by a user will determine the appropriate risk control measure to be implemented to ensure the risk is as low as reasonably practicable. 9

How HMRI address these issues, in terms of ensuring the appropriate risk control measures are in place, is dependent upon knowing the type of failure committed by the user. The human failure types have been simplified for the purposes of this work, into the following categories:9

- Violation behaviour is a deliberate deviation from the correct procedure. The user perceives the benefits (i.e., saving time) of undertaking the violation outweighs those risks of committing it (i.e., risk of being hit by a train). This type of behaviour is most appropriately dealt with through emphasising the consequences. 9
- Error behaviour is an unintentional behaviour that deviates from the correct procedure. The user carries out a task (i.e., crossing the railway) but fails to take account of the correct crossing procedure (i.e., does not comprehend change in audible warning tone). These are better addressed through the application of appropriate measures which design out the error. 9

4.4.1 Issues beyond HSE control

It is recognised that some of the identified issues are outside the control of the railway industry and fall under the responsibility of other organisations. However, they have been maintained within the database as they continue to impact on the behaviour of level crossing users. 9

Co-ordination with these outside organisations may support the development of measures to deal with some of the HF issues, for example, collaboration with Highway Authorities to drive changes in signage design, to address the error behaviour of users. 9

HF issues such as these may present an opportunity for review by the HSE’s Railways Policy Team. But limitations are again recognised where the level of risk control is benchmarked by established rules and principles, such as the Highway Code. 9
4.5 Moving forward to tools and approaches for Inspectors

Applying the human factors issues during the inspection process, for defining what should be expected at a particular crossing type, to ensure any risk is controlled, will be covered as part of the development of tools and approaches.

4.6 Database of human factors issues

The following pages contain the 104 human factors issues. Two issues are presented per page, in numerical order using the reference numbers.
Level crossings: communication and user behaviour issues

Issue

Phone cabinet instructions

1. Level crossing type
   1.1 Protected
   1.2 Unprotected
   2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

2.1 Level crossing user type
   Pedestrian
   Motorcyclist
   Farmer
   Passenger
   Cyclist
   Horse rider
   Car driver
   Train driver
   Van driver
   Other
   HGV driver

2.2 Age
   0-10
   11-15
   16-20
   20-35
   35-50
   50-60

2.3 On own
   Individual
   Group
   Undefined

3. Description of issue / design feature

Unclear phone instructions provided within phone cabinets at UWC may result in users failing to communicate with the signaller.

4. User behaviour

Information should be provided within telephones cabinets at UWC, giving details to the user of how to call the signaller and information regarding the location of the crossing. However, any information not clearly conveying the correct procedure nor the necessary details required by the signaller to ascertain the location of the level crossing, may reduce the user’s willingness to carry out the required phone call.

Superfluous information, not required by the level crossing user, may also hinder the communication between the signaller and user. For example, the phonetic alphabet appears at some UWC+T. It forms part of the railway industry training to help convey safety critical information, but is not required to be learnt by UWC users.

5. Error type

Error
Violation

6. Sources of information

6.1 Interview source
6.2 Level crossing visit - areas
6.3 Document source
6.4 Document details

Level crossings: communication and user behaviour issues

Issue

Driver distractions

1. Level crossing type
   1.1 Protected
   1.2 Unprotected
   2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

2.1 Level crossing user type
   Pedestrian
   Motorcyclist
   Farmer
   Passenger
   Cyclist
   Horse rider
   Car driver
   Train driver
   Van driver
   Other
   HGV driver

2.2 Age
   0-10
   11-15
   16-20
   20-35
   35-50
   50-60

2.3 On own
   Individual
   Group
   Undefined

3. Description of issue / design feature

Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.

4. User behaviour

The attention of vehicle drivers when approaching the level crossing may be diverted because of visual distractions at the side of the road. Distractions may be seasonal, such as fun fairs or other similar events that may be held only once a year. Therefore visits to a crossing only a few times a year may not always identify these particular events.

Distractions at the side of the rail line may also impact on the attention of the train driver to observe the crossing.

5. Error type

Error
Violation

6. Sources of information

6.1 Interview source
6.2 Level crossing visit - areas
6.3 Document source
6.4 Document details
Level crossings: communication and user behaviour issues

6.1 Interview source

6.2 Level crossing visit - areas

6.3 Document source

6.4 Document details

Ref 03 Creation date 10.06.2004 Last modified 02.02.2005

Issue

Weather: Ice

1. Level Crossing type

2. User details

3. Description of issue / design feature

Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.

4. User behaviour

Icy weather conditions may affect the capability of vehicles to stop when required at the crossing. The effect on vehicle driver behaviour may also be affected by the presence of ice, such as not wanting to stop for the initial warning activation when they are close to the train line because of the risk of sliding forward onto the tracks.

Level crossings on 'B' roads may not be gritted during icy weather conditions and these may present a driving hazard to level crossing users.

The risks to users on foot when walking over the level crossing may also be increased, resulting in slips and falls.

5. Error type

6. Sources of information

7. Error type

8. Sources of information
Level crossings: communication and user behaviour issues

Issue

Frequency of trains

1. Level Crossing type
   1.1 Protected
   - AOC
   - MCB
   - Undefined

   1.2 Unprotected
   - MCB
   - Undefined

2. User details
   2.1 Level crossing user type
   - Pedestrian
   - Motorcyclist
   - Farmer
   - Passenger
   - Cyclist
   - Horsebox
   - Car driver
   - Train driver
   - Van driver
   - Other
   - HGV driver
   - Undefined

   2.2 Age
   - 0-10
   - 11-15
   - 16-20
   - 20-35
   - 35-50
   - 50-60
   - 60+

   2.3 On own
   - Individual
   - Group
   - Other

3. Description of issue / design feature

Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.

4. User behaviour

The risk compensation behaviour of users explains that users will behave less cautiously when they have a low perception of risk. User risk perception tends to be low where there are infrequent trains. A regular user’s expectations of not seeing a train are reinforced every time they use the crossing and a train does not pass, perceiving there to be a low chance of a train passing the next time they cross. This results in the user adapting their behaviour to this condition, such as behaving less cautiously.

UWC’s with accident history are associated with train lines that have low train frequencies. For example, at a train line with only two trains per week, the same regular user of the crossing has been hit twice by passing trains.

5. Error type

Error
Violation

6. Sources of information

6.1 Interview source
   - RAIL INDUSTRY
   - Network Rail
   - RSIB
   - HSE/HMRI
   - RPC
   - BTP
   - Others

6.2 Level crossing visit - areas
   - Milton Keynes
   - Doncaster
   - Hartford
   - Peterborough
   - Bedford
   - Redcar

6.3 Document source
   - RAIL INDUSTRY
   - Network Rail
   - RSIB
   - HSE/HMRI
   - RPC
   - BTP
   - Others

6.4 Document details
   - AIR/IS
   - TRL (rail)
   - TRL (road)
   - Independent
   - Non-UK

Level crossings: communication and user behaviour issues

Issue

Road junctions

1. Level Crossing type
   1.1 Protected
   - AOC
   - MCB
   - Undefined

   1.2 Unprotected
   - MCB
   - Undefined

2. User details
   2.1 Level crossing user type
   - Pedestrian
   - Motorcyclist
   - Farmer
   - Passenger
   - Cyclist
   - Horsebox
   - Car driver
   - Train driver
   - Van driver
   - Other
   - HGV driver
   - Undefined

   2.2 Age
   - 0-10
   - 11-15
   - 16-20
   - 20-35
   - 35-50
   - 50-60
   - 60+

   2.3 On own
   - Individual
   - Group
   - Other

3. Description of issue / design feature

Road junctions close to the level crossing may result in increased decision making and errors by vehicle drivers, and blocking-back over the crossing.

4. User behaviour

Roads that intersect with the vehicle driver’s road before or after the level crossing may increase the amount of visual information presented to the vehicle driver and therefore cause distraction. A vehicle driver’s primary focus of attention is likely to be on assessing the presence and determining the actions of other road users movement in and around the junctions, and secondly on the decisions and actions required at a level crossing. This reduction in observation of the level crossing and/or the activated warning system to concentrate on other vehicle drivers may increase their decision making errors at the crossing.

Right turns on the exit of the level crossing pose a particular problem for vehicles blocking-back over the crossing, especially at automatic crossings. While a vehicle is waiting to turn across the path of oncoming traffic, waiting traffic behind the turning vehicle, queue over the crossing. Although there are no reasons provided by research for vehicle drivers continuing to cross when there is insufficient clearance on the other-side, it is in our opinion that vehicle drivers are:

- Tailgating the vehicle in-front, to ensure they are already on the crossing, to avoid having to wait if the warning system is activated.
- Unaware of the dangers posed by waiting on the crossing.
- This reduction in observation of the level crossing and/or the activated warning system to concentrate on other vehicle drivers may increase their decision making errors at the crossing.

5. Error type

Error
Violation

6. Sources of information

6.1 Interview source
   - RAIL INDUSTRY
   - Network Rail
   - RSIB
   - HSE/HMRI
   - RPC
   - BTP
   - Others

6.2 Level crossing visit - areas
   - Milton Keynes
   - Doncaster
   - Hartford
   - Peterborough
   - Bedford
   - Redcar

6.3 Document source
   - RAIL INDUSTRY
   - Network Rail
   - RSIB
   - HSE/HMRI
   - RPC
   - BTP
   - Others

6.4 Document details
   - RAIL INDUSTRY
   - Network Rail
   - RSIB
   - HSE/HMRI
   - RPC
   - BTP
   - Others

Woburn Sands MCB: the road junction close to the crossing is used by local people and commercial traffic.
## Level crossings: communication and user behaviour issues

### Issue

#### Vehicle approach speed

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>2.1 Level crossing user type</td>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
<td></td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.3 On own</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of information</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
<tr>
<td>RRISB</td>
<td>Hertford</td>
<td>RRISB</td>
<td>RRISB</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td>RPC</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td>BTP</td>
</tr>
</tbody>
</table>

### User behaviour

- Road vehicle research has suggested that speed is a factor in road accidents and therefore, speed could also be considered as a contributor to vehicle drivers not stopping at level crossings. With increased speed, vehicle drivers will have less time to react to an activated warning at a level crossing. Greater numbers of red light violations have been recorded at a level crossing with road vehicle drivers passing through at a higher average speed. Vehicle drivers have responded to red light violations (or provide this reason when questioned to avoid potential prosecution) by stating their concern that stopping when travelling at higher speeds will result in a vehicle-vehicle collision at the level crossing, therefore they continue across the crossing which they perceive at the time to present a lesser risk to themselves.

5. Error type

- Error
- Violation

### Level crossings: communication and user behaviour issues

#### Age of drivers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>2.1 Level crossing user type</td>
<td>Violations at level crossings may be influenced by the age of the local population.</td>
<td></td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.3 On own</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of information</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
<tr>
<td>RRISB</td>
<td>Hertford</td>
<td>RRISB</td>
<td>RRISB</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td>RPC</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td>BTP</td>
</tr>
</tbody>
</table>

### User behaviour

- Local populations with higher numbers of a certain age-group may result in an increased number of violations or errors at level crossings. At a red light camera testing site, a disproportionate number of more elderly people continued to travel past the red warning lights. This behaviour has been associated with lower reaction speed and lack of visual awareness of their immediate surroundings, rather than being assigned to them purposefully crossing the activated warning system. High numbers of other age-groups within a geographical location may also contribute to increased violations or errors at level crossings.

5. Error type

- Error
- Violation

### Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
<tr>
<td>RRISB</td>
<td>Hertford</td>
<td>RRISB</td>
<td>RRISB</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td>RPC</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td>BTP</td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

**Issue**

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1 Protected</strong></td>
<td><strong>2.1 Level crossing user type</strong></td>
</tr>
<tr>
<td>AOCCL</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>AOCCL</td>
<td>Farmer</td>
</tr>
<tr>
<td>MCB</td>
<td>Passenger</td>
</tr>
<tr>
<td>ACRCL</td>
<td>Cyclist</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Horsedriver</td>
</tr>
<tr>
<td>ACRCL</td>
<td>Car driver</td>
</tr>
<tr>
<td>MCB</td>
<td>Train driver</td>
</tr>
<tr>
<td>AHB</td>
<td>Van driver</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Other</td>
</tr>
<tr>
<td>ABCL</td>
<td>HGV driver</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>1.2 Unprotected</strong></th>
<th><strong>2.2 Age</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>UWC/Monitor</td>
<td>0-10</td>
</tr>
<tr>
<td>UWC/Undefined</td>
<td>11-15</td>
</tr>
<tr>
<td>UWC/Monitor</td>
<td>16-20</td>
</tr>
<tr>
<td>UWC/Undefined</td>
<td>20-35</td>
</tr>
<tr>
<td>UWC/Unprotected</td>
<td>35-50</td>
</tr>
<tr>
<td>MCB/Unprotected</td>
<td>50-60</td>
</tr>
</tbody>
</table>

**3. Description of issue / design feature**

High-visibility clothing appears white on black & white monitors.

**4. User behaviour**

If track side workers are carrying out duties in the vicinity of a level crossing, they should phone the local signaliser and inform them of the type of work they are carrying out, and the area they are working within and for how long.

However, this does not always happen and can create problems for signalisers when checking the CCTV monitors if a level crossing is clear. The high-visibility clothing worn by track-side workers appears white when viewed on black and white monitors. If the signaliser has not been made aware of any work being carried out, the signaliser assumes the people to be members of the public standing track side.

It is now policy for track-side workers to wear hardhats, which can provide the signaller with an additional visual cue to help identify them from the general public. However, these are not worn consistently by all workers, and this can again create problems for distinguishing between workers and the general public.

Recent research has suggested the use of colour monitors as acceptable for use within signal boxes.

**5. Sources of information**

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCCL</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Doncaster</td>
<td>HSE/HMRI</td>
<td>OTHER</td>
</tr>
<tr>
<td>AOCCL</td>
<td>Hartford</td>
<td>Network Rail</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Peterborough</td>
<td>DfT (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>ACRCL</td>
<td>Bedford</td>
<td>Railway GS</td>
<td>Other dept.</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Redcar</td>
<td>Others</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

**Issue**

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1 Protected</strong></td>
<td><strong>2.1 Level crossing user type</strong></td>
</tr>
<tr>
<td>AOCCL</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>AOCCL</td>
<td>Farmer</td>
</tr>
<tr>
<td>MCB</td>
<td>Passenger</td>
</tr>
<tr>
<td>ACRCL</td>
<td>Cyclist</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Horsedriver</td>
</tr>
<tr>
<td>ACRCL</td>
<td>Car driver</td>
</tr>
<tr>
<td>MCB</td>
<td>Train driver</td>
</tr>
<tr>
<td>AHB</td>
<td>Van driver</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Other</td>
</tr>
<tr>
<td>ABCL</td>
<td>HGV driver</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>1.2 Unprotected</strong></th>
<th><strong>2.2 Age</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>UWC/Monitor</td>
<td>0-10</td>
</tr>
<tr>
<td>UWC/Undefined</td>
<td>11-15</td>
</tr>
<tr>
<td>UWC/Monitor</td>
<td>16-20</td>
</tr>
<tr>
<td>UWC/Undefined</td>
<td>20-35</td>
</tr>
<tr>
<td>UWC/Unprotected</td>
<td>35-50</td>
</tr>
<tr>
<td>MCB/Unprotected</td>
<td>50-60</td>
</tr>
</tbody>
</table>

**3. Description of issue / design feature**

HGV drivers form a disproportionately high number of incidents at level crossings.

**4. User behaviour**

A higher percentage of HGVs are involved in level crossings incidents than cars (total number of incidents from collisions with both trains and level crossing equipment), when compared with the proportion of cars using level crossings and road miles travelled.

It has been proposed in a report on HGV accidents at level crossings that this may be due to the following.

- The size of the vehicles; they have less room for error when compared to cars.
- They may not be reacting to the activation of the crossing warning system in sufficient time. The HGV study proposed they may attempt to traverse the crossing once the barriers have already started to descend, suggesting that it could be do with the driver’s awareness of their vehicle’s poorer braking performance, and therefore considering it safer to continue.

**5. Sources of information**

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCCL</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Doncaster</td>
<td>HSE/HMRI</td>
<td>OTHER</td>
</tr>
<tr>
<td>AOCCL</td>
<td>Hartford</td>
<td>Network Rail</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Peterborough</td>
<td>DfT (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>ACRCL</td>
<td>Bedford</td>
<td>Railway GS</td>
<td>Other dept.</td>
</tr>
<tr>
<td>MCB/Monitor</td>
<td>Redcar</td>
<td>Others</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

Dockhills CCTV level crossing (& Moathills in background): provides access from a lorry park to a main road. The crossings have been reviewed and changes made to accommodate for the large volumes of HGV’s that use these on a daily basis.
### Level crossings: communication and user behaviour issues

**Issue**

**1. Level Crossing type**

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCEbctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>C</td>
</tr>
<tr>
<td>MG</td>
<td>F/W</td>
</tr>
<tr>
<td>MCB</td>
<td>C</td>
</tr>
</tbody>
</table>

**2. User details**

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td>Group</td>
</tr>
<tr>
<td>Horse rider</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td>Car driver</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>Train driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**3. Description of issue / design feature**

Pedestrians and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.

**4. User behaviour**

Vehicular level crossings without pedestrian bridges influences the risk taking behaviour of both pedestrians and train passengers.

It has been observed that pedestrians and passengers approaching the level crossing, on seeing and/or hearing the activation of the level crossing warning system, rush across the crossing to avoid having to wait. Users at crossing without bridges are more likely to commit violations by attempting to run across the crossing, aware that they have no alternative means of crossing during the activated warning. At crossings with bridges, users are able to use an alternative access for crossing the railway lines.

Crossings without bridges, used by train passengers to gain access to other platforms at a nearby station may undertake particularly risky behaviour to avoid missing their train. The activated warning informs the passenger that a train is approaching and they continue to cross to ensure they catch their train.

**5. Error type**

- Error
- Violation

---

**Level crossings: communication and user behaviour issues**

**Issue**

**1. Level Crossing type**

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCEbctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>C</td>
</tr>
<tr>
<td>MG</td>
<td>F/W</td>
</tr>
<tr>
<td>MCB</td>
<td>C</td>
</tr>
</tbody>
</table>

**2. User details**

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td>Group</td>
</tr>
<tr>
<td>Horse rider</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td>Car driver</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>Train driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**3. Description of issue / design feature**

Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.

**4. User behaviour**

The supposed regularity of trains passing a point at a known time is being used by level crossing users to make judgments of when to cross. Users are assuming trains to pass a crossing at a particular point in time, thus believing the crossing to be safe at certain times. Many users also believe the timetable to be ‘set in stone’, thus allowing them to make an accurate assessment of when they should and should not cross. However, users fail to consider the variations in train schedules and that many trains, such as freight, are not scheduled under passenger timetables.

The research refers to a landowner who retains a train timetable within his tractor cab to allow him to make ‘safe’ assessments of when he should cross. Other research also identified 4% of users considered a crossing to be ‘safe’ because they were knowledgeable of the train timetable.

GI/GN7611 indicates that the regularity of trains to be a factor in posing a high risk to users, due to “the rarity of them encountering a train and the reduced vigilance that they may therefore demonstrate in crossing”.

**5. Error type**

- Error
- Violation
### Level crossings: communication and user behaviour issues

#### Issue at a level crossing

#### Group - 1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQCL</td>
<td>MCBcvw</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>UWC</td>
</tr>
<tr>
<td>AHB</td>
<td>UWC/MWL</td>
</tr>
<tr>
<td>MG</td>
<td>OC</td>
</tr>
<tr>
<td>MCB</td>
<td>FF/MW</td>
</tr>
<tr>
<td>RPC</td>
<td>FC</td>
</tr>
</tbody>
</table>

#### Group - 2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Passenger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse rider</td>
<td>16-20</td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>12-21</td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

#### Group - 3. Description of issue / design feature

#### Group - 4. User behaviour

The nature of a group of people will mean they look and listen less at their surroundings and be more concerned with the dynamics of the group. This may result in the first few of a group of walkers crossing carefully, but the remaining group members continuing to progress over the railway line without checking for oncoming trains. This may be a particular problem at footpath and bridleway crossings on routes used often by ramblers.

Young people in groups also exhibit more risky behaviour. A young person’s perception of risk tends to be one of a ‘risk adopter’, however, although most young people will not engage in extreme danger, their perception of risk is sufficient for them to behave dangerously, especially when provided with opportunities.

Many of the behaviours exhibited by young people are driven by a particular motivation (an opportunity), for example, not being picked upon or to just be accepted by others. When in groups, this type of motivation can further influence young people to undertake very risky behaviours, more so than when on their own.

#### Group - 5. Error type

#### Group - 6. Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td></td>
<td>Doncaster</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hartford</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peterborough</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bedford</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Redcar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Level crossings: communication and user behaviour issues

#### Issue at a level crossing

#### Group - 1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQCL</td>
<td>MCBcvw</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>UWC</td>
</tr>
<tr>
<td>AHB</td>
<td>UWC/MWL</td>
</tr>
<tr>
<td>MG</td>
<td>OC</td>
</tr>
<tr>
<td>MCB</td>
<td>FF/MW</td>
</tr>
<tr>
<td>RPC</td>
<td>FC</td>
</tr>
</tbody>
</table>

#### Group - 2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Passenger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse rider</td>
<td>16-20</td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td>12-21</td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

#### Group - 3. Description of issue / design feature

#### Group - 4. User behaviour

Vehicle driver violations may be associated with the time of day. The rate of vehicle incidents increases at crossings during the morning and evening rush-hours. Vehicle drivers needing to arrive somewhere on time (e.g., meeting) may consider the risks of passing through the activated warning lights to be lower than the perceived risks associated with being late. This may be further compounded with the general increase in road traffic during rush-hours and at the beginning and end of the school day.

Increases in vehicle driver violations were also detected during the later afternoon hours and is suggested as being associated with the school-run (v/w/e). Parents on multi-school runs, prior to driving to work is also considered a factor in risk taking behaviour, because of the need to drive to various locations within a short period of time. Crossings used as access routes for the school-run, as well as those in close proximity to the school may have higher number of violations as a result.

Red light violations are also high for some sites at midday. This may be due to people trying to fit in activities within their lunch-hour. Factories and other similar industrial working environments have specific staff working hours, with workers arriving and leaving on-mass. This may result in violations at crossings nearby because of the large volumes of traffic using the crossing at specific times.

#### Group - 5. Error type

#### Group - 6. Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td></td>
<td>Doncaster</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Network Rail</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSE/HMRI</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RPC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BTP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Issue at a level crossing

5. Error type

Error
Violation

Level crossings: communication and user behaviour issues

Issue at a level crossing

1. Level Crossing type

1.1 Protected
1.2 Unprotected

2. User details

2.1 Level crossing user type

2.2 Age

2.3 On own

3. Description of issue / design feature

Vehicle drivers approaching the level crossing are presented with an array of standard level crossing information and warning signs. However, superfluous information and roadside structures (both rail and other authorities) in the vehicle driver’s visual field may reduce the impact of the level crossing information.
### Level crossings: communication and user behaviour issues

#### Issue

**Understanding of warning lights**

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
<th>3. Description of issue / design feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>2.1 Level crossing user type</td>
<td>3. Onset of the amber light of the activated warning system lead to various vehicle driver behaviours at level crossings.</td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Pedestrian</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td>Motorcyclist</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>0-10</td>
<td></td>
</tr>
<tr>
<td>UWC</td>
<td>Farmer</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>11-15</td>
<td></td>
</tr>
<tr>
<td>UWC/ML</td>
<td>Passenger</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>16-20</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Cyclist</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td>Horse rider</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Car driver</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td>Train driver</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Van driver</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td>HGV driver</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

#### User behaviour

Not all vehicle drivers fully understand the instruction given and the required user behaviour to the onset of an amber light. Users understanding of the steady amber at road traffic lights and at level crossing lights was compared. Higher numbers of users (slightly more for level crossings) interpreted the required action for an amber light incorrectly for both light warning systems.

There is also evidence that some users incorrectly determine the required action upon the onset of the red lights at a level crossing. Just over 50% of users correctly confirmed the required action at the onset of a red light compared to all users for road traffic lights. Not all vehicle drivers fully understand the instruction given and the required user behaviour to the onset of an amber light.

The wigwag light system also used at fire stations to stop road traffic and allow the fire pumps to be driven onto the road, are routinely ignored by vehicle drivers.

#### Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>Error</td>
</tr>
<tr>
<td>BTP</td>
<td>Doncaster</td>
<td>HSE/HERMI</td>
<td>Error</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Hartford</td>
<td>Network Rail</td>
<td>Error</td>
</tr>
<tr>
<td>RSSB</td>
<td>Peterborough</td>
<td>DIT (rail)</td>
<td>Error</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bedford</td>
<td>DIT (road)</td>
<td>Error</td>
</tr>
<tr>
<td>RPC</td>
<td>Redcar</td>
<td>Independent</td>
<td>Error</td>
</tr>
<tr>
<td>BTP</td>
<td>OTHER</td>
<td>Others</td>
<td>Error</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Level crossings: communication and user behaviour issues

#### Issue

**Closure time**

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
<th>3. Description of issue / design feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>2.1 Level crossing user type</td>
<td>3. The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Pedestrian</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td>Motorcyclist</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>0-10</td>
<td></td>
</tr>
<tr>
<td>UWC</td>
<td>Farmer</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>11-15</td>
<td></td>
</tr>
<tr>
<td>UWC/ML</td>
<td>Passenger</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>16-20</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Cyclist</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td>Horse rider</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Car driver</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td>Train driver</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>AOCIL</td>
<td>Van driver</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

#### User behaviour

Vehicle drivers consider the warning time of the activated system (required to allow for safety margins) to be far too long. Vehicle drivers at automatic crossings also overestimate the time they are required to wait. Reasons given for their actions, such as ‘having an appointment to make’ were time related. The greater the time delay, the more risky behaviour of level crossing users. The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.

In particular, this overestimation of waiting time has been found to be a factor in why users cross during the red light phase at UWC/MLW.
Level crossings: communication and user behaviour issues

Issue at a level crossing

1. Level Crossing type

1.1 Protected

AOCL  MCB

1.2 Unprotected

AOCR  AHB  MG  MCB

2. User details

2.1 Level crossing user type

Pedestrian  Farmer  Cyclist  Car driver  Van driver  HGV driver

2.2 Age

Motorcyclist  Passenger  1-10  11-15  16-20  20-35  35-50  50-60

2.3 On own

Undefined  Individual  Group  Other

Open gates

UWC  UWC/T  UWC/MWL

Crossing type 2. User details

Pedestrian  Motorcyclist  Farmer  Passenger  Cyclist  Horsedr  Train driver  Other

Open gates are provided closed across the road and open away from the railway lines. Footpath and Bridleway crossings have a variety of gates fitted that are closed across the paths on the approach to both sides of the crossing.

UWC gates are provided closed across the road and open away from the railway lines. Footpath and Bridleway crossings have a variety of gates fitted that are closed across the paths on the approach to both sides of the crossing.

Open gates increases the risk to approaching users.

Second audible warning tone is not detected and/or understood by level crossing users.

5. Error type

Error  Violation

Sources of information

6.1 Interview source

RAIL INDUSTRY  Network Rail  Doncaster  RAIL INDUSTRY  RAIL INDUSTRY  RAIL INDUSTRY

6.2 Level crossing visit - areas

Milton Keynes  Hertford  Peterborough  Redcar

6.3 Document source

ROAD INDUSTRY  Network Rail  RAIL INDUSTRY  GOVERNMENT  TRL (rail)

6.4 Document details

DfT (rail)  Independent  Railway GS  Non-UK  hu/hu

Issue at a level crossing

1. Level Crossing type

1.1 Protected

AOCL  MCB

1.2 Unprotected

AOCR  AHB  MG  MCB

2. User details

2.1 Level crossing user type

Pedestrian  Motorcyclist  Farmer  Passenger  Cyclist  Horsedr  Train driver  Other

2.2 Age

Motorcyclist  Passenger  1-10  11-15  16-20  20-35  35-50  50-60

2.3 On own

Undefined  Individual  Group  Other

Audible alarm

UWC  UWC/T  UWC/MWL

Crossing type 2. User details

Pedestrian  Motorcyclist  Farmer  Passenger  Cyclist  Horsedr  Train driver  Other

Second audible warning tone is not detected and/or understood by level crossing users.

5. Error type

Error  Violation

Sources of information

6.1 Interview source

RAIL INDUSTRY  Network Rail  Doncaster  RAIL INDUSTRY  RAIL INDUSTRY  RAIL INDUSTRY

6.2 Level crossing visit - areas

Milton Keynes  Hertford  Peterborough  Redcar

6.3 Document source

ROAD INDUSTRY  Network Rail  RAIL INDUSTRY  GOVERNMENT  TRL (rail)

6.4 Document details

DfT (rail)  Independent  Railway GS  Non-UK  hu/hu
Level crossings: communication and user behaviour issues

**Issue**

**6.1 Interview source**

Level crossings: communication and user behaviour issues

**6.2 Level crossing visit - areas**

Crossing type 2. User details

*2.1 Level crossing user type*

- Pedestrian
- Motorcyclist
- Farmer
- Passenger
- Cyclist
- Horse rider
- Car driver
- Train driver
- Van driver
- Other
- HGV driver

*2.2 Age*

- 0-10
- 11-15
- 16-20
- 20-35
- 35-50
- 50-60

*2.3 On own*

- Individual
- Group
- Other

**3. Description of issue / design feature**

Unprotected crossings (without MWL) used during the hours of darkness may lead to increased decision making errors by crossing users.

**4. User behaviour**

The speed of an object can be judged by assessing the moving object against the background. However, during the hours of darkness, the background is not visible against the moving object and therefore users lose this important visual information cue for assessing speed, resulting in increased decision making errors by level crossing users.

Farmers often continue to use UWC’s during the hours of darkness, especially during harvesting time. The context of working during darkness and under tight timescales to transport produce from their farms could impact on the behaviour of the farmer to use the crossing safely.

Issue 25 “Users perception of train speed and distance” addresses the use of an incorrect mental model of train speed and distance as a factor in why level crossing users may cross during an unsafe period of time. The impact of darkness in impairing a user to assess speed, resulting in increased decision making errors by level crossing users.

**5. Error type**

- Error
- Violation

**6. Sources of information**

**6.1 Interview source**

<table>
<thead>
<tr>
<th>Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>st/au</td>
</tr>
<tr>
<td>Network Rail</td>
<td>ROAD INDUSTRY</td>
<td>GOVERNMENT</td>
<td></td>
</tr>
<tr>
<td>RSSB</td>
<td>AHB</td>
<td>Network Rail</td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bus drivers</td>
<td>DIT (rail)</td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td>ABCL</td>
<td>DIT (road)</td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td>MCB</td>
<td>Independent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Railway GS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other dept.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-UK</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Level crossings: communication and user behaviour issues**

**Issue**

**3. Description of issue / design feature**

The effectiveness of flashing lights is limited by veiling glare, limited light output and their position.

**4. User behaviour**

The combined effects of sun reflection and the use of limited light output in the warning lights may contribute to vehicle drivers and other users missing the activated warning system at level crossings. At automatic open crossings, the lack of any barrier dropping means vehicle drivers and others may continue to pass through the lights much later during the activated warning time.

Although it should be noted, of the drivers who stated they were unaware of the crossing when they had run a red light, only 1% gave the sun as a reason for impairing their vision (UK based research). However, in non-UK research the sun as an affect on accidents at crossings is an established cause. In Scotland, the affects of low sun in winter present a particular problem, especially at open crossings. Therefore the issue of the sun and its effect on the flashing warning lights remains a precursor for vehicle drivers unintentionally passing the activated warning system.

The conspicuity of warning lights is improved with the use of the red and white chequered board surround, located behind the lights. The previous grey back boarding remains legal, but replacement back boards are of the new style.

**5. Error type**

- Error
- Violation

**6. Sources of information**

**6.1 Interview source**

<table>
<thead>
<tr>
<th>Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>st/au</td>
</tr>
<tr>
<td>Network Rail</td>
<td>ROAD INDUSTRY</td>
<td>GOVERNMENT</td>
<td></td>
</tr>
<tr>
<td>RSSB</td>
<td>AHB</td>
<td>Network Rail</td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bus drivers</td>
<td>DIT (rail)</td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td>ABCL</td>
<td>DIT (road)</td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td>MCB</td>
<td>Independent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Railway GS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other dept.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-UK</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Issue

Sunlight strobing

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCBCTV</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>AHB</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
</tr>
</tbody>
</table>

2. User details

2.1 Level crossing user type

<table>
<thead>
<tr>
<th>2.1.1 Pedestrian</th>
<th>2.1.2 Motorcyclist</th>
<th>2.1.3 Cyclist</th>
<th>2.1.4 Car driver</th>
<th>2.1.5 Van driver</th>
<th>2.1.6 HGV driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15</td>
<td>0-10</td>
<td>11-15</td>
<td>16-20</td>
<td>20-35</td>
<td>35-50</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.

4. User behaviour

Trees along the sides of the road, combined with sunlight passing through the trees can provide a strobe lighting affect along the road. A vehicle driver approaching a level crossing is subjected to a broken line of shadow and light, which may affect the vehicle driver’s detection of objects ahead of them. This may result in the vehicle driver continuing to cross over a level crossing, including those with activated warning lights. This is a particular problem at open crossings, those with and without activated warning lights because of the lack of any physical barrier across the road to act as a final warning cue of the presence of a crossing.

5. Sources of information

6. Error type

Error
Violation

Level crossings: communication and user behaviour issues

Issue

Half barrier

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCBCTV</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>AHB</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
</tr>
</tbody>
</table>

2. User details

2.1 Level crossing user type

<table>
<thead>
<tr>
<th>2.1.1 Pedestrian</th>
<th>2.1.2 Motorcyclist</th>
<th>2.1.3 Cyclist</th>
<th>2.1.4 Car driver</th>
<th>2.1.5 Van driver</th>
<th>2.1.6 HGV driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15</td>
<td>0-10</td>
<td>11-15</td>
<td>16-20</td>
<td>20-35</td>
<td>35-50</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Automatic half barriers facilitate vehicle drivers to undertake risk taking behaviour.

4. User behaviour

Automatic half barriers are normally kept in the raised position and when lowered, the barriers extend only across the entrances to the crossing. The exits from the crossing are left clear and therefore allow for vehicle drivers to clear the crossing.

Although half barriers increase the observance by drivers of the automatic warning system, they introduce another undesirable risk taking behaviour, known as zigzagging. The vehicle driver not wanting to wait at the level crossing, weaves around the first barrier onto the other side of the road and exits via the open gate side.

An earlier report stated that half of all accidents at AHB’s are due to the drivers violating user procedures and zigzagging around the barriers (pi/re, st/au).

5. Error type

Error
Violation

6. Sources of information
Level crossings: communication and user behaviour issues

Issue

1. Level Cross type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC, MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Group</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Group</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td>Horserider</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td>Car driver</td>
<td>Undefined</td>
<td>Group</td>
</tr>
<tr>
<td>Train driver</td>
<td>Undefined</td>
<td>Group</td>
</tr>
<tr>
<td>Van driver</td>
<td>Undefined</td>
<td>Group</td>
</tr>
<tr>
<td>Other</td>
<td>Undefined</td>
<td>Group</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Train speed and distance is underestimated by users, which may result in increased decision making errors by users at level crossings.

4. User behaviour

The speed at which trains travel and how far it takes for a train to stop is vastly underestimated by the general public. There are various perceptual problems that may increase the decision making errors of users at level crossings.

Large objects appear to move more slowly than smaller objects travelling at the same speed.

The public are using an incorrect mental model of road vehicle movement for estimating train speed, distance travelled over time and potential stopping distances. This may increase the decision making errors of users when crossing both protected and unprotected level crossings.

Users in vehicles are to some extent ‘shielded’ from the senses normally evoked from a high speed passing train. A greater understanding of train speed and its size is enhanced when standing close to a passing train.

5. Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hartford</td>
<td>RSSB</td>
<td>RSSB</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>Other</td>
<td>Other</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>Non-UK</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Foliage

1. Level Cross type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC, MCB</td>
<td>Defined</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Group</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Group</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td>Horserider</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td>Car driver</td>
<td>Defined</td>
<td>Group</td>
</tr>
<tr>
<td>Train driver</td>
<td>Defined</td>
<td>Group</td>
</tr>
<tr>
<td>Van driver</td>
<td>Defined</td>
<td>Group</td>
</tr>
<tr>
<td>Other</td>
<td>Defined</td>
<td>Group</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Defined</td>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.

4. User behaviour

Foliage that has been left to overgrow on the approach to the level crossing covers the information signs and removes the initial warning cue to vehicle drivers. Vehicle drivers have less time to react and respond accordingly through changing their driving behaviour. This issue is further compounded when the level crossing is positioned on the bend in a road or on a high speed road, as the vehicle driver has even less time to respond to the required change in driving behaviour.

This issue is also applicable to train drivers. Foliage on the lineside may impact on the train driver from obtaining a sufficient view while on the approach to a crossing, of any information, objects or people on the crossing.

5. Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hartford</td>
<td>RSSB</td>
<td>RSSB</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>Other</td>
<td>Other</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>Non-UK</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Issue

Harvesting time

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC/L</td>
<td>MCB/ctv</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
<tr>
<td>AOCR</td>
<td></td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>UnDefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>Horse rider</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

The effectiveness of warning lights is influenced by their position.

4. User behaviour

If a user is unable to clearly see the warning lights at a level crossing, from either a position of safety at the crossing, or a clear line of sight from their direction of approach, this may result in the user moving into an unsafe area to read the lights or cross without taking account of the warning information.

The 10cm diameter of the red and green miniature warning lights at UWC were found to be of adequate size for being discerned from a distance of up to 15m. However, it was suggested that an ‘alternative’ to MWL’s be considered if they were to positioned on the far side of the tracks and the total distance across the tracks was greater than 15m. There is currently on-going discussions within NWR to address this issue.

The position of road vehicle wigwag lights is also critical for providing sufficient time for approaching vehicle drivers to observe and respond to the lights. Their position should accommodate the approach route of all types of road vehicles and take account of any internal vehicle features that may reduce the vehicle driver’s detection of the lights. Poorly positioned lights may reduce the time available for the vehicle driver to respond accordingly.

5. Error type

Error type

Error
Violation

Sources of information

6.1 Interview source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>Network Rail</th>
<th>ROAD INDUSTRY</th>
<th>AOCR</th>
<th>AOC/L</th>
<th>MCB/ctv</th>
</tr>
</thead>
</table>

6.2 Level crossing visit - areas

<table>
<thead>
<tr>
<th>Milton Keynes</th>
<th>Doncaster</th>
<th>Hertford</th>
<th>Peterborough</th>
<th>Bedford</th>
<th>Redcar</th>
</tr>
</thead>
</table>

6.3 Document source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>HSE/HMRI</th>
<th>GOVERNMENT</th>
<th>TRL (rail)</th>
<th>Independent</th>
</tr>
</thead>
</table>

6.4 Document details

<table>
<thead>
<tr>
<th>OTHER</th>
<th>OTHER</th>
<th>OTHER</th>
<th>OTHER</th>
</tr>
</thead>
</table>

Leveel crossings: communication and user behaviour issues

Issue

Position of warning lights

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC/L</td>
<td>MCB/ctv</td>
</tr>
<tr>
<td>AOC/L</td>
<td>Undefined</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td></td>
</tr>
<tr>
<td>AHB</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
<tr>
<td>AOCR</td>
<td></td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>UnDefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>Horse rider</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

The effectiveness of warning lights is influenced by their position.

4. User behaviour

If a user is unable to clearly see the warning lights at a level crossing, from either a position of safety at the crossing, or a clear line of sight from their direction of approach, this may result in the user moving into an unsafe area to read the lights or cross without taking account of the warning information.

The 10cm diameter of the red and green miniature warning lights at UWC were found to be of adequate size for being discerned from a distance of up to 15m. However, it was suggested that an ‘alternative’ to MWL’s be considered if they were to positioned on the far side of the tracks and the total distance across the tracks was greater than 15m. There is currently on-going discussions within NWR to address this issue.

The position of road vehicle wigwag lights is also critical for providing sufficient time for approaching vehicle drivers to observe and respond to the lights. Their position should accommodate the approach route of all types of road vehicles and take account of any internal vehicle features that may reduce the vehicle driver’s detection of the lights. Poorly positioned lights may reduce the time available for the vehicle driver to respond accordingly.

5. Error type

Error type

Error
Violation

Sources of information

6.1 Interview source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>Network Rail</th>
<th>ROAD INDUSTRY</th>
<th>AOCR</th>
<th>AOC/L</th>
<th>MCB/ctv</th>
</tr>
</thead>
</table>

6.2 Level crossing visit - areas

<table>
<thead>
<tr>
<th>Milton Keynes</th>
<th>Doncaster</th>
<th>Hertford</th>
<th>Peterborough</th>
<th>Bedford</th>
<th>Redcar</th>
</tr>
</thead>
</table>

6.3 Document source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>HSE/HMRI</th>
<th>GOVERNMENT</th>
<th>TRL (rail)</th>
<th>Independent</th>
</tr>
</thead>
</table>

6.4 Document details

<table>
<thead>
<tr>
<th>OTHER</th>
<th>OTHER</th>
<th>OTHER</th>
<th>OTHER</th>
</tr>
</thead>
</table>

Level crossings: communication and user behaviour issues

Issue

Position of warning lights

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC/L</td>
<td>MCB/ctv</td>
</tr>
<tr>
<td>AOC/L</td>
<td>Undefined</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td></td>
</tr>
<tr>
<td>AHB</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
<tr>
<td>AOCR</td>
<td></td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>UnDefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>Horse rider</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

The effectiveness of warning lights is influenced by their position.

4. User behaviour

If a user is unable to clearly see the warning lights at a level crossing, from either a position of safety at the crossing, or a clear line of sight from their direction of approach, this may result in the user moving into an unsafe area to read the lights or cross without taking account of the warning information.

The 10cm diameter of the red and green miniature warning lights at UWC were found to be of adequate size for being discerned from a distance of up to 15m. However, it was suggested that an ‘alternative’ to MWL’s be considered if they were to positioned on the far side of the tracks and the total distance across the tracks was greater than 15m. There is currently on-going discussions within NWR to address this issue.

The position of road vehicle wigwag lights is also critical for providing sufficient time for approaching vehicle drivers to observe and respond to the lights. Their position should accommodate the approach route of all types of road vehicles and take account of any internal vehicle features that may reduce the vehicle driver’s detection of the lights. Poorly positioned lights may reduce the time available for the vehicle driver to respond accordingly.

5. Error type

Error type

Error
Violation

Sources of information

6.1 Interview source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>Network Rail</th>
<th>ROAD INDUSTRY</th>
<th>AOCR</th>
<th>AOC/L</th>
<th>MCB/ctv</th>
</tr>
</thead>
</table>

6.2 Level crossing visit - areas

<table>
<thead>
<tr>
<th>Milton Keynes</th>
<th>Doncaster</th>
<th>Hertford</th>
<th>Peterborough</th>
<th>Bedford</th>
<th>Redcar</th>
</tr>
</thead>
</table>

6.3 Document source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>HSE/HMRI</th>
<th>GOVERNMENT</th>
<th>TRL (rail)</th>
<th>Independent</th>
</tr>
</thead>
</table>

6.4 Document details

<table>
<thead>
<tr>
<th>OTHER</th>
<th>OTHER</th>
<th>OTHER</th>
<th>OTHER</th>
</tr>
</thead>
</table>
Level crossings: communication and user behaviour issues

Issue

Quantity of information

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCIC</td>
<td>MCB/CCTV</td>
</tr>
<tr>
<td>AOCIC</td>
<td>MCB</td>
</tr>
<tr>
<td>AOCIC</td>
<td>AOCIC</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>MG</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>0-10</td>
<td>Group</td>
</tr>
<tr>
<td>Cyclist</td>
<td>20-35</td>
<td>Undefined</td>
</tr>
<tr>
<td>Car driver</td>
<td>35-50</td>
<td>Undefined</td>
</tr>
<tr>
<td>Train driver</td>
<td>50-60</td>
<td>Undefined</td>
</tr>
<tr>
<td>Van driver</td>
<td>0-10</td>
<td>Group</td>
</tr>
<tr>
<td>Other</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>HGV driver</td>
<td>0-10</td>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

The quantity of signage information that can be read and understood decreases with road speed.

4. User behaviour

A road transport study provided a minimum exposure time required (based upon a simple calculation using the amount of words and driver speed) for drivers of vehicles to register and understand the information provided by a vehicle activated warning system.

Large quantities of information on signs with an inadequate time for users to register and interpret the information may result in two user behaviours:

1. The time it takes the user to read all of the information and respond accordingly to its instructions, they have proceeded past the sign and decide to ignore its requirements and continue across the crossing; or

2. The user does not have sufficient time to comprehend all of the information and makes a judgement that it does not apply to them anyway.

6. Sources of information

6.1 Interview source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>Network Rail</th>
<th>Road INDUSTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSSLB</td>
<td>Other</td>
<td>OTHER</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bus drivers</td>
<td>TRL (road)</td>
</tr>
<tr>
<td>RRC</td>
<td>DfT (road)</td>
<td>OTHER</td>
</tr>
<tr>
<td>RBP</td>
<td>TRL (road)</td>
<td>OTHER</td>
</tr>
<tr>
<td>MCB</td>
<td>TRL (road)</td>
<td>OTHER</td>
</tr>
</tbody>
</table>

6.2 Level crossing visit - areas

<table>
<thead>
<tr>
<th>Milton Keynes</th>
<th>Doncaster</th>
<th>Hertford</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterborough</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
<tr>
<td>Redcar</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
</tbody>
</table>

6.3 Document source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSE/HMRI</td>
<td>TRL (road)</td>
</tr>
</tbody>
</table>

6.4 Document details

<table>
<thead>
<tr>
<th>Milton Keynes</th>
<th>Doncaster</th>
<th>Hertford</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterborough</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
<tr>
<td>Redcar</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Issue

Trespassing on rail structures

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCIC</td>
<td>MCB/CCTV</td>
</tr>
<tr>
<td>AOCIC</td>
<td>MCB</td>
</tr>
<tr>
<td>AOCIC</td>
<td>AOCIC</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>MG</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>0-10</td>
<td>Group</td>
</tr>
<tr>
<td>Cyclist</td>
<td>20-35</td>
<td>Undefined</td>
</tr>
<tr>
<td>Car driver</td>
<td>35-50</td>
<td>Undefined</td>
</tr>
<tr>
<td>Train driver</td>
<td>50-60</td>
<td>Undefined</td>
</tr>
<tr>
<td>Van driver</td>
<td>0-10</td>
<td>Group</td>
</tr>
<tr>
<td>Other</td>
<td>16-20</td>
<td>Unundefined</td>
</tr>
<tr>
<td>HGV driver</td>
<td>0-10</td>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.

4. User behaviour

Level crossings can be perceived by some people as an accessible point to the railway infrastructure. Objects located at level crossings, that resemble day-to-day objects or create opportunities for use may increase the likelihood of children or young people playing in and around level crossings.

The position of the crossing close to housing areas, schools and other places where children and young people may utilise the crossing, may also contribute to increased trespassing.

Youth perception of risk tends to be one of a ‘risk adopter’. Although most young people will not engage in extreme danger, their perception of risk is sufficient for them to behave dangerously, especially when provided with opportunities.

6. Sources of information

6.1 Interview source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>Network Rail</th>
<th>Road INDUSTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSSLB</td>
<td>Other</td>
<td>OTHER</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bus drivers</td>
<td>TRL (road)</td>
</tr>
<tr>
<td>RRC</td>
<td>TRL (road)</td>
<td>OTHER</td>
</tr>
<tr>
<td>RBP</td>
<td>TRL (road)</td>
<td>OTHER</td>
</tr>
<tr>
<td>MCB</td>
<td>TRL (road)</td>
<td>OTHER</td>
</tr>
</tbody>
</table>

6.2 Level crossing visit - areas

<table>
<thead>
<tr>
<th>Milton Keynes</th>
<th>Doncaster</th>
<th>Hertford</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterborough</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
<tr>
<td>Redcar</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
</tbody>
</table>

6.3 Document source

<table>
<thead>
<tr>
<th>RAIL INDUSTRY</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSE/HMRI</td>
<td>TRL (road)</td>
</tr>
</tbody>
</table>

6.4 Document details

<table>
<thead>
<tr>
<th>Milton Keynes</th>
<th>Doncaster</th>
<th>Hertford</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterborough</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
<tr>
<td>Redcar</td>
<td>Bedford</td>
<td>Redcar</td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Issue

Location near rail stations

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>MCBCctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>ABCL</td>
</tr>
<tr>
<td>AHB</td>
<td>MG</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horserider</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Level crossings adjacent to rail stations influence the risk taking behaviour of vehicle drivers and other users.

4. User behaviour

Level crossings located adjacent to a rail station can increase the length of time the warning system is activated, and therefore require users to wait for longer periods of time at the crossing. This is due to slower trains pulling into and out of the station in close proximity from either direction and the interval between the trains being too short to allow the warning system to be deactivated.

At level crossings located next to a rail station, users estimated their waiting time to be much higher than at crossings not located in the vicinity of a station. It is suggested that users (for example regular, local users who are aware of the increased waiting times) may have been encouraged to violate the warning system because of the potential for a prolonged delay to their journey.

5. Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>Error</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Error</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hartford</td>
<td>RSSB</td>
<td>Error</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>HSE/HMRI</td>
<td>Error</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td>Error</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td>Error</td>
</tr>
<tr>
<td>Others</td>
<td>Other</td>
<td>Others</td>
<td>Error</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Issue

Train speeds

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>MCBCctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>ABCL</td>
</tr>
<tr>
<td>AHB</td>
<td>MG</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horserider</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Low train speeds may increase the risk taking behaviour of users.

4. User behaviour

Circumstances which present a lower perceived risk, often result in changes to a user’s behaviour. It has been established that users perceive UWC and footpath crossings to be safer when trains are slower. In this case, the users are responding to the perceived low level of risk presented by slower trains by behaving less cautiously.

At open crossings with slow moving trains, vehicle drivers (and pedestrians) may be inclined to think “I can beat the train”. By being able to edge forward past a point of safety and look along the railway line, they may believe they have ample time to make a safe crossing in front of a slower train. This behaviour may also be prevalent at half barrier crossings, where users may zigzag around the barrier.

Railway Group Standard GI/GN7611 identifies “maximum train speed” as a factor for consideration within risk assessments at level crossings. However, slow train speeds are also a factor because of the effect it may have upon the user’s perception of risk.

5. Error type

<table>
<thead>
<tr>
<th>Error type</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>Violation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>Error</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Error</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hartford</td>
<td>RSSB</td>
<td>Error</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>HSE/HMRI</td>
<td>Error</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td>Error</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td>Error</td>
</tr>
<tr>
<td>Others</td>
<td>Other</td>
<td>Others</td>
<td>Error</td>
</tr>
</tbody>
</table>

St. Margarets CCTV: this crossing is positioned next to the station. The barrier downtime is lengthy, especially during the evening rush-hour when there is an increase in train traffic.
## Level crossings: communication and user behaviour issues

### Issue

#### Sighting distance

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>protected</td>
<td>user details</td>
</tr>
<tr>
<td>AOC</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>MCB</td>
<td>Farmer</td>
</tr>
<tr>
<td>AOCR</td>
<td>Passenger</td>
</tr>
<tr>
<td>ABCL</td>
<td>Cyclist</td>
</tr>
<tr>
<td>AHB</td>
<td>Horse rider</td>
</tr>
<tr>
<td>MG</td>
<td>Car driver</td>
</tr>
<tr>
<td>MCB</td>
<td>Train driver</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>HGV driver</td>
</tr>
</tbody>
</table>

#### User behaviour

There is a low occurrence of accidents at UWCs and footpath crossings where the sighting distance is poor. This contradicts the established view that good sighting times will always reduce the risk of accidents at unprotected level crossings. Research at UWCs confirmed the issue of risk compensation by users, as discussed in the AD Little report. Level crossing users are aware of the poor sight times, perceive the crossing as dangerous and therefore compensate by being extra vigilant. But, where sight times are good, the user perception of risk is low, and they may adapt their behaviour, acting less cautiously, such as failing to look or look less often for approaching trains.

Note: the research does not suggest that poor sighting times should be permitted, however it identifies that those with good sighting times should also be considered as ‘high risk’.

Clear sighting distance of a train at AHB, AOCR and AOCL crossings may also provide vehicle drivers with the opportunity to move close to the tracks and check for oncoming trains, thus making a decision of whether to cross, during the activated warning system. Good sighting of the railway line from the road, may also encourage some vehicle drivers to make a judgment that they have sufficient time to move past the activated warning system and cross the railway line.

### Issue at a level crossing

- Marsh Lane: the sighting distance is good at this footpath level crossing.

### Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit</th>
<th>Document source</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td></td>
</tr>
<tr>
<td>Network Rail</td>
<td>Warrington</td>
<td>Network Rail</td>
<td></td>
</tr>
<tr>
<td>HSE/MHRI</td>
<td>Peterborough</td>
<td>HSE/MHRI</td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td></td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>

## Level crossings: communication and user behaviour issues

### Issue

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>protected</td>
<td>user details</td>
</tr>
<tr>
<td>AOC</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>MCB</td>
<td>Farmer</td>
</tr>
<tr>
<td>AOCR</td>
<td>Passenger</td>
</tr>
<tr>
<td>ABCL</td>
<td>Cyclist</td>
</tr>
<tr>
<td>AHB</td>
<td>Horse rider</td>
</tr>
<tr>
<td>MG</td>
<td>Car driver</td>
</tr>
<tr>
<td>MCB</td>
<td>Train driver</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>HGV driver</td>
</tr>
</tbody>
</table>

#### User behaviour

- Parked cars before and after the level crossing may result in vehicle drivers slowing and stopping while on the level crossing.

4. User behaviour

- Parked cars before and after the level crossing affect the flow of traffic approaching and moving over the crossing. As vehicle drivers progress over the crossing, parked cars in the road ahead of them, coupled with oncoming traffic prevents them from moving forwards, resulting in vehicles stopping on the level crossing.

Although users should wait until there is sufficient clearance on the other side, before moving forwards, it has been observed on many occasions that vehicle drivers fail to do this. It is in our opinion that vehicle drivers do this for various reasons:

- They fail to comprehend the danger associated with stopping on the crossing.
- The are tailgating the car in front to avoid being held at the crossing if the warning system is activated.
- They do not expect the level crossing to be activated so soon after the road has just been opened to road traffic again.

In our opinion, parked cars are often a result of home owners that do not have off-street parking, leaving their vehicles on the roadside. Previous railway cottages, now privately owned, are often a source of this problem. Customers of local village or town shops with limited or no parking also park on the approach and exit roads to level crossings.

5. Error type

- Error
- Violation

---

**Note:** The table and text content on the page are adaptations from the original document, preserved with the intention of retaining the information's core context and structure. The page contains various sections discussing issues at level crossings, user behaviour, and sources of information, with specific examples and references provided where applicable. The table outlines different levels of crossing types and user details, emphasizing the importance of sight distances and user perception of risk. The text also touches upon the impact of parked cars and user behaviour on traffic flow and safety at level crossings.
Level crossings: communication and user behaviour issues

1. Position of safety

2. User details

3. Description of issue / design feature

4. User behaviour

5. Error type

6. Sources of information

---

**Level crossings: communication and user behaviour issues**

**Issue**

**Position of safety**

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>2.1 Level crossing user type</td>
</tr>
<tr>
<td>AOCL</td>
<td>MCB</td>
</tr>
<tr>
<td>AOCR</td>
<td>ABCL</td>
</tr>
<tr>
<td>AHB</td>
<td>MG</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
</tbody>
</table>

**Description of issue / design feature**

Insufficient space between the trackside gate and rail results in potential obstruction of the track by bicycles and pushchairs.

**User behaviour**

Footpath and bridleway crossings are often used by cyclists and people with pushchairs. These users will need to stand at a trackside position to clearly check for any oncoming trains before moving over the railway line. However, insufficient space trackside (between the railway line and gate they have just moved through) to stand with their bicycle or pushchair and observe along the track may result in users obstructing the railway line with the bicycle or pushchair.

**Error type**

Error

Violation

---

**Sources of information**

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>Network Rail</td>
<td>Other</td>
</tr>
<tr>
<td>BTP</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hartford</td>
<td>HSE/HMRI</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>Network Rail</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>Network Rail</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>Network Rail</td>
<td>HSE/HMRI</td>
</tr>
</tbody>
</table>

---

**Level crossings: communication and user behaviour issues**

**Issue**

**Telephone use**

**Level crossing users failure to use the telephone is a factor in incidents at UWC.**

**User behaviour**

Visitors, workers and local people who use a UWC must all follow the required crossing procedures. However, it is apparent that users are not complying with the telephone procedures of calling the signaller to request permission to cross. 17 UWC accidents in the last 10 years are associated with users not using the telephone prior to crossing.

Research has highlighted, for example, a female resident crossing up to three times a day, chose not to use the telephone, because she regarded the crossing as safe due to good sighting distances. It is also common for regular UWC users to call the signaller only at the beginning of the day to inform them they will be using the crossing all day but will not be phoning for each crossing made.

**Error type**

Error

Violation

---

**Sources of information**

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>Network Rail</td>
<td>Other</td>
</tr>
<tr>
<td>BTP</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hartford</td>
<td>Network Rail</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>Network Rail</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>HSE/HMRI</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>HSE/HMRI</td>
<td>RAIL INDUSTRY</td>
</tr>
</tbody>
</table>

---
### Level crossings: communication and user behaviour issues

#### Issue at a level crossing

**Traffic moment**

1. **Level Crossing type**
   - 1.1 Protected
     - AOC/G
     - MCB/cctv
     -Undefined
   - 1.2 Unprotected
     - UWC
     - Undefined

2. **User details**
   - 2.1 Level crossing user type
     - Pedestrian
     - Motorcyclist
   - 2.2 Age
     - 0-10
     - 11-15
   - 2.3 On own
     - Individual
     - Group

3. **Description of issue / design feature**
   - High levels of traffic moment at user worked crossings increase the chances of an incident.

4. **User behaviour**
   - Traffic moment is a measure of the frequency of trains and utilisation of the crossing by users.
   - Traffic moment = traverses (by user) per day X trains per day.

   Research has identified high traffic moment as a feature of those crossings with accident histories. Research has identified a total of 56% of crossings surveyed to have traffic moments in excess of 1000. A high percentage of these had accident history (44% versus 12%).

   It should be noted that the HSE, Railway Safety Principles, Part 2, Section E, Guidance on level crossings, does not give a maximum traffic moment for UWC’s or footpath crossings. The only reference to daily road usage (not traffic moment) is that telephones or MCB’s should be provided on both sides of the crossing when usage exceeds 50.

5. **Error type**
   - Error
   - Violation

#### Issue at a level crossing

**Visitor parking**

1. **Level Crossing type**
   - 1.1 Protected
     - AOC/G
     - MCB/cctv
     - Undefined
   - 1.2 Unprotected
     - UWC
     - Undefined

2. **User details**
   - 2.1 Level crossing user type
     - Pedestrian
     - Motorcyclist
   - 2.2 Age
     - 0-10
     - 11-15
   - 2.3 On own
     - Individual
     - Group

3. **Description of issue / design feature**
   - The position of visitors parked vehicles at a level crossing may affect the behaviour of other road drivers.

4. **User behaviour**
   - “Visitor” parking refers to those persons using the level crossing for any kind of associated business with the crossing, i.e., maintenance. It differs from Issue 34: Parked cars, as the position of these vehicles are often located in places other than just on the approach and exit roads of the crossing.

   Because of the remote position of many level crossings, people tend to drive their vehicles when visiting a level crossing. The location of where the visitor parks their vehicle can influence the behaviour of other road drivers.

   For example, if they park in the ‘long/slow’ parking bay this will prevent drivers of long or slow vehicles from stopping and therefore influence them to drive straight over the crossing without informing the signaller.

   Parking on the immediate approach or exit to the crossing may force other drivers to take evasive action, such as driving into the middle of the crossing or it may cause blocking-back of vehicles over the crossing.

   The position of their parked vehicle can also block from view the warning information from other approaching vehicle drivers.

5. **Error type**
   - Error
   - Violation
Level crossings: communication and user behaviour issues

**Issue**

**Crossing utilisation**

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
<th>3. Description of issue / design feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>2.1 Level crossing user type</td>
<td>2.2 Age</td>
</tr>
<tr>
<td>[AOC]</td>
<td>[LWC]</td>
<td>[10-15]</td>
</tr>
<tr>
<td>[MCBcv]</td>
<td>[LWC/T]</td>
<td>[11-15]</td>
</tr>
<tr>
<td>[ABCL]</td>
<td>[LWC/MWL]</td>
<td>[16-20]</td>
</tr>
<tr>
<td>[AHS]</td>
<td>[OC]</td>
<td>[20-25]</td>
</tr>
<tr>
<td>[MG]</td>
<td>[FP/MWL]</td>
<td>[25-30]</td>
</tr>
<tr>
<td>[MCB]</td>
<td>[TC]</td>
<td>[35-60]</td>
</tr>
</tbody>
</table>

**User behaviour**

Research has shown that 100+ pedestrian users equates to 'high' crossing utilisation. It warns of daily, weekly or even seasonal effects on utilisation which may not be captured during specific visits, and therefore suggests that to determine utilisation, numerous visits must be made to each crossing.

Where there is high pedestrian utilisation, this usually means the crossing is located as an access point between places such as a school, a housing estate, places of work or a local shopping area. Pedestrians may be using the crossing a couple of times a day and therefore they are likely to be regular users of the crossing. It is unclear from research the exact behavioural traits of users at these crossings, however it can be assumed that with continued use, the user becomes less sensitive to the risks posed by the crossing, resulting in less cautious crossing behaviour. This research has shown that 'high' pedestrian utilisation appears to be a dominant risk factor at level crossings that have previous accident history.

**SOURCES OF INFORMATION**

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network Rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSISB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Document Details**

<table>
<thead>
<tr>
<th>Error type</th>
<th>Error</th>
<th>Violation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Level crossings: communication and user behaviour issues**

**Issue**

**Type of trains**

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
<th>3. Description of issue / design feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>2.1 Level crossing user type</td>
<td>2.2 Age</td>
</tr>
<tr>
<td>[AOC]</td>
<td>[LWC]</td>
<td>[10-15]</td>
</tr>
<tr>
<td>[MCBcv]</td>
<td>[LWC/T]</td>
<td>[11-15]</td>
</tr>
<tr>
<td>[ABCL]</td>
<td>[LWC/MWL]</td>
<td>[16-20]</td>
</tr>
<tr>
<td>[AHS]</td>
<td>[OC]</td>
<td>[20-25]</td>
</tr>
<tr>
<td>[MG]</td>
<td>[FP/MWL]</td>
<td>[25-30]</td>
</tr>
<tr>
<td>[MCB]</td>
<td>[TC]</td>
<td>[35-60]</td>
</tr>
</tbody>
</table>

**User behaviour**

Both passenger and freight trains using a train line route will affect the behaviour of users at a level crossing.

Freight trains are often longer than passenger trains and travel at much slower speeds. This may result in the following user behaviours:

- Users seeing a train in the distance and judging they have sufficient time to cross because it appears to be or it is normally always a freight train that passes (user’s perception of speed based on their previous knowledge).
- Users knowing they will have to wait for longer periods of time and therefore they may demonstrate increased impatience to wait and attempt to cross immediately before the train passes.
- Users seeing a train in the distance and judging they have sufficient time to cross because it appears to be or it is normally always a freight train that passes (user’s perception of speed based on their previous knowledge).

**SOURCES OF INFORMATION**

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network Rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSISB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Document Details**

<table>
<thead>
<tr>
<th>Error type</th>
<th>Error</th>
<th>Violation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---
**Level crossings: communication and user behaviour issues**

### 5. Error type
- Error
- Violation

---

**Issue**

#### 3. Description of issue / design feature

Over a period of time, vehicle drivers remain responsive to the specific message given by vehicle-activated signs.

---

**Issue**

#### 4. User behaviour

The road industry has devised a range of measures to encourage drivers to adopt a safe speed on the approach to hazards, for example, junctions or bends. One method currently in use at various sites within the UK, are vehicle-activated signing. The sign displays a message relating to the road conditions to specific drivers that are exceeding a particular speed threshold. The signs are effective in reducing the habitual nature of vehicle drivers, resulting in drivers continuing to respond to the messages over a long period of time.

It has been suggested by the road industry that the benefits demonstrated in reducing accidents at road hazards and maintaining the effectiveness of the message could also be applied successfully to advising vehicle drivers of level crossing hazards.

Note: vehicle activated signs are due to be tested at various level crossing sites.

---

**Issue**

#### 6. Sources of information

<table>
<thead>
<tr>
<th>Source</th>
<th>Level crossing type</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Protected</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>wi/wh</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Road industry</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Other</td>
</tr>
<tr>
<td>RSSB</td>
<td>AAB</td>
<td>Hertford</td>
<td>DfT (rail)</td>
<td>TRL (road)</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bus drivers</td>
<td>Peterborough</td>
<td>TRL (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>RPC</td>
<td>Other</td>
<td>Bedford</td>
<td>Independent</td>
<td>Non-UK</td>
</tr>
<tr>
<td>BTP</td>
<td>Non-UK</td>
<td>Redcar</td>
<td>TRL (road)</td>
<td>Non-UK</td>
</tr>
<tr>
<td>OTHERS</td>
<td>Undefined</td>
<td>Undefined</td>
<td>OTHER</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

---

**Issue**

#### 6. Sources of information

<table>
<thead>
<tr>
<th>Source</th>
<th>Level crossing type</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Protected</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>pi/ve</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Road industry</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>Other</td>
</tr>
<tr>
<td>RSSB</td>
<td>AAB</td>
<td>Hertford</td>
<td>DfT (rail)</td>
<td>TRL (road)</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bus drivers</td>
<td>Peterborough</td>
<td>TRL (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>RPC</td>
<td>Other</td>
<td>Bedford</td>
<td>Independent</td>
<td>Non-UK</td>
</tr>
<tr>
<td>BTP</td>
<td>Non-UK</td>
<td>Redcar</td>
<td>TRL (road)</td>
<td>Non-UK</td>
</tr>
<tr>
<td>OTHERS</td>
<td>Undefined</td>
<td>Undefined</td>
<td>OTHER</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Issue

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/cctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>MG</td>
</tr>
<tr>
<td>AHB</td>
<td>MCB</td>
</tr>
<tr>
<td>MCB</td>
<td>OC</td>
</tr>
<tr>
<td>MCB</td>
<td>FF/MWL</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

2.1 Level crossing user type

<table>
<thead>
<tr>
<th>Unprotected</th>
<th>Protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horserider</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2.2 Age

<table>
<thead>
<tr>
<th>0-10</th>
<th>11-15</th>
<th>20-35</th>
<th>35-50</th>
<th>50-60</th>
<th>60+</th>
</tr>
</thead>
</table>

2.3 On own

<table>
<thead>
<tr>
<th>Individual</th>
<th>Group</th>
<th>Other</th>
<th>Undefined</th>
</tr>
</thead>
</table>

5. Error type

| Error | Violation |

6. Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Network Rail</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RPC</td>
<td>RPC</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>BTP</td>
<td>BTP</td>
<td>Non-UK</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Issue

1. Level Crossing type

Automatic open level crossings

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/cctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>MG</td>
</tr>
<tr>
<td>AHB</td>
<td>MCB</td>
</tr>
<tr>
<td>MCB</td>
<td>OC</td>
</tr>
<tr>
<td>MCB</td>
<td>FF/MWL</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

2.1 Level crossing user type

<table>
<thead>
<tr>
<th>Unprotected</th>
<th>Protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horserider</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2.2 Age

<table>
<thead>
<tr>
<th>0-10</th>
<th>11-15</th>
<th>20-35</th>
<th>35-50</th>
<th>50-60</th>
<th>60+</th>
</tr>
</thead>
</table>

2.3 On own

<table>
<thead>
<tr>
<th>Individual</th>
<th>Group</th>
<th>Other</th>
<th>Undefined</th>
</tr>
</thead>
</table>

5. Error type

| Error | Violation |

6. Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Network Rail</td>
<td>Network Rail</td>
<td>Network Rail</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>RPC</td>
<td>RPC</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>BTP</td>
<td>BTP</td>
<td>Non-UK</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>
**Level crossings: communication and user behaviour issues**

### Issue

#### Animals: Horses

<table>
<thead>
<tr>
<th>Crossing type</th>
<th>User type</th>
<th>Age</th>
<th>On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>1. Unprotected</td>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td></td>
<td>Farmer</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td></td>
<td>Passenger</td>
<td>16-20</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Cyclist</td>
<td>20-35</td>
<td>Group</td>
</tr>
<tr>
<td></td>
<td>Horse rider</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Car driver</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Train driver</td>
<td>50-60</td>
<td>Group</td>
</tr>
<tr>
<td></td>
<td>Van driver</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>50-60</td>
<td>Individual</td>
</tr>
</tbody>
</table>

#### User behaviour

Activated warnings at level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road vehicle users.

#### Sources of information

- RAIL INDUSTRY
- Network Rail
- ROAD INDUSTRY
- RSSB
- HSE/HMRI
- RPC
- BTP
- OTHERS

### Issue at a level crossing

#### Level crossings: communication and user behaviour issues

**Ref**: 45  **Creation date**: 26.08.2004  **Last modified**: 02.02.2005

<table>
<thead>
<tr>
<th>Issue</th>
<th>Issue at a level crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Level crossings

**Ref**: 46  **Creation date**: 24.08.2004  **Last modified**: 02.02.2005

<table>
<thead>
<tr>
<th>Issue</th>
<th>Issue at a level crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Crossing type

<table>
<thead>
<tr>
<th>Crossing type</th>
<th>User details</th>
<th>Age</th>
<th>On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>1. Unprotected</td>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td></td>
<td>Farmer</td>
<td>16-20</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Passenger</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Cyclist</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Horse rider</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>Car driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Train driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Van driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Sources of information

- RAIL INDUSTRY
- Network Rail
- ROAD INDUSTRY
- RSSB
- HSE/HMRI
- RPC
- BTP
- OTHERS

#### User behaviour

The most common violation at UWC/MWL was found to be users leaving gates open. Reasons for this behaviour are:

- Gates left open during the whole day to allow easier access to homes and places of work either side of the crossing;
- Gates open for short periods of the day to accommodate shorter visits, such as deliveries to a farm;
- Only one gate closed for the purposes of fencing off the owner’s land;
- Adverse weather conditions, i.e., users wanting to reduce the amount of time they are exposed to the weather;
- Vehicle tailgating or vehicles following later-on;
- First-time or irregular users not aware of the correct crossing procedures.

In general, users perceive the process for crossing correctly as complex, compared with the aim of crossing which is regarded as fairly simple.

#### Sources of information

- RAIL INDUSTRY
- Network Rail
- ROAD INDUSTRY
- RSSB
- HSE/HMRI
- RPC
- BTP
- OTHERS
Level crossings: communication and user behaviour issues

Issue

Violations at MWL

1. Level crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/cctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABL</td>
<td>UWC/ML</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FP/MWL</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Horse rider</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Car driver</td>
<td>20-35</td>
<td>Group</td>
</tr>
<tr>
<td>Van driver</td>
<td>35-50</td>
<td>Group</td>
</tr>
<tr>
<td>Other</td>
<td>35-50</td>
<td>Group</td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Once the crossing closure procedure has been activated, the amber light of the road traffic lights immediately shows for approximately 3 seconds. After this period, the intermittent red lights immediately show. The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.

4. User behaviour

A suggestion of why crossing violations are likely to occur is provided by those users who say they would consider violating a red warning light.

A combination of underestimating their crossing time and overestimating the time between the warning onset and train arrival indicates that users feel they have time to make the violation 'safely'. Users are underestimating the level of risk associated with violating the crossing procedures.

5. Error type

Error

Violations at MWL

1. Level crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/cctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABL</td>
<td>UWC/ML</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FP/MWL</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Horse rider</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Car driver</td>
<td>20-35</td>
<td>Group</td>
</tr>
<tr>
<td>Van driver</td>
<td>35-50</td>
<td>Group</td>
</tr>
<tr>
<td>Other</td>
<td>35-50</td>
<td>Group</td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Once the crossing closure procedure has been activated, the amber light of the road traffic lights immediately shows for approximately 3 seconds. After this period, the intermittent red lights immediately show. The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.

4. User behaviour

A suggestion of why crossing violations are likely to occur is provided by those users who say they would consider violating a red warning light.

A combination of underestimating their crossing time and overestimating the time between the warning onset and train arrival indicates that users feel they have time to make the violation 'safely'. Users are underestimating the level of risk associated with violating the crossing procedures.

5. Sources of information

6. Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>Nu/nu</td>
</tr>
<tr>
<td>Network Rail</td>
<td>HSE/HMRI</td>
<td>Network Rail</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>RSSB</td>
<td>HSE/HMRI</td>
<td>RSSB</td>
<td>TRL (road)</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Bus drivers</td>
<td>DfT (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>RPC</td>
<td>Railway GS</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>BTP</td>
<td>Other dept.</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>OTHERS</td>
<td>Redcar</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>WCF</td>
<td>Other driver</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>OTHER</td>
<td>Redcar</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Other driver</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Network Rail</td>
<td>Network Rail</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>DfT (road)</td>
<td>Independent</td>
<td>Independent</td>
<td>Non-UK</td>
</tr>
<tr>
<td>RSSB</td>
<td>Other driver</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Other driver</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Issue at a level crossing

1. Level crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   Level crossing user type
   2.1
   2.2 Age
   2.3 On own

3. Description of issue / design feature

Level crossings that provide the only access to routes either side of the crossing influences the risk taking behaviour of vehicle drivers.

4. User behaviour

Vehicle drivers using level crossings that provide the only access to roads and locations within the area, may increase their risk taking behaviour. Knowing they will be held at the crossing for some time and without an opportunity to seek an alternative route, they may violate the activated warning system.

5. Error type

Error
Violation

6. Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hertford</td>
<td>Railway GS</td>
<td>Other dept.</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>Others</td>
<td>Non-UK</td>
</tr>
<tr>
<td>RPC</td>
<td>Redcar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Issue at a level crossing

1. Level crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   Level crossing user type
   2.1
   2.2 Age
   2.3 On own

3. Description of issue / design feature

Non-designated passenger drop-off points close to level crossings affects the flow and behaviour of traffic approaching a crossing.

4. User behaviour

Problems are caused by vehicle drivers parking in side turnings or with two wheels on the pavement, close to the level crossing for short periods of time to allow their passengers to exit the vehicle. This results in traffic flow problems over the level crossing and also distracts other vehicle drivers from observing the warning information and general road procedures.

5. Error type

Error
Violation

6. Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hertford</td>
<td>Railway GS</td>
<td>Other dept.</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>Others</td>
<td>Non-UK</td>
</tr>
<tr>
<td>RPC</td>
<td>Redcar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Level crossings: communication and user behaviour issues

**Ref 51**
Creation date 30.06.2004 Last modified 02.02.2005

#### Issue

**See-through effect**

1. **Level crossing type**
   - 1.1 Protected
   - 1.2 Unprotected
   - 2. User details

2. **User details**
   - 2.1 Level crossing user type
   - 2.2 Age
   - 2.3 On own

3. **Description of issue / design feature**

   Level crossing located in a dip or on a brow of a long straight road may result in increases of red-light running.

4. **User behaviour**

   The see-through effect is an established road design effect that results in the failure of the vehicle driver to observe road features and therefore fail to respond with the required change in vehicle driver behaviour. This effect is most often observed at road junctions and road traffic lights, where the result of the see-through effect has the most adverse impact. Vehicle drivers approaching a set of traffic lights continue to drive straight past the red light and have later reported that they have not only missed the red light, but failed to see any lights at all.

This effect is also an issue for vehicle drivers approaching a level crossing. As the vehicle driver looks ahead, the rail line and surrounding crossing information is lost within the immediate environment because of its position within a dip or on a brow of the road, resulting in the vehicle driver fixating their vision further along the road. The driver unintentionally misses the information regarding the level crossing.

5. **Error type**

   - Error
   - Violation

#### Sources of information

6.1 Interview source
- RAIL INDUSTRY
- Network Rail
- RSSB
- HSE/HMRI
- RPC
- BTP
- OTHERS

6.2 Level crossing visit - areas
- Milton Keynes
- Doncaster
- Hartford
- Peterborough
- Bedford
- Redcar

6.3 Document source
- RAIL INDUSTRY
- Network Rail
- HSE/HMRI
- RSSB
- HSE/HMRI
- Network Rail
- RAIL INDUSTRY
- GOVERNMENT
- TRL (rail)
- TRL (road)
- Independent
- Railway GS
- Other dept.
- Non-UK

6.4 Document details
- Milton Keynes
- Doncaster
- Hartford
- Peterborough
- Bedford
- Redcar

---

### Level crossings: communication and user behaviour issues

**Ref 52**
Creation date 30.06.2004 Last modified 02.02.2005

#### Issue

**HGV drivers using rail station facilities**

1. **Level crossing type**
   - 1.1 Protected
   - 1.2 Unprotected

2. **User details**
   - 2.1 Level crossing user type
   - 2.2 Age
   - 2.3 On own

3. **Description of issue / design feature**

   The effectiveness of information is reduced by HGV drivers parking in front of signs and warning devices.

4. **User behaviour**

   Information signs and warning lights can be blocked from the view of approaching traffic by HGV drivers parking their vehicle to use station facilities.

5. **Error type**

   - Error
   - Violation

#### Sources of information

6.1 Interview source
- RAIL INDUSTRY
- Network Rail
- RSSB
- HSE/HMRI
- RPC
- BTP
- OTHERS

6.2 Level crossing visit - areas
- Milton Keynes
- Doncaster
- Hartford
- Peterborough
- Bedford
- Redcar

6.3 Document source
- RAIL INDUSTRY
- Network Rail
- HSE/HMRI
- RSSB
- HSE/HMRI
- Network Rail
- RAIL INDUSTRY
- GOVERNMENT
- TRL (rail)
- TRL (road)
- Independent
- Railway GS
- Other dept.
- Non-UK

6.4 Document details
- Milton Keynes
- Doncaster
- Hartford
- Peterborough
- Bedford
- Redcar

---

St. Margarets CCTV: a HGV driver parked in front of the station. The driver vehicle completely blocked the view of the warning light from approaching traffic.
Events

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>MCB</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horsedriver</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Events increase the amount of irregular users at level crossings.

4. User behaviour

Events can attract enormous increases in visitors to an area, often for only short periods of time and at certain times of the year. Visitors may be needing to arrive at their destination at a particular time or have a had a long and difficult journey, resulting in users wanting to avoid any further delays by being held at a crossing. This may result in increased risk taking behaviour by these users. The general increase in vehicle and pedestrian traffic also affects the flow of traffic on the level crossings, and this is further impaired when visitors may have additional vehicle equipment, such as horse trailers and caravans.

5. Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td>BP</td>
<td>Dooncaster</td>
<td>HSE/HMRI</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hertford</td>
<td>Network Rail</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>DIT (rail)</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RSSB</td>
<td>DIT (road)</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>Railway GS</td>
<td>Independent</td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
<td>Other dept.</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Ref 53  Creation date: 30.06.2004  Last modified: 02.02.2005

Issue

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>MCB</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horsedriver</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Events can attract enormous increases in visitors to an area, often for only short periods of time and at certain times of the year. Visitors may be needing to arrive at their destination at a particular time or have a had a long and difficult journey, resulting in users wanting to avoid any further delays by being held at a crossing. This may result in increased risk taking behaviour by these users. The general increase in vehicle and pedestrian traffic also affects the flow of traffic on the level crossings, and this is further impaired when visitors may have additional vehicle equipment, such as horse trailers and caravans.

4. User behaviour

Events can attract enormous increases in visitors to an area, often for only short periods of time and at certain times of the year. Visitors may be needing to arrive at their destination at a particular time or have a had a long and difficult journey, resulting in users wanting to avoid any further delays by being held at a crossing. This may result in increased risk taking behaviour by these users. The general increase in vehicle and pedestrian traffic also affects the flow of traffic on the level crossings, and this is further impaired when visitors may have additional vehicle equipment, such as horse trailers and caravans.

5. Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>OTHER</td>
</tr>
<tr>
<td>BP</td>
<td>Dooncaster</td>
<td>HSE/HMRI</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hertford</td>
<td>Network Rail</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>DIT (rail)</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RSSB</td>
<td>DIT (road)</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>Railway GS</td>
<td>Independent</td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
<td>Other dept.</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Ref 54  Creation date: 27.08.2004  Last modified: 02.02.2005

Issue

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>MCB</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horsedriver</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Narrow roads before and after the level crossing may result in vehicle drivers slowing and stopping on the level crossing.

4. User behaviour

Narrow roads before and after the level crossing affect the traffic flow in the level crossing. As vehicle drivers progress over the crossing, they may have to slow to accommodate the narrow road or stop to allow oncoming vehicles to pass. Vehicle drivers may have to wait for some time before they can move off from the crossing.

The road infrastructure around the crossing could further impact on the risk taking behaviour of vehicle drivers. If the narrow roads before and after the crossing affect the traffic flow over the level crossing, vehicle drivers may have to slow or stop on the crossing to accommodate for oncoming traffic. Vehicle drivers may have to wait for some time before they can move off from the crossing.

Stopping on the crossing occurs more often during rush hours.
## Level crossings: communication and user behaviour issues

### Ref 55
**Creation date** 27.08.2004  **Last modified** 02.02.2005

#### Issue

<table>
<thead>
<tr>
<th>Contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Level Crossing type</td>
</tr>
<tr>
<td>1.1 Protected</td>
</tr>
<tr>
<td>AOCL</td>
</tr>
<tr>
<td>AOCR</td>
</tr>
<tr>
<td>AHC</td>
</tr>
<tr>
<td>AHB</td>
</tr>
<tr>
<td>MG</td>
</tr>
<tr>
<td>AHC</td>
</tr>
</tbody>
</table>

### 3. Description of issue / design feature

Landowners failure to inform new contractors of the procedures and restrictions for using their vehicles across the level crossing may increase the risk of an incident.

### 4. User behaviour

Users not fully aware of the restrictions the level crossing imposes on their vehicles, may experience problems when traversing the crossing. For example, while transporting goods they may not be aware of restrictions on vehicle size and therefore unable to manoeuvre their vehicle easily or without creating an obstruction on the crossing.

In Scotland, crossings only previously used by the forestry commission are now being used by contractors, because of the rapid development of wind farms in recent years, bringing contractors into areas that require the use of UWC.

---

### Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>DIT (rail)</td>
</tr>
<tr>
<td>RSSB</td>
<td>Hartford</td>
<td>RSSB</td>
<td>DIT (road)</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>Railway GS</td>
<td>Other dept.</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>Others</td>
<td>Other</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>HMRI internal report</td>
<td></td>
</tr>
</tbody>
</table>

---

## Level crossings: communication and user behaviour issues

### Ref 56
**Creation date** 27.08.2004  **Last modified** 02.02.2005

#### Issue

<table>
<thead>
<tr>
<th>Issue at a level crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Location near major roads</td>
</tr>
<tr>
<td>2. Crossings type</td>
</tr>
<tr>
<td>1.1 Protected</td>
</tr>
<tr>
<td>AOCL</td>
</tr>
<tr>
<td>AOCR</td>
</tr>
<tr>
<td>AHC</td>
</tr>
<tr>
<td>AHB</td>
</tr>
<tr>
<td>MG</td>
</tr>
<tr>
<td>AHC</td>
</tr>
</tbody>
</table>

### 3. Description of issue / design feature

Long traffic queues onto and off of major roads and motorways result in queues forming on either side of the level crossings. While the crossing is open to road traffic, users do not wait for traffic to exit the other side before progressing across, therefore creating a queue of traffic over the crossing.

### 5. Error type

#### Error type

- Error
- Violation
Level crossings: communication and user behaviour issues

Ref 57
Creation date 27.08.2004
Last modified 02.02.2005

Issue

Traffic calming systems

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>Cctv screen</td>
</tr>
<tr>
<td>AOC</td>
<td>Cctv screen</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>MG</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horserider</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HVG driver</td>
<td>Undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back.

4. User behaviour

Traffic calming systems positioned on the approach roads to a level crossing may increase the risk of vehicle drivers blocking-back onto the crossing.

While the crossing is active, and the road closed to traffic, queues form along the road. Vehicle drivers position themselves around the traffic islands, so they are located in a stationary position on the opposite side of the road. When the road is then opened to traffic again, oncoming vehicles cannot continue along the road because of other vehicles positioned around the traffic islands. This creates slow moving traffic and momentarily causes vehicles to block-back over the crossing.

5. Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHERS</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>MRRI internal report</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>OTHERS</td>
<td>Non-UK</td>
</tr>
<tr>
<td>AOCR</td>
<td>Peterborough</td>
<td>GOVERNMENT</td>
<td>Independent</td>
</tr>
<tr>
<td>RSSB</td>
<td>Bedford</td>
<td>TRL (road)</td>
<td>Non-UK</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Undefined</td>
<td>DfT (rail)</td>
<td>Independent</td>
</tr>
<tr>
<td>RPC</td>
<td>Undefined</td>
<td>Other</td>
<td>Non-UK</td>
</tr>
<tr>
<td>AA</td>
<td>Undefined</td>
<td>DfT (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>HGV</td>
<td>Undefined</td>
<td>OTHER</td>
<td>Independent</td>
</tr>
<tr>
<td>Car driver</td>
<td>Undefined</td>
<td>HSE/HMRI</td>
<td>Independent</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Undefined</td>
<td>Network Rail</td>
<td>Independent</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Undefined</td>
<td>RSSB</td>
<td>Independent</td>
</tr>
<tr>
<td>~</td>
<td>Undefined</td>
<td>Railway GS</td>
<td>Independent</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Ref 58
Creation date 27.08.2004
Last modified 02.02.2005

Issue

Diversification in farming

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>Cctv screen</td>
</tr>
<tr>
<td>AOC</td>
<td>Cctv screen</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>MG</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horserider</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HVG driver</td>
<td>Undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Diversification in farming increases public access to user-worked crossings.

4. User behaviour

Farming is changing the use of its land to ensure the survival of many farming businesses. Instead of using traditional farming methods, many are encouraging the public to access their land for leisure activities, such as open farms and golf courses.

However, members of the public are using UWC to access farm land, and the types of activities undertaken do not allow for new users to be informed of how to correctly use these crossings. This results in many untrained users passing through a crossing which relies upon the user to take full responsibility in opening and closing the gates, ensuring they follow all the correct crossing procedures.

It is also resulting in additional vehicles using UWC, including vehicles completely unsuitable for certain crossings.

5. Sources of information

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHERS</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>MRRI internal report</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>OTHERS</td>
<td>Non-UK</td>
</tr>
<tr>
<td>AOCR</td>
<td>Peterborough</td>
<td>GOVERNMENT</td>
<td>Independent</td>
</tr>
<tr>
<td>RSSB</td>
<td>Bedford</td>
<td>TRL (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Undefined</td>
<td>DfT (rail)</td>
<td>Independent</td>
</tr>
<tr>
<td>RPC</td>
<td>Undefined</td>
<td>Other</td>
<td>Independent</td>
</tr>
<tr>
<td>AA</td>
<td>Undefined</td>
<td>DfT (road)</td>
<td>Independent</td>
</tr>
<tr>
<td>HGV</td>
<td>Undefined</td>
<td>OTHER</td>
<td>Independent</td>
</tr>
<tr>
<td>Car driver</td>
<td>Undefined</td>
<td>HSE/HMRI</td>
<td>Independent</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Undefined</td>
<td>Network Rail</td>
<td>Independent</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Undefined</td>
<td>RSSB</td>
<td>Independent</td>
</tr>
<tr>
<td>~</td>
<td>Undefined</td>
<td>Railway GS</td>
<td>Independent</td>
</tr>
<tr>
<td>~</td>
<td>Undefined</td>
<td>Other</td>
<td>Independent</td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Ref 60 Creation date 27.08.2004 Last modified 13.01.2005

### Issue

#### Foreign vehicle drivers

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>2.1 Level crossing user type</td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
</tr>
<tr>
<td>2.3 On own</td>
<td>2.3 3 On own</td>
</tr>
<tr>
<td>AOCL</td>
<td>MCB</td>
</tr>
<tr>
<td>AOCR</td>
<td>MCB</td>
</tr>
<tr>
<td>ABCL</td>
<td>UWC</td>
</tr>
<tr>
<td>AHB</td>
<td>UF</td>
</tr>
<tr>
<td>MG</td>
<td>FF</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Cyclist</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

#### Issue at a level crossing

Areas with high levels of foreign vehicle drivers may result in increased decision making errors at level crossings. This may be more evident during seasonal periods.

#### User behaviour

Other countries have alternative measures in place for controlling access across level crossings and require different procedures to be followed. Vehicle drivers are unlikely to be familiar with UK procedures and they may also have some difficulty in correctly interpreting written information.

This is particularly prevalent in areas with high volumes of continental HGV drivers. Although they are legally required to be aware of the rules and procedures for using UK crossings, it is unlikely that all foreign HGV drivers will be aware of these. This may result in them failing to make any necessary calls to a signaler if their vehicle is too long or slow for passing over a crossing without previously obtaining permission.

#### Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>HMRI internal report</td>
</tr>
<tr>
<td>Network Rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSSB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road industry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus drivers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car driver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Level crossings: communication and user behaviour issues

Ref 69 Creation date 27.08.2004 Last modified 02.02.2005

### Issue

#### Bus stops

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>2.1 Level crossing user type</td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
</tr>
<tr>
<td>2.3 On own</td>
<td>2.3 3 On own</td>
</tr>
<tr>
<td>AOCL</td>
<td>MCB</td>
</tr>
<tr>
<td>AOCR</td>
<td>MCB</td>
</tr>
<tr>
<td>ABCL</td>
<td>UWC</td>
</tr>
<tr>
<td>AHB</td>
<td>UF</td>
</tr>
<tr>
<td>MG</td>
<td>FF</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Cyclist</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

#### Description of issue / design feature

Unofficial bus stops in the level crossing lay-by, affects the behaviour of large or slow vehicle drivers.

#### Description of issue / design feature

A lay-by is often provided at the approach and exit of AHB’s, so vehicles required to call the signaler for permission to cross, can park clear of the crossing.

However, the lay-by is often used as an unofficial bus stop, sometimes preventing large or slow vehicles from stopping, forcing them to continue across the crossing without calling the signaler.

These unofficial bus stops can arise for various reasons, such as:

- The lay-by is closer to bus users’ homes than the official bus stop, and users make a request for the bus driver to stop in the lay-by;
- The bus company is temporarily using the lay-by because roadworks have blocked the official bus stop;
- The local council have allocated the lay-by as an official stop.

#### Sources of information

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>HMRI internal report</td>
</tr>
<tr>
<td>Network Rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSSB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road industry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus drivers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car driver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Level crossings: communication and user behaviour issues

Issue

Crossing surface

1. Level crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

3. Description of issue / design feature

Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.

4. User behaviour

Poor crossing surfaces increases the difficulty for users traversing the level crossing. Users may be distracted by having to look carefully at where they are stepping and this may also increase user crossing time. It may present particular problems for cyclists, horse riders, elderly, visually or physically impaired crossing users. The crossing surface may also present a hazard to road vehicles in general as well as a hazard to trains.

5. Error type

Error
Violation

Sources of information

6.1 Interview source
6.2 Level crossing visit - areas
6.3 Document source
6.4 Document details

Level crossings: communication and user behaviour issues

Issue

Roadworks

1. Level crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

3. Description of issue / design feature

Roadworks positioned up to 3 kilometres from the level crossing may still impact on vehicles blocking-back.

4. User behaviour

Roadworks located on roads around a level crossing can impact on vehicles blocking-back over the crossing. Vehicle drivers expecting to be able to move forwards over the crossing, may be impeded by slow moving traffic as a result of the road works. This is further compounded by vehicle drivers tailgating the vehicle in-front to avoid potentially being held by an activated warning system.

Blocking-back is also not just associated with roadworks located in the immediate vicinity, they may continue to have an impact on the crossing when located up to 3 kilometres away.

Blocking-back from roadworks is a particular problem at automatic level crossings.

5. Error type

Error
Violation

Sources of information

6.1 Interview source
6.2 Level crossing visit - areas
6.3 Document source
6.4 Document details
## Level crossings: communication and user behaviour issues

### Issue

#### Housing developments

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>2.1 Level crossing user type</td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
</tr>
<tr>
<td>AOCCL</td>
<td>2.3 On own</td>
</tr>
<tr>
<td>AOCR</td>
<td></td>
</tr>
<tr>
<td>ABCL</td>
<td></td>
</tr>
<tr>
<td>AHB</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
</tbody>
</table>

#### Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.

### User behaviour

#### Vehicle shortcuts

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>2.1 Level crossing user type</td>
</tr>
<tr>
<td>1.2 Unprotected</td>
<td>2.2 Age</td>
</tr>
<tr>
<td>AOCCL</td>
<td>2.3 On own</td>
</tr>
<tr>
<td>AOCR</td>
<td></td>
</tr>
<tr>
<td>ABCL</td>
<td></td>
</tr>
<tr>
<td>AHB</td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
</tr>
</tbody>
</table>

#### New housing developments near to crossings used as access to major towns or other key locations will affect the use and behaviour of both vehicle drivers and pedestrians over the crossing. These developments will increase vehicle and pedestrian traffic levels and the existing crossing type may be unsuitable for accommodating these increased levels.

### Error type

<table>
<thead>
<tr>
<th>Error</th>
<th>Violation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Issue

Crossing instructions

1. Level Crossing type
   1.1 Protected
   AOC
   MC
   AR
   AB
   AH
   MG
   MCB
   UC

   1.2 Unprotected
   UWC
   UWC/ML
   OC
   FP/ML
   FC

2. User details
   2.1 Level crossing user type
   Pedestrian
   Motorcyclist
   Farmer
   Passenger
   Cyclist
   Horse rider
   Car driver
   Train driver
   Van driver
   Other

   2.2 Age
   0-10
   11-15
   16-20
   20-35
   35-50
   50-60

   2.3 On own
   Individual
   Group
   Underfilled

3. Description of issue / design feature

Ambiguous crossing instructions may result in users failing to undertake the correct crossing procedure.

4. User behaviour

Users at UWC are provided with instructions to guide them in carrying out the crossing procedure in the correct order. However, it is not always apparent to users the exact order in which they should undertake the crossing procedure. For example, should they phone the signaller first to obtain permission to cross or open the first gate. If the user has incorrectly followed the procedure, this has a large impact on the overall time taken by the user to cross, as well as impacting on their safety while crossing.

6. Sources of information

6.1 Interview source
   RAIL INDUSTRY
   Network Rail
   RSIB
   HSE/HMRI
   RPC
   BTP

6.2 Level crossing visit - areas
   Milton Keynes
   Doncaster
   Hertford
   Peterborough
   Bedford
   Redcar

6.3 Document source
   RAIL INDUSTRY
   Network Rail
   GOVERNMENT
   OTHER
   HSE/HMRI
   RSSB
   Independent
   Railway GS
   Others

5. Error type

Error
Violation
### Level crossings: communication and user behaviour issues

#### Issue

**Animals: Dogs**

1. **Level Crossing type**
   - 1.1 Protected
   - 1.2 Unprotected

2. **User details**
   - 2.1 Level crossing user type
     - UWC
     - LC/T
     - UWC/MWL
   - 2.2 Age
     - 0-10
     - 11-15
     - 16-20
     - 20-35
     - 35-50
     - 50-60
     - 60+
   - 2.3 On own
     - Individual
     - Group
     - Undefined

3. **Description of issue / design feature**

   Unrestrained dogs may impair their owner’s concentration while on the level crossing.

4. **User behaviour**

   An observation of users at UWC level crossings saw over a quarter of all people walking with dogs failing to use any form of dog restraint. A sign requesting dog walkers to put their dog on a lead was positioned on the majority of these UWC’s.

   Train drivers also have reported seeing unrestrained dogs along side the tracks with their owners standing at the crossing.

   It appears that the risk of not restraining a dog is not evident to dog owners, possibly because of their assumption that they are capable of maintaining control of their pet.

5. **Error type**

   - Error
   - Violation

### Sources of information

6.1 Interview source
   - RAIL INDUSTRY
   - ROAD INDUSTRY
   - RSAH
   - RSSB
   - HSE/HMRI
   - Independent
   - TRL (rail)
   - Non-UK

6.2 Level crossing visit - areas
   - Milton Keynes
   - Doncaster
   - Hartford
   - Peterborough
   - Bedford
   - Redcar

6.3 Document source
   - RAIL INDUSTRY
   - HSE/HMRI
   - Network Rail
   - HSE/HMRI internal report
   - Independent
   - Non-UK

6.4 Document details
   - Miton Keynes
   - Doncaster
   - Hartford
   - Peterborough
   - Bedford
   - Redcar

### Issue at a level crossing

#### Contacting the signaler

1. **Level Crossing type**
   - 1.1 Protected
   - 1.2 Unprotected

2. **User details**
   - 2.1 Level crossing user type
     - UWC
     - LC/T
     - UWC/MWL
   - 2.2 Age
     - 0-10
     - 11-15
     - 16-20
     - 20-35
     - 35-50
     - 50-60
     - 60+
   - 2.3 On own
     - Individual
     - Group
     - Undefined

3. **Description of issue / design feature**

   Unclear ‘user-type’ information may result in users failing to contact the signaler prior to crossing.

4. **User behaviour**

   Information is provided at UWC to indicate which types of users must call the signaler to request permission to cross the railway line. Prior to crossing, all users must determine from this information, whether they should first contact the signaler. However, non-specific and unclear ‘user-type’ information may result in users failing to contact the signaler.

5. **Error type**

   - Error
   - Violation

### Sources of information

6.1 Interview source
   - RAIL INDUSTRY
   - ROAD INDUSTRY
   - RSAH
   - RSSB
   - HSE/HMRI
   - Independent
   - TRL (rail)
   - Non-UK

6.2 Level crossing visit - areas
   - Milton Keynes
   - Doncaster
   - Hartford
   - Peterborough
   - Bedford
   - Redcar

6.3 Document source
   - RAIL INDUSTRY
   - HSE/HMRI
   - Network Rail
   - HSE/HMRI internal report
   - Independent
   - Non-UK

6.4 Document details
   - Milton Keynes
   - Doncaster
   - Hartford
   - Peterborough
   - Bedford
   - Redcar
Level crossings: communication and user behaviour issues

Ref 69  Creation date 27.08.2004  Last modified 02.02.2005

### Issue

#### Rural level crossings

1. **Level Crossing type**
   - 1.1 Protected
   - 1.2 Unprotected
   - 2. User details
   - 2.1 Level crossing user type
   - 2.2 Age
   - 2.3 On own

#### 3. Description of issue / design feature

The environmental context of a rural level crossing reduces the awareness of approaching vehicle drivers.

#### 4. User behaviour

Rural level crossings, positioned amongst roads with few surrounding roadside structures are often missed by approaching vehicle drivers. The vehicle driver, progressing through country roads, is in a mind-set that is unlikely to be expecting hazard information or a warning system to appear. They may not register the presence of a crossing until they are nearly driving over it or they may miss it completely. The problem is further increased when crossings are located on bends, hills or foliage covers information signs.

#### 5. Sources of information

**6.1 Interview source**
- RAIL INDUSTRY
- Network Rail
- HSE/HMRI
- Other

**6.2 Level crossing visit - areas**
- Milton Keynes
- Doncaster
- Peterborough
- Redcar

**6.3 Document source**
- RAIL INDUSTRY
- Network Rail
- HSE/HMRI
- Other

**6.4 Document details**
- GOVERNMENT
- TRL (road)
- Independent
- Non-UK

---

Level crossings: communication and user behaviour issues

Ref 70  Creation date 27.08.2004  Last modified 02.02.2005

### Issue

#### Road markings

1. **Level Crossing type**
   - 1.1 Protected
   - 1.2 Unprotected
   - 2. User details
   - 2.1 Level crossing user type
   - 2.2 Age
   - 2.3 On own

#### 3. Description of issue / design feature

The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.

#### 4. User behaviour

Road markings are provided at some level crossings to help vehicle drivers stop their vehicle in a safe location during the activated warning system. It is important in preventing vehicles from parking underneath the lowering barriers and from positioning their vehicle too close to the train lines. Road markings that have been worn away reduce the effectiveness of informing vehicle drivers where they should stop. Markings are also a particularly important element in informing an irregular user of where they should locate their vehicle.

The importance of road markings in providing vehicle drivers with information has been highlighted by the road industry. Dramatic reductions in vehicle drivers running through red lights have been recorded when the ‘STOP’ line has been newly painted on road surfaces.

#### 5. Sources of information

**6.1 Interview source**
- RAIL INDUSTRY
- Network Rail
- HSE/HMRI
- Other

**6.2 Level crossing visit - areas**
- Milton Keynes
- Doncaster
- Peterborough
- Redcar

**6.3 Document source**
- RAIL INDUSTRY
- Network Rail
- HSE/HMRI
- Other

**6.4 Document details**
- GOVERNMENT
- TRL (road)
- Independent
- Non-UK
Level crossings: communication and user behaviour issues

Ref 71
Creation date 27.08.2004 Last modified 02.02.2005

Issue

Number of train lines

<table>
<thead>
<tr>
<th>Crossing type</th>
<th>1. Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/cctv</td>
<td>UWC</td>
</tr>
<tr>
<td>AOCL</td>
<td>AA</td>
<td>UWC/MWL</td>
</tr>
<tr>
<td>ABCL</td>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
<td>FP/MWL</td>
</tr>
<tr>
<td>RPC</td>
<td>BTP</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>User type</th>
<th>Level crossing user type</th>
<th>Age</th>
<th>On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horsedrier</td>
<td>16-20</td>
<td>Defined</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.

User behaviour

Users may perceive a single train line to present less of a risk than double train lines. Therefore users may see the opportunity to drive over or walk across the lines without observing the activated warning system or by behaving less cautiously at unprotected crossings.

This user behaviour is in line with the risk compensation theory; the user perceiving there to be less of a risk to themselves results in them behaving less cautiously.

5. Error type

Error
Violation

Sources of information

6. Interview source

RAIL INDUSTRY
Network Rail
RSSB
HSE/HMRI
RPC
BTP
OTHERS

6.2 Level crossing visit - areas

Milton Keynes
Doncaster
Hertford
Peterborough
Bedford
Redcar

6.3 Document source

RAIL INDUSTRY
HSE/HMRI
Network Rail
DfT (rail)
TRL (rail)
GOVERNMENT
TRL (road)
Independent
Railway GS
Other dept.
Non-UK

6.4 Document details

Level crossings: communication and user behaviour issues

Ref 72
Creation date 27.08.2004 Last modified 02.02.2005

Issue

Location near farms

<table>
<thead>
<tr>
<th>Crossing type</th>
<th>1. Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/cctv</td>
<td>UWC</td>
</tr>
<tr>
<td>AOCL</td>
<td>AA</td>
<td>UWC/MWL</td>
</tr>
<tr>
<td>ABCL</td>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
<td>FP/MWL</td>
</tr>
<tr>
<td>RPC</td>
<td>BTP</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>User type</th>
<th>Level crossing user type</th>
<th>Age</th>
<th>On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horsedrier</td>
<td>16-20</td>
<td>Defined</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
<td>50-60</td>
<td></td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.

Farm traffic tends to move at a much slower pace and impacts on the speed and general driving behaviour of other road vehicles.

High volumes of farm traffic using local roads to transport produce or move between farm land will impact on the behaviour of other vehicles traversing the level crossing. This may increase vehicle driver frustration and result in them overtaking on the approach to and while on the level crossing to avoid being held at the activated warning system.

5. Error type

Error
Violation

Sources of information

6. Interview source

RAIL INDUSTRY
Network Rail
RSSB
HSE/HMRI
RPC
BTP
OTHERS

6.2 Level crossing visit - areas

Milton Keynes
Doncaster
Hertford
Peterborough
Bedford
Redcar

6.3 Document source

RAIL INDUSTRY
HSE/HMRI
Network Rail
DfT (rail)
TRL (rail)
GOVERNMENT
TRL (road)
Independent
Railway GS
Other dept.
Non-UK

6.4 Document details

Bainton Green: a tractor using the crossing after leaving nearby farm land. Tractors combined with the position of the crossing on a straight road, its proximity to Lolham crossing and use as a regular shortcut route could impact heavily on the behaviour of other vehicle drivers.
### Issue

**Commercial traffic**

1. **Level Crossing type**
   - Protected
   - Unprotected

2. **User details**
   - Level crossing user type
   - Age

3. **Description of issue / design feature**
   - Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.

4. **User behaviour**
   - Commercial vehicle drivers, such as salespersons, work to strict timescales and therefore their driving behaviour is often influenced by having to reach destinations on time. Commercial drivers using a level crossing may be inclined to 'beat the lights' to avoid having to wait at the crossing, or they may fail to obey the correct crossing procedure at unprotected crossings.

5. **Error type**

6. **Sources of information**

### Issue

**Proximity of level crossing to another**

1. **Level Crossing type**
   - Protected
   - Unprotected

2. **User details**
   - Level crossing user type
   - Age

3. **Description of issue / design feature**
   - Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.

4. **User behaviour**
   - A road or geographical area may have more than one level crossings located in close proximity. If a driver is required to wait at one level crossing and then at the next, and so on, this may affect their risk taking behaviour. The vehicle driver may become agitated at being delayed at each level crossing and exhibit behaviour such as speeding to the approach of the next crossing to try and avoid being held again or crossing during the activated warning lights.

   This risk taking behaviour may be further increased at level crossings with lengthy barrier downtimes on busy rail lines or those with CCTV, as vehicle drivers know that if they are unable to get over each crossing they may be held at the crossing for a considerable time.

5. **Error type**

6. **Sources of information**
**Issue at a level crossing**

**Tallington CCTV:** The public house is located on the left-hand side of the crossing. The nearest homes are located on the other side and some locals often use the crossing in their vehicle or on foot while under the influence of alcohol.

**Issue at a level crossing**

**Tallington CCTV:** The public house is located on the left-hand side of the crossing. The nearest homes are located on the other side and some locals often use the crossing in their vehicle or on foot while under the influence of alcohol.

**Issue at a level crossing**

**Tallington CCTV:** The public house is located on the left-hand side of the crossing. The nearest homes are located on the other side and some locals often use the crossing in their vehicle or on foot while under the influence of alcohol.

**Issue at a level crossing**

**Tallington CCTV:** The public house is located on the left-hand side of the crossing. The nearest homes are located on the other side and some locals often use the crossing in their vehicle or on foot while under the influence of alcohol.
**Level crossings: communication and user behaviour issues**

**Issue**

1. **Level Crossing type**
   - 1.1 Protected
   - 1.2 Unprotected

2. **User details**
   - 2.1 Level crossing user type
   - 2.2 Age
   - 2.3 On own

3. **Description of issue / design feature**

4. **User behaviour**

5. **Error type**

6. **Sources of information**

---

**Level crossings: communication and user behaviour issues**

**Issue**

1. **Level Crossing type**
   - 1.1 Protected
   - 1.2 Unprotected

2. **User details**
   - 2.1 Level crossing user type
   - 2.2 Age
   - 2.3 On own

3. **Description of issue / design feature**

4. **User behaviour**

5. **Error type**

6. **Sources of information**

---

**Issue at a level crossing**

- Ware footpath: the user can stand in various positions to observe for oncoming trains, however it is unclear where they should not stand while observing for trains.

---

**Issue at a level crossing**

- While the user is waiting, they continue not to see a train for a lengthy period of time and perceive they have a sufficient period of safe time to cross within;
Level crossings: communication and user behaviour issues

Issue

Combined environmental features

1. Level Crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

Crossing type 2. User details

User behaviour

Issue at a level crossing

Combined environmental features

Level crossings: communication and user behaviour issues

Ref 79
Creation date 26.08.2004 Last modified 02.02.2005

1. Level crossing user type
   1.1 Protected
   1.2 Unprotected

2. Age
   2.3 On own

Crossing type 2. User details

User behaviour

An environmental feature on the approach to a level crossing may require the vehicle driver to divide their attention, however they can continue to concentrate on and manage the information regarding the crossing.

However, the combined affect of many environmental features, such as bends, hills, trees and hedges on the approach to a crossing, may result in increased decision making errors by the vehicle driver as their attention is diverted in accommodating a range of complex environmental features.

Error type

6. Sources of information

Level crossings: communication and user behaviour issues

Ref 80
Creation date 26.08.2004 Last modified 02.02.2005

3. Description of issue / design feature

Level crossings with a combination of environmental features, such as bends, hills, trees and hedges, may increase the decision making errors of vehicle drivers.

Cats-eyes

Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night.

User behaviour

Cats-eyes are located along the centre line and left hand-side of the road. They help vehicle drivers to see in advance the changes in road contour. Cats-eyes support approaching vehicle drivers to assess the position of the level crossing in relation to the road and the contour of the exit road. However, cats-eyes do deteriorate over a period of time and gradually fail to reflect any light, reducing their effectiveness in ‘guiding’ the vehicle driver along the road.

Cats-eyes are particularly important in rural locations when lighting from surrounding roadside structures will be at a minimum.

Error type

6. Sources of information

Level crossings: communication and user behaviour issues

Ref 81
Creation date 26.08.2004 Last modified 02.02.2005

3. Description of issue / design feature

Cats-eyes

Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night.

User behaviour

Cats-eyes are located along the centre line and left hand-side of the road. They help vehicle drivers to see in advance the changes in road contour. Cats-eyes support approaching vehicle drivers to assess the position of the level crossing in relation to the road and the contour of the exit road. However, cats-eyes do deteriorate over a period of time and gradually fail to reflect any light, reducing their effectiveness in ‘guiding’ the vehicle driver along the road.

Cats-eyes are particularly important in rural locations when lighting from surrounding roadside structures will be at a minimum.
Issue: Level crossings: communication and user behaviour issues

Sign pictogram

1. Level Crossing type
   - 1.1 Protected
   - 1.2 Unprotected

2. User details
   - 2.1 Level crossing user type
     - Pedestrian
     - Motorcyclist
     - Farmer
     - Passenger
     - Cyclist
     - Horse rider
     - Car driver
     - Train driver
     - Van driver
     - Other
     - HGV driver
   - 2.2 Age
     - 0-10
     - 11-15
     - 16-20
     - 20-35
     - 35-50
     - 50-60
     - 60+
   - 2.3 On own
     - Individual
     - Group
     - Undefined

3. Description of issue / design feature
   - The ‘Puffer’ sign does not convey any directly useful information to users.

4. User behaviour
   - The information presented to the vehicle driver or pedestrian on approaching the level crossing should identify the ‘potential hazard’ ahead of them and support them to adjust their behaviour accordingly.
   - Subject matter experts in the road industry have suggested the image of a ‘steam’ train does not support users in identifying with the modern standards of the railway and conveys no relevant information to approaching crossing users. Research has suggested there is no guidance in how this might affect user behaviour, but in our opinion it may lead to vehicle drivers not following the correct level crossing procedures.

5. Error type
   - Error
   - Violation

Sources of information

6. Interview source
   - RAIL INDUSTRY
   - ROAD INDUSTRY
   - Network Rail
   - Doncaster
   - Hertford
   - Bedford
   - Bedford
   - Redcar
   - RAIL INDUSTRY
   - GOVERNMENT
   - TRL (rail)
   - Independent
   - Railway GS
   - Other dept.
   - Non-UK

6. Level crossings: communication and user behaviour issues

Highway Code

1. Level Crossing type
   - 1.1 Protected
   - 1.2 Unprotected

2. User details
   - 2.1 Level crossing user type
     - Pedestrian
     - Motorcyclist
     - Farmer
     - Passenger
     - Cyclist
     - Horse rider
     - Car driver
     - Train driver
     - Van driver
     - Other
     - HGV driver
   - 2.2 Age
     - 0-10
     - 11-15
     - 16-20
     - 20-35
     - 35-50
     - 50-60
     - 60+
   - 2.3 On own
     - Individual
     - Group
     - Undefined

3. Description of issue / design feature
   - The highway code currently contains 278 rules for vehicle drivers.

4. User behaviour
   - The current issue of the Highway Code contains 278 rules. Since 1959, the rules have increased from just 90. With this quantity of rules to remember, the influence on vehicle drivers making errors in interpreting and understanding level crossing procedures is possible.
   - This is especially relevant considering vehicle drivers are not required to update their knowledge on the highway code at regular intervals, and as a minimum are only required to learn the code to obtain a full driving licence. The presence of any level crossings in the area where a learner vehicle driver is trained may also influence their competence in correctly obeying level crossing rules.

5. Error type
   - Error
   - Violation

Sources of information

6. Interview source
   - RAIL INDUSTRY
   - ROAD INDUSTRY
   - Network Rail
   - Doncaster
   - Hertford
   - Bedford
   - Bedford
   - Redcar
   - RAIL INDUSTRY
   - GOVERNMENT
   - TRL (rail)
   - Independent
   - Railway GS
   - Other dept.
   - Non-UK
### Level crossings: communication and user behaviour issues

**Ref 83**  
Creation date 26.08.2004  
Last modified 02.02.2005

#### Issue  

<table>
<thead>
<tr>
<th>Level Crossing type</th>
<th>User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Level Protected</td>
<td>2.1 Level crossing user type</td>
</tr>
<tr>
<td>AOCL</td>
<td>MCBIctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCI</td>
<td>AHB</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
</tr>
<tr>
<td>MCB</td>
<td>Furniture</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
</tr>
<tr>
<td>Cyclist</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>Other</td>
<td>50-80</td>
</tr>
</tbody>
</table>

#### 3. Description of issue / design feature

Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers.

#### 4. User behaviour

Vehicle speed is easily increased when travelling downhill, and with increased speed a vehicles stopping distance is also greatly increased. The road industry report increased red-light running at traffic lights when situated at the end of a road descent. This is also an issue that could apply level crossings.

Previous rail research suggested vehicle drivers may also be concerned at causing vehicle-vehicle collisions if they were to stop suddenly, which may further suggest why red-light running may be more prevalent at the end of a descent.

#### 5. Error type

<table>
<thead>
<tr>
<th>Error</th>
<th>Violation</th>
</tr>
</thead>
</table>

---

### Level crossings: communication and user behaviour issues

**Ref 84**  
Creation date 31.08.2004  
Last modified 02.02.2005

#### Issue  

<table>
<thead>
<tr>
<th>Level Crossing type</th>
<th>User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Level Protected</td>
<td>2.1 Level crossing user type</td>
</tr>
<tr>
<td>AOCL</td>
<td>MCBIctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCI</td>
<td>AHB</td>
</tr>
<tr>
<td>MG</td>
<td>MCB</td>
</tr>
<tr>
<td>MCB</td>
<td>Furniture</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
</tr>
<tr>
<td>Cyclist</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>Other</td>
<td>50-80</td>
</tr>
</tbody>
</table>

#### 3. Description of issue / design feature

Position of the camera at a level crossing influences the signallers ability to detect objects.

#### 4. User behaviour

The position of a CCTV camera varies from crossing to crossing. It may be located to the side of the crossing or positioned at one end. Various factors influence the effectiveness of the camera location, such as the direction of the sun (which could shine directly into the camera at certain times of the day or year).

However, the angle at which the camera is positioned also affects the signaller’s ability to assess whether the crossing is clear of vehicles, people or other objects.

#### 5. Error type

<table>
<thead>
<tr>
<th>Error</th>
<th>Violation</th>
</tr>
</thead>
</table>
Level crossings: communication and user behaviour issues

Issue

Passenger compliance with MWL

1. Passenger compliance with MWL

1.1 Level crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>MCBcctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>LWC</td>
</tr>
<tr>
<td>AHB</td>
<td>Undefined</td>
</tr>
<tr>
<td>MG</td>
<td>CC</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2. User details

2.1 Level crossing user type

<table>
<thead>
<tr>
<th>Level crossing user type</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWC</td>
<td>0-10</td>
</tr>
<tr>
<td>AC</td>
<td>11-15</td>
</tr>
<tr>
<td>Undefined</td>
<td>60+</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horse rider</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2.2 Age

<table>
<thead>
<tr>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
</tr>
<tr>
<td>11-15</td>
</tr>
<tr>
<td>16-20</td>
</tr>
<tr>
<td>20-35</td>
</tr>
<tr>
<td>35-50</td>
</tr>
<tr>
<td>50-60</td>
</tr>
</tbody>
</table>

2.3 On own

<table>
<thead>
<tr>
<th>On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
</tr>
<tr>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

The red light of a MWL is associated with the train the passengers have alighted from.

4. User behaviour

When passengers alight at a station, the active red light at the station foot crossing is assumed by passengers to be associated with the train they have just alighted from. Passengers continue to walk across the train tracks, even though the red light is active.

This issue is a problem at many train stations that have a station foot crossing with MWL. To help deal with the problem, some train companies are reminding passengers via the train public address system not to cross while the red light is active as it may refer to an oncoming train on the other line(s).

Group behaviour may also have an impact on many users choosing to cross once they have seen other passengers do so during times to make an assessment that a train is not scheduled to pass so it is therefore acceptable to walk while the red light is on.

These passengers may also use their knowledge about train times to make an assessment that a train is not scheduled to pass so it is therefore acceptable to walk while the red light is on.

The mindset of a commuter passenger may also contribute to them violating the red light. For example, they may be thinking about getting home and not concentrating on the immediate surroundings.

5. Sources of information

Error type

<table>
<thead>
<tr>
<th>Error type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
</tr>
<tr>
<td>Violation</td>
</tr>
</tbody>
</table>

Level crossings: communication and user behaviour issues

Issue

Train enthusiasts

1. Train enthusiasts

1.1 level crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>MCBcctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABCL</td>
<td>LWC</td>
</tr>
<tr>
<td>AHB</td>
<td>Undefined</td>
</tr>
<tr>
<td>MG</td>
<td>CC</td>
</tr>
<tr>
<td>MCB</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2. User details

2.1 Level crossing user type

<table>
<thead>
<tr>
<th>Level crossing user type</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWC</td>
<td>0-10</td>
</tr>
<tr>
<td>AC</td>
<td>11-15</td>
</tr>
<tr>
<td>Undefined</td>
<td>60+</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
</tr>
<tr>
<td>Farmer</td>
<td>Passenger</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horse rider</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
</tr>
<tr>
<td>HGV driver</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

2.2 Age

<table>
<thead>
<tr>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
</tr>
<tr>
<td>11-15</td>
</tr>
<tr>
<td>16-20</td>
</tr>
<tr>
<td>20-35</td>
</tr>
<tr>
<td>35-50</td>
</tr>
<tr>
<td>50-60</td>
</tr>
</tbody>
</table>

2.3 On own

<table>
<thead>
<tr>
<th>On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
</tr>
<tr>
<td>Group</td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

To view trains closely, people undertake risky behaviour at level crossings.

4. User behaviour

Level crossings provide an accessible point onto rail infrastructure and are often used by train enthusiasts, standing inside of the barrier to obtain a clear and unobstructed view of passing trains.

Some level crossings attract many train enthusiasts on a regular basis. These are organised meetings and are often advertised in local papers, indicating which crossings are suitable for obtaining a good view of particular trains. Level crossings positioned prior to a curve in the track are often used by enthusiasts as these provide a clear view of the train for a much longer period of time.

The vehicles parked by the enthusiasts on the approaches to level crossings also cause obstructions for other vehicle drivers approaching the crossing.

5. Sources of information

Error type

<table>
<thead>
<tr>
<th>Error type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
</tr>
<tr>
<td>Violation</td>
</tr>
</tbody>
</table>
### Level crossings: communication and user behaviour issues

**Issue at a level crossing**

**School parking**

<table>
<thead>
<tr>
<th>School parking</th>
<th>1. Level crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protected</td>
<td>1.1 AOCL</td>
<td>1.2 MCBcctv</td>
</tr>
<tr>
<td>2. Unprotected</td>
<td>1.1 AOCR</td>
<td>1.2 Undefined</td>
</tr>
</tbody>
</table>

**User details**

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Passenger</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Cyclist</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Horsedrider</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td>Car driver</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td>Train driver</td>
<td></td>
<td>Individual</td>
</tr>
<tr>
<td>Van driver</td>
<td></td>
<td>Individual</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>Individual</td>
</tr>
<tr>
<td>HGV driver</td>
<td></td>
<td>Individual</td>
</tr>
</tbody>
</table>

**3. Description of issue / design feature**

School drop-off and collection points close to level crossings affects the flow and behaviour of other vehicle drivers approaching the crossing.

**4. User behaviour**

Level crossings in the vicinity of schools are used by parents as accessible drop-off and collection points for their children, with vehicle drivers stopping on the crossing as well as on the approach and exit roads.

The position of these parked cars causes problems for other vehicle drivers traversing the level crossing. Their attention is diverted from the level crossing, to concentrate on avoiding and manoeuvring around the parked vehicles. They are also forced to drive down the centre line, resulting in conflicts with oncoming vehicles. The practice of dropping children at or collecting from school means that vehicles may be parked from some time.

**5. Sources of information**

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>RSAIB</td>
<td>Hertford</td>
<td>RSAIB</td>
<td>OTHER</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>HSE/HMRI</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td>Independent</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

**Issue at a level crossing**

**Proximity of different road speeds**

High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.

**4. User behaviour**

Different road speeds in close proximity may affect the speed at which vehicle drivers approach a level crossing. This may influence the vehicle driver in the following ways:

- The vehicle driver is conditioned to driving at the higher speed and maintains the same speed on the lower speed limit road; any small reduction in speed is perceived as considerable, even if it continues to be higher than the lower speed road limit.

The vehicle driver may then continue to cross over the level crossing at a speed which is inappropriate.

**5. Sources of information**

<table>
<thead>
<tr>
<th>6.1 Interview source</th>
<th>6.2 Level crossing visit - areas</th>
<th>6.3 Document source</th>
<th>6.4 Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>Milton Keynes</td>
<td>RAIL INDUSTRY</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>Network Rail</td>
<td>Doncaster</td>
<td>Network Rail</td>
<td>GOVERNMENT</td>
</tr>
<tr>
<td>RSAIB</td>
<td>Hertford</td>
<td>RSAIB</td>
<td>OTHER</td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Peterborough</td>
<td>HSE/HMRI</td>
<td>TRL (rail)</td>
</tr>
<tr>
<td>RPC</td>
<td>Bedford</td>
<td>RPC</td>
<td>Independent</td>
</tr>
<tr>
<td>BTP</td>
<td>Redcar</td>
<td>BTP</td>
<td>Non-UK</td>
</tr>
</tbody>
</table>

**Issue at a level crossing**
Level crossings: communication and user behaviour issues

### 6.1 Interview source

<table>
<thead>
<tr>
<th>Ref</th>
<th>Interview source</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>89</td>
<td>Network Rail</td>
</tr>
<tr>
<td>89</td>
<td>RSSB</td>
</tr>
<tr>
<td>89</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>89</td>
<td>RPC</td>
</tr>
<tr>
<td>89</td>
<td>BTP</td>
</tr>
<tr>
<td>89</td>
<td>OTHERS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref</th>
<th>Interview source</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>90</td>
<td>Network Rail</td>
</tr>
<tr>
<td>90</td>
<td>RSSB</td>
</tr>
<tr>
<td>90</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>90</td>
<td>RPC</td>
</tr>
<tr>
<td>90</td>
<td>OTHERS</td>
</tr>
</tbody>
</table>

### 6.2 Level crossing visit - areas

<table>
<thead>
<tr>
<th>Ref</th>
<th>Interview source</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>Milton Keynes</td>
</tr>
<tr>
<td>89</td>
<td>Doncaster</td>
</tr>
<tr>
<td>89</td>
<td>Hartford</td>
</tr>
<tr>
<td>89</td>
<td>Peterborough</td>
</tr>
<tr>
<td>89</td>
<td>Bedford</td>
</tr>
<tr>
<td>89</td>
<td>Redcar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref</th>
<th>Interview source</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>Milton Keynes</td>
</tr>
<tr>
<td>90</td>
<td>Doncaster</td>
</tr>
<tr>
<td>90</td>
<td>Hartford</td>
</tr>
<tr>
<td>90</td>
<td>Peterborough</td>
</tr>
<tr>
<td>90</td>
<td>Bedford</td>
</tr>
<tr>
<td>90</td>
<td>Redcar</td>
</tr>
</tbody>
</table>

### 6.3 Document source

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document source</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>89</td>
<td>Network Rail</td>
</tr>
<tr>
<td>89</td>
<td>HSE/HMRI</td>
</tr>
<tr>
<td>89</td>
<td>Others</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document source</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>90</td>
<td>Network Rail</td>
</tr>
<tr>
<td>90</td>
<td>RSSB</td>
</tr>
<tr>
<td>90</td>
<td>Independent</td>
</tr>
<tr>
<td>90</td>
<td>Others</td>
</tr>
</tbody>
</table>

### 6.4 Document details

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>P/s</td>
</tr>
<tr>
<td>89</td>
<td>le/dr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>OTHER</td>
</tr>
<tr>
<td>90</td>
<td>TRL (road)</td>
</tr>
<tr>
<td>90</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>90</td>
<td>Network Rail</td>
</tr>
<tr>
<td>90</td>
<td>RAIL INDUSTRY</td>
</tr>
</tbody>
</table>

### 6.5 Document source

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document source</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>89</td>
<td>Network Rail</td>
</tr>
<tr>
<td>89</td>
<td>RSSB</td>
</tr>
<tr>
<td>89</td>
<td>Independent</td>
</tr>
<tr>
<td>89</td>
<td>Others</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document source</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>90</td>
<td>Network Rail</td>
</tr>
<tr>
<td>90</td>
<td>Independent</td>
</tr>
<tr>
<td>90</td>
<td>Others</td>
</tr>
</tbody>
</table>

### 6.6 Document details

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td>P/s</td>
</tr>
<tr>
<td>89</td>
<td>le/dr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ref</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>OTHER</td>
</tr>
<tr>
<td>90</td>
<td>TRL (road)</td>
</tr>
<tr>
<td>90</td>
<td>RAIL INDUSTRY</td>
</tr>
<tr>
<td>90</td>
<td>Network Rail</td>
</tr>
<tr>
<td>90</td>
<td>RAIL INDUSTRY</td>
</tr>
</tbody>
</table>

---

### Issue

#### 1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCCL</td>
<td>MCBcctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Defined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FF/ML</td>
</tr>
<tr>
<td>MCB</td>
<td>TC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCCL</td>
<td>MCBcctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Defined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FF/ML</td>
</tr>
<tr>
<td>MCB</td>
<td>TC</td>
</tr>
</tbody>
</table>

#### 2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>11-15</td>
<td>Individual</td>
</tr>
<tr>
<td>Passenger</td>
<td>11-15</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>16-20</td>
<td>Individual</td>
</tr>
<tr>
<td>Horse rider</td>
<td>16-20</td>
<td>Individual</td>
</tr>
<tr>
<td>Car driver</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Train driver</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Van driver</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td>Other</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td>Undefined</td>
<td>50-60</td>
<td>Individual</td>
</tr>
</tbody>
</table>

#### 3. Description of issue / design feature

The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users.

#### 4. User behaviour

Operational feedback from experts indicates that level crossing warnings lose their effectiveness when they are not perceived as credible by crossing users. Regular users aware that a crossing has frequent reliability problems may choose to ignore an activated warning system, if they perceive the warning as false and want to avoid being kept at the crossing for a perceived unnecessary period of time. Certain conditions, combined with this perception may increase the chances of users crossing during an activated warning, such as having a clear view of the railway line and not seeing a train approach.

The perception of reliability may also affect the behaviour of other users. For example, if people inform others of how unreliable they perceive the crossing to be, this may influence them to ignore the activated warning system.

#### 5. Error type

- Error
- Violation

---

### Issue

#### 1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCCL</td>
<td>MCBcctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Defined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FF/ML</td>
</tr>
<tr>
<td>MCB</td>
<td>TC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCCL</td>
<td>MCBcctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Defined</td>
</tr>
<tr>
<td>ABCL</td>
<td>Undefined</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FF/ML</td>
</tr>
<tr>
<td>MCB</td>
<td>TC</td>
</tr>
</tbody>
</table>

#### 2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Farmer</td>
<td>11-15</td>
<td>Individual</td>
</tr>
<tr>
<td>Passenger</td>
<td>11-15</td>
<td>Individual</td>
</tr>
<tr>
<td>Cyclist</td>
<td>16-20</td>
<td>Individual</td>
</tr>
<tr>
<td>Horse rider</td>
<td>16-20</td>
<td>Individual</td>
</tr>
<tr>
<td>Car driver</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Train driver</td>
<td>20-35</td>
<td>Individual</td>
</tr>
<tr>
<td>Van driver</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td>Other</td>
<td>35-50</td>
<td>Individual</td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td>Individual</td>
</tr>
<tr>
<td>Undefined</td>
<td>50-60</td>
<td>Individual</td>
</tr>
</tbody>
</table>

#### 3. Description of issue / design feature

Perception of a hazard is improved when information referencing the imminent danger are associated together.

#### 4. User behaviour

A user’s detection of a hazard is improved when information about the danger is presented together with the imminent danger.

Therefore, the position of information warning vehicle drivers of the level crossing should be presented while also in view of the crossing. An information ‘void’ that does not convey the message nor the danger together does not strongly reinforce the presence of the crossing. A vehicle driver is less likely to be aware and suitably prepared for the hazard if they cannot see together information about the crossing hazard and the actual level crossing.

The road industry has undertaken similar research on the position of information signs on motorways and the point at which an action is required by the vehicle driver. The response to a prompt was most evident when the sign and point of where the action was required were seen together.

#### 5. Error type

- Error
- Violation
### Level crossings: communication and user behaviour issues

**Issue at a level crossing**

#### Vehicle speed zones

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>1.2 Unprotected</td>
</tr>
<tr>
<td>AOCL</td>
<td>undefined</td>
</tr>
<tr>
<td>MCB</td>
<td>CCTV</td>
</tr>
<tr>
<td>UNNC</td>
<td>undefined</td>
</tr>
<tr>
<td>UWC</td>
<td>undefined</td>
</tr>
<tr>
<td>UWC/CT</td>
<td>undefined</td>
</tr>
<tr>
<td>OC</td>
<td>undefined</td>
</tr>
<tr>
<td>P/F</td>
<td>undefined</td>
</tr>
<tr>
<td>FC</td>
<td>undefined</td>
</tr>
</tbody>
</table>

#### User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>10-15</td>
</tr>
<tr>
<td>Fisherman</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horsedr</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HGV driver</td>
<td>undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

#### Description of issue / design feature

The position of incremental speed restriction signs influences the speed of vehicle drivers when approaching the crossing.

### User behaviour

The position of incremental speed restriction signs on the approach to a level crossing can have an effect on the speed at which vehicle drivers approach and pass over the crossing.

### Double train lines

The space between two sets of double train lines provides users with a refuge point.

### Error type

<table>
<thead>
<tr>
<th>Error type</th>
<th>Error</th>
<th>Violation</th>
</tr>
</thead>
</table>

---

**Level crossings: communication and user behaviour issues**

**Issue at a level crossing**

#### Double train lines

<table>
<thead>
<tr>
<th>1. Level Crossing type</th>
<th>2. User details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Protected</td>
<td>1.2 Unprotected</td>
</tr>
<tr>
<td>AOCL</td>
<td>undefined</td>
</tr>
<tr>
<td>MCB</td>
<td>CCTV</td>
</tr>
<tr>
<td>UNNC</td>
<td>undefined</td>
</tr>
<tr>
<td>UWC</td>
<td>undefined</td>
</tr>
<tr>
<td>UWC/CT</td>
<td>undefined</td>
</tr>
<tr>
<td>OC</td>
<td>undefined</td>
</tr>
<tr>
<td>P/F</td>
<td>undefined</td>
</tr>
<tr>
<td>FC</td>
<td>undefined</td>
</tr>
</tbody>
</table>

#### User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>Motorcyclist</td>
<td>10-15</td>
</tr>
<tr>
<td>Fisherman</td>
<td>Passenger</td>
<td>11-15</td>
</tr>
<tr>
<td>Cyclist</td>
<td>Horsedr</td>
<td>16-20</td>
</tr>
<tr>
<td>Car driver</td>
<td>Train driver</td>
<td>20-35</td>
</tr>
<tr>
<td>Van driver</td>
<td>Other</td>
<td>35-50</td>
</tr>
<tr>
<td>HGV driver</td>
<td>undefined</td>
<td>50-60</td>
</tr>
</tbody>
</table>

#### Description of issue / design feature

The position of incremental speed restriction signs on the approach to a level crossing can have an effect on the speed at which vehicle drivers approach and pass over the crossing.

### User behaviour

Doubles sets of trains lines can be positioned so that the crossing has a 'refuge' point in the middle section. This section is often used by vehicle drivers and pedestrians when they are already on the crossing and see the lights being activated. They fail to continue moving over the crossing, believing the middle section a suitable and safe area to wait until the train passes.
Level crossings: communication and user behaviour issues

Issue

Distance between gates

1. Level Crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

Issue at a level crossing

4. User behaviour

If the overall distance between the gates is fairly wide, this will greatly increase the overall time taken to undertake the correct procedure of crossing 5 times. This impacts on the users willingness to comply with the correct crossing procedure.

If there is sufficient space to park a vehicle inside of the gate, but in front of the train track, users will prefer to do this to reduce the amount of crossings required to manoeuvre their vehicle across the tracks. Instead of following the correct procedure of crossing 5 times, the user only moves across the tracks once. Users benefit through a dramatic saving in time by choosing to park their vehicle inside of the gate.

However, the user may not be aware that the front of their vehicle might be too close or even protruding over the tracks. UWC users may also use vehicles of different lengths when crossing, some which may clear the tracks when parked inside the gate, while others may not.

5. Error type

6. Sources of information

Trespassers

1. Level Crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

3. Description of issue / design feature

Food and drink rubbish at a level crossing is often an indicator of young people using the crossing as a meeting place.

4. User behaviour

Young people are often happy to congregate around train lines and level crossings. Food and drink leftovers, such as takeaway cartons and drink cans can indicate that the crossing is not only being used as access but as a meeting place for groups of friends.

The use of crossings as a social area and over a continued period of time may lower the users' perception of how dangerous the crossing is, resulting in risk taking behaviour.

5. Error type

6. Sources of information

Level crossings: communication and user behaviour issues

Ref 95
Creation date 26.08.2004 Last modified 02.02.2005

Issue

Noise

1. Level Crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

straight roads

3. Description of issue / design feature
   Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing.

4. User behaviour
   Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour. Drivers often move on to the opposite side of the road when approaching and going over a level crossing. This issue is further compounded if the vehicle at the front of the queue has been progressing slowly and other vehicle drivers now resent the possibility of having to wait at the crossing.

5. Error type
   Error
   Violation

Sources of information

Level crossings: communication and user behaviour issues

Ref 96
Creation date 31.08.2004 Last modified 02.02.2005

Issue

Noise

1. Level Crossing type
   1.1 Protected
   1.2 Unprotected

2. User details
   2.1 Level crossing user type
   2.2 Age
   2.3 On own

straight roads

3. Description of issue / design feature
   Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing.

4. User behaviour
   Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour. Drivers often move on to the opposite side of the road when approaching and going over a level crossing. This issue is further compounded if the vehicle at the front of the queue has been progressing slowly and other vehicle drivers now resent the possibility of having to wait at the crossing.

5. Error type
   Error
   Violation

Sources of information
Level crossings: communication and user behaviour issues

Issue

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/ctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABOC</td>
<td>UWC/ML</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FF/ML</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>60+</td>
<td></td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Users who violate crossing procedures are not always male and in their twenties.

4. User behaviour

Users that fail to obey level crossing procedures are not always the stereotypical male in his twenties, sometimes referred to as the 'Boy Racer'.

Other groups of users, often perceived as law abiders, are known to cross without obeying crossing procedures. The following have all been identified as prominent groups of users who fail to follow level crossing procedures:

- Middle-aged family women and men;
- People from 'upper-class' groups;
- Parents with children;
- Coach drivers with tourists;
- Taxi drivers with passengers;
- Salespersons;
- Ramblers;
- Cyclists & Motorcyclists.

5. Error type

Error
Violation

6. Sources of information

6.1 Interview source

6.2 Level crossing visit - areas

6.3 Document source

6.4 Document details

Level crossings: communication and user behaviour issues

Issue

Train arrival

1. Level Crossing type

<table>
<thead>
<tr>
<th>1.1 Protected</th>
<th>1.2 Unprotected</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCL</td>
<td>MCB/ctv</td>
</tr>
<tr>
<td>AOCR</td>
<td>Undefined</td>
</tr>
<tr>
<td>ABOC</td>
<td>UWC/ML</td>
</tr>
<tr>
<td>AHB</td>
<td>OC</td>
</tr>
<tr>
<td>MG</td>
<td>FF/ML</td>
</tr>
<tr>
<td>MCB</td>
<td>FC</td>
</tr>
</tbody>
</table>

2. User details

<table>
<thead>
<tr>
<th>2.1 Level crossing user type</th>
<th>2.2 Age</th>
<th>2.3 On own</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian</td>
<td>0-10</td>
<td>Individual</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>11-15</td>
<td>Group</td>
</tr>
<tr>
<td>Farmer</td>
<td>16-20</td>
<td>Undefined</td>
</tr>
<tr>
<td>Passenger</td>
<td>20-35</td>
<td></td>
</tr>
<tr>
<td>Cyclist</td>
<td>35-50</td>
<td></td>
</tr>
<tr>
<td>HGV driver</td>
<td>50-60</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>60+</td>
<td></td>
</tr>
</tbody>
</table>

3. Description of issue / design feature

Activation of the warning lights is used by passengers as a train arrival indicator.

4. User behaviour

Passengers are using the activation of the warning lights as an indicator of their train arriving at the station. Because users are leaving their decision to progress to the platform on the light activation, users are dashing across the level crossing at the last moment.

Passengers walking on the approach to the level crossing know whether they need to run over the crossing to catch their train, by observing the warning lights.

At one level crossing, a board has been positioned next to the station car park to block the view of the warning lights from passengers sitting in their cars. Passengers were waiting in the warmth and comfort of their cars and then rushing across the level crossing to the other platform once the lights were activated.

5. Error type

Error
Violation

6. Sources of information

6.1 Interview source

6.2 Level crossing visit - areas

6.3 Document source

6.4 Document details
Level crossings: communication and user behaviour issues

Ref 99 Creation date 31.08.2004 Last modified 02.02.2005

Issue

Sightlines

1. Level Crossing type

1.1 Protected

2. User details

1.2 Unprotected

<table>
<thead>
<tr>
<th>AOCL</th>
<th>MCBcctv</th>
<th>Undefined</th>
<th>UWC</th>
<th>UWC/T</th>
<th>UWC/MWL</th>
<th>OC</th>
<th>HC</th>
<th>FP</th>
<th>MWL</th>
<th>TC</th>
</tr>
</thead>
</table>

2.1 Level crossing user type

2.2 Age

2.3 On own

<table>
<thead>
<tr>
<th>Pedestrian</th>
<th>Motorcyclist</th>
<th>Farmer</th>
<th>Passenger</th>
<th>Cyclist</th>
<th>Horse rider</th>
<th>Car driver</th>
<th>Train driver</th>
<th>Van driver</th>
<th>Other</th>
<th>HGV driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>11-15</td>
<td>16-20</td>
<td>20-35</td>
<td>35-50</td>
<td>50-60</td>
<td>60+</td>
<td>Defined</td>
<td>Defined</td>
<td>Defined</td>
<td>Defined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual</th>
<th>Group</th>
<th>Undefined</th>
</tr>
</thead>
</table>

| ABCL | AOCR | AHB | MG | MCB | Undefined | UC | OC | WP | MWL | TC |

3. Description of issue / design feature

Restricted or blocked sightlines may encourage users to move past a point of safety.

4. User behaviour

At crossings that have restricted sightlines along the tracks, this may result in users moving beyond a position of safety to view for oncoming trains along the tracks.

This may be a particular problem at AOCL’s because of the lack of any physical barrier across the road. After waiting a period of time, vehicle drivers may creep forward past a point of safety to view along the tracks. Without the driver knowing, their vehicle may be positioned over the tracks and in the path of an oncoming train.

5. Error type

| Error | Violation |

Issue at a level crossing

Level crossings: communication and user behaviour issues

Ref 100 Creation date 26.08.2004 Last modified 02.02.2005

Issue

Communication with signaller

1. Level Crossing type

1.1 Protected

2. User details

1.2 Unprotected

<table>
<thead>
<tr>
<th>AOCL</th>
<th>MCBcctv</th>
<th>Undefined</th>
<th>UWC</th>
<th>UWC/T</th>
<th>UWC/MWL</th>
<th>OC</th>
<th>HC</th>
<th>FP</th>
<th>MWL</th>
<th>TC</th>
</tr>
</thead>
</table>

2.1 Level crossing user type

2.2 Age

2.3 On own

<table>
<thead>
<tr>
<th>Pedestrian</th>
<th>Motorcyclist</th>
<th>Farmer</th>
<th>Passenger</th>
<th>Cyclist</th>
<th>Horse rider</th>
<th>Car driver</th>
<th>Train driver</th>
<th>Van driver</th>
<th>Other</th>
<th>HGV driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>11-15</td>
<td>16-20</td>
<td>20-35</td>
<td>35-50</td>
<td>50-60</td>
<td>60+</td>
<td>Defined</td>
<td>Defined</td>
<td>Defined</td>
<td>Defined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual</th>
<th>Group</th>
<th>Undefined</th>
</tr>
</thead>
</table>

| ABCL | AOCR | AHB | MG | MCB | Undefined | UC | OC | WP | MWL | TC |

3. Description of issue / design feature

The dialogue between the level crossing user and the signaller may impact on the behaviour of the user.

4. User behaviour

The type of dialogue used between the user and the signaller may affect the behaviour of the user at the level crossing.

Rail specific terminology used by the signaller may be misunderstood and incorrectly interpreted by the user.

Inconsistencies in information provided by the signaller from one call to another may also result in misinterpretation of instructions by the user. This may come about from heavy use of a crossing, with the signaller having to provide continued feedback to users, therefore affecting the depth and quality of information provided on each phonecall.

The information provided by the user also affects the decisions and replies provided by the signaller. If the user provides inaccurate or false information, or through continued use of a crossing, provides insufficient detail during each phonecall, this may result in the signaller giving permission for the user to cross when in fact it is unsafe for them to do so.

5. Error type

| Error | Violation |

6. Sources of information

6.1 Interview source

6.2 Level crossing visit - areas

6.3 Document source

6.4 Document details
1. Category

1.1 Level type

1.1.1 Protected

1.1.2 Unprotected

1.2 Age

1.2.1 0-10

1.2.2 11-15

1.2.3 16-20

1.2.4 20-35

1.2.5 35-50

1.2.6 50-60

1.2.7 60+

1.3 Level crossing type

1.3.1 Vehicle

1.3.2 Footpath

1.4 Level crossing user type

1.4.1 Motorcyclist

1.4.2 Motorised

1.4.3 Motorised or pedestrian

1.5 User details

1.5.1 On own

1.5.2 On own or with others

1.5.3 On own or walking over the rubber floor surfaces

2. Source of information

2.1 Interview source

2.1.1 Milton Keynes

2.1.2 Doncaster

2.1.3 Peterborough

2.1.4 Bedford

2.1.5 Redcar

2.2 Level crossing visit - areas

2.2.1 Network Rail

2.2.2 DfT

2.2.3 HSE

2.2.4 Independent

2.3 Document source

2.3.1 Network Rail

2.3.2 Transport

2.3.3 Independent

2.4 Document details

2.4.1 Network Rail

2.4.2 Rail

2.4.3 Independent

2.5 Error type

2.5.1 Error

2.5.2 Violation
Level crossings: communication and user behaviour issues

Issue

1. **Level Crossing type**
   - 1.1 Protected
   - 1.2 Unprotected

2. **User details**
   - 2.1 Level crossing user type
   - 2.2 Age
   - 2.3 On own

Emergency services

<table>
<thead>
<tr>
<th>AOCL</th>
<th>MBCctv</th>
<th>Undefined</th>
<th>LWC</th>
<th>Undefined</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOCR</td>
<td>Defined</td>
<td>LWC/ML</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABCL</td>
<td>Defined</td>
<td>OC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHB</td>
<td></td>
<td>FP/ML</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG</td>
<td></td>
<td>TC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**User type**
- Pedestrian
- Motorcyclist
- Farmer
- Passenger
- Cyclist
- Horse rider
- Car driver
- Train driver
- Van driver
- Other
- HGV driver

**On own**
- Individual
- Group
- Undefined

**Age**
- 0-10
- 11-15
- 16-20
- 20-35
- 35-50
- 50-60
- 60+

**Sources of information**

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>MBC ctv</td>
<td>RAIL INDUSTRY</td>
<td></td>
</tr>
<tr>
<td>Network Rail</td>
<td>Defined</td>
<td>HSE/HMRI</td>
<td></td>
</tr>
<tr>
<td>RSIB</td>
<td>Bus drivers</td>
<td>Network Rail</td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Undefined</td>
<td>DIT (rail)</td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td></td>
<td>DIT (road)</td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td>O U T H E R S</td>
<td>Independent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Railway GS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other dept.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-UK</td>
<td></td>
</tr>
</tbody>
</table>

**User behaviour**

No vehicles, including those of the emergency services, are legally permitted to pass the activated warning system at a level crossing.

Level crossings located on roads used frequently by the emergency services may result in increased risk taking behaviour.

The ability of the vehicle drivers or other users to detect the presence of a level crossing, hazard information, warning lights or an approaching train is impaired by fog. The impact of fog on users behaviour may result in users undertaking risky behaviour such as failing to take account of warning information or failing to see oncoming trains.

5. **Error type**

- Error
- Violation

6. **Sources of information**

<table>
<thead>
<tr>
<th>Interview source</th>
<th>Level crossing visit - areas</th>
<th>Document source</th>
<th>Document details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL INDUSTRY</td>
<td>MBC ctv</td>
<td>RAIL INDUSTRY</td>
<td></td>
</tr>
<tr>
<td>Network Rail</td>
<td>Defined</td>
<td>HSE/HMRI</td>
<td></td>
</tr>
<tr>
<td>RSIB</td>
<td>Bus drivers</td>
<td>Network Rail</td>
<td></td>
</tr>
<tr>
<td>HSE/HMRI</td>
<td>Undefined</td>
<td>DIT (rail)</td>
<td></td>
</tr>
<tr>
<td>RPC</td>
<td></td>
<td>DIT (road)</td>
<td></td>
</tr>
<tr>
<td>BTP</td>
<td>O U T H E R S</td>
<td>Independent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Railway GS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other dept.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-UK</td>
<td></td>
</tr>
</tbody>
</table>

**User behaviour**

The effectiveness of visual information is impaired by fog.
5 Validation

5.1 Objective

The validation exercise was carried out to assess the feasibility of assigning HF issues to level crossings. This is a precursor to the development of tools and approaches for inspectors.

5.2 Method

5.2.1 Location

The area of Helpston (figure 15), near Peterborough, was selected for carrying out the validation exercise. The signal box in Helpston, quantity of level crossings, different road infrastructures and level crossing users within a relatively small geographical area, made it an ideal location.

![Figure 15 Helpston and the surrounding villages.](image)

The following level crossings were used for the validation exercise;

- Helpston: MCB
- Maxey: CCTV
- Lolham: CCTV
- Tallington: CCTV
- Bainton Green: AHB9
- Fox Covert: FP9

5.2.2 Timescale

The exercise was conducted over a total of four days, 5th October and 19-21st October, 2004.

5.2.3 Process

The process used for assigning specific HF issues to level crossings is broken down into the following tasks; a, b, c, and d (figure 16).

- Task a: select level crossing types to be reviewed and extract relevant HF issues from database.
- Task b: issues relevant to each crossing type are assessed using ‘Observations’, ‘Physical evidence’ and ‘Interviews’.
- Task c: a set of final HF issues are assigned to each crossing.
- Task d: new HF issues identified from task b are fed back into database.
Three techniques were applied for assigning the human factors issues at each of the 9 level crossings; Observations, Physical evidence and Interviews (task b).

5.2.3.1 Observations
During the validation exercise, observations were carried out at the level crossings. This involved spending periods of time at the crossing and observing the behaviour of users. Any issues from the database that were confirmed from observing users were recorded against a data sheet with issues relevant to that specific type of crossing. All observations were video recorded.

5.2.3.2 Physical evidence
A review of the physical aspects of each crossing and its immediate surroundings were made.

This involved verifying the presence of issues from any physical evidence. For example, a nearby ‘road junction’, ‘farm land’ in the vicinity of the crossing, ‘traffic calming system’ or ‘type of trains’. An assessment of the crossing from a user’s perspective, both on foot and from a vehicle was also made to ensure all physical evidence was confirmed. Any issues established through this process were recorded on the data sheet.

Still photographs and video footage were taken to record each identified issue.

5.2.3.3 Interviews
Contact was made with key persons within the Helpston area. These contacts were used for the interview stages of the validation exercise.

The type of users sourced for the interviews were chosen to ensure that each of the following ‘characteristics’ were covered by at least one person:

- Local to area
- Represented community
• Business user9
• Rail industry member9

Response from the local community and railway industry was forthcoming and the 9 following users agreed to participate:9
• Joe Dobson, Parish Councillor for Helpston 9
• Pc Dave Roberston, BTP9
• Fred Mann, Warden of local Glinton College9
• Mark Delaine-Smith, Delaine Buses (and drivers)9
• Signallers at Helpston signal box9

The use of local knowledge is a valuable method for gaining insights into the behaviour 9 of level crossing users. However, correctly defining the boundaries of each interview 9 is key to ensuring the discussion generates HF issues and the reasons behind user 9 behaviour, and not on ‘fault-finding’ with individual users or any industry. Each 9 interviewee was provided with a set of guidelines prior to the interview, which 9 detailed some examples of HF issues. These examples provided a framework for the 9 discussion and facilitated users to talk around the issues, ensuring maximum output 9 from the interview.9

Interviews were carried out with people either at their place of work, home or during 9 visits to the local level crossings. The visits to crossings with users can assist in 9 confirming many HF issues. The context-specific environment supported the user 9 in their discussion of issues and helped uncover additional minor details about user 9 behaviour relevant to each individual crossing. 9

During each interview, the HF issues previously confirmed as relevant to each level 9 crossing were reviewed, as well as all HF issues relevant to the type(s) of crossing. 9

5.3 Findings

The following tables list the identified human factors issues for each level crossing. 9 Each table gives the reference number, name and description for each issue. The 9 issues are not ranked in terms of their level of risk, but are presented in numerical 9 order.9

An indication of how the human factors issues were identified is also provided. A 9 colour-coding key has been used to show whether an issue was identified through 9 Observation, Physical evidence or Interview. An issue may have been identified by 9 one, two or all three of the techniques. 9

5.3.1 Generating information through interviews

The colour coding clearly shows that the interview technique identified the majority of 9 issues for all level crossings, followed by physical evidence and then observations.9
Not only did the interviews identify which issues were relevant, they also uncovered a breadth of knowledge about the resultant behaviour of users. This additional information on user behaviour has been included within the database.

Many of the issues and associated behaviours of users would not have been captured through using just evidence at the crossing or from observing users for interim periods of time. The inclusion of interviews with local users and those from the rail industry has generated extensive feedback on HF issues and user behaviour.

5.3.2 Assigned HF issues

Tables are provided for Helpston (table 3), Tallington (table 4), Maxey (table 5), Lolham (table 6), Bainton Green (table 7) and Fox Covert (table 8) level crossings. Photographic evidence of some of the issues are provided at the end of each table.

<table>
<thead>
<tr>
<th>Ref</th>
<th>Issue identified</th>
<th>Description</th>
<th>O</th>
<th>P</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Weather: Ice</td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Users familiarity with a crossing</td>
<td>Regular users are more likely to undertake risky behaviour when crossing. Those living close to level crossings often behave less cautiously when using the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Vehicle approach speed</td>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Pedestrian access</td>
<td>Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Groups</td>
<td>People in groups may undertake more risky behaviour, than when on their own (figure 18).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Time of day</td>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Presence of rail staff</td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable impact on level crossing user behaviour.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Closure time</td>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Audible alarm</td>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Conspicuity of flashing lights</td>
<td>The effectiveness of flashing lights is limited be veiling glare, limited light output and their position.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Days of the week</td>
<td>Risk taking behaviour at level crossings increases on working days.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Animals: Horses</td>
<td>Activated protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Observation of amber light</td>
<td>The length of activation of the amber light has little affect on the behaviour of vehicle drivers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Events</td>
<td>Events increase the amount of irregular users at level crossings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Location near major roads</td>
<td>The risk of vehicle drivers blocking-back over the level crossing or general risk taking behaviour is increased when the crossing is located on roads with direct access to major roads and motorways.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Traffic calming systems</td>
<td>Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back (figure 19).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Location near farms</td>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Public houses</td>
<td>Crossing located on-route to public houses may result in increased violations of crossing procedures.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Train enthusiasts</td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Proximity of different road speeds</td>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing (figure 20).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>Vehicle speed zones</td>
<td>The position of incremental speed restriction signs influences the speed of vehicle drivers on approaching the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Double train lines</td>
<td>The space between two sets of double train lines provides users with a refuge point.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Straight roads</td>
<td>Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at a level crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Stereotypical crossing users</td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Weather: Fog</td>
<td>The effectiveness of visual information is impaired by fog.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 18**
13: many young children use the Helpston crossing, before and after school on cycles and by foot. Children in groups undertake more risky behaviour than children on their own.

**Figure 19**
57: The local traffic calming scheme can cause blocking-back problems over the crossing. Additional schemes on the other side of the crossing was considered inappropriate.

**Figure 20**
88: the 30mph zone is positioned very close to the crossing, after a 60mph straight road. It provides very limited time for vehicles drivers to adjust their behaviour.
### Table 4

**Tallington: CCTV**

<table>
<thead>
<tr>
<th>Ref</th>
<th>Issue identified</th>
<th>Description</th>
<th>O</th>
<th>P</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Weather: Ice</td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Users familiarity with a crossing</td>
<td>Regular users and those living close to level crossings are more likely to undertake risky behaviour when using the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Representation of HGV users</td>
<td>HGV drivers form a disproportionately high number of incidents at level crossings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Time of day</td>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Visual clutter</td>
<td>Superfluous information and roadside structures on the approach to the crossing may reduce user’s detection of level crossing information and warning signs (figure 21).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Closure time</td>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Days of the week</td>
<td>Risk taking behaviour at level crossings increases on working days.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Observation of amber light</td>
<td>The length of activation of the amber light has little affect on the behaviour of vehicle drivers (figure 22).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Location near farms</td>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Public houses</td>
<td>Crossing located on-route to public houses may result in increased violations of crossing procedures (figure 23).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Train enthusiasts</td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Stereotypical crossing users</td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 21**

15: the approach to Tallington is cluttered with yellow advertising signs and a yellow branded petrol station. These all make it very difficult for approaching vehicle drivers to identify the similar coloured crossing signage.

**Figure 22**

48: drivers have been observed ignoring the amber light, although they have had sufficient time to stop at the lights. The vehicle driver approaching the crossing continues to drive straight over.

**Figure 23**

75: some users of the local public house use the crossing while under the influence of alcohol. The BTP have been called to this crossing to clear it of nuisance users who jump the barriers.
<table>
<thead>
<tr>
<th>Ref</th>
<th>Issue identified</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Weather: Ice</td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of users.</td>
</tr>
<tr>
<td>04</td>
<td>Users familiarity with a crossing</td>
<td>Regular users and those living close to level crossings are more likely to undertake risky behaviour when crossing when using the crossing (figure 24).</td>
</tr>
<tr>
<td>11</td>
<td>Pedestrian access</td>
<td>Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.</td>
</tr>
<tr>
<td>14</td>
<td>Time of day</td>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
</tr>
<tr>
<td>16</td>
<td>Presence of rail staff</td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable impact on level crossing user behaviour.</td>
</tr>
<tr>
<td>18</td>
<td>Closure time</td>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
</tr>
<tr>
<td>20</td>
<td>Audible alarm</td>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
</tr>
<tr>
<td>22</td>
<td>Conspicuity of flashing lights</td>
<td>The effectiveness of flashing lights is limited be veiling glare, limited light output and their position.</td>
</tr>
<tr>
<td>25</td>
<td>Users perception of train speed and distance</td>
<td>Train speed and distance is underestimated by users, which may result in increased decision making errors by users at level crossings.</td>
</tr>
<tr>
<td>26</td>
<td>Foliage on roadside</td>
<td>The effectiveness of information on the approach to the level crossing is reduced by overgrown foliage (figure 25).</td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
</tr>
<tr>
<td>42</td>
<td>Days of the week</td>
<td>Risk taking behaviour at level crossings increases on working days.</td>
</tr>
<tr>
<td>45</td>
<td>Animals: Horses</td>
<td>Activated protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road vehicle users.</td>
</tr>
<tr>
<td>48</td>
<td>Observation of amber light</td>
<td>The length of activation of the amber light has little affect on the behaviour of vehicle drivers.</td>
</tr>
<tr>
<td>63</td>
<td>Housing developments</td>
<td>Housing developments increase road traffic and level crossing use.</td>
</tr>
<tr>
<td>70</td>
<td>Road markings</td>
<td>The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.</td>
</tr>
<tr>
<td>72</td>
<td>Location near farms</td>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
</tr>
<tr>
<td>86</td>
<td>Train enthusiasts</td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
</tr>
<tr>
<td>88</td>
<td>Proximity of different road speeds</td>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing (figure 26).</td>
</tr>
<tr>
<td>92</td>
<td>Double train lines</td>
<td>The space between two sets of double train lines provides users with a refuge point.</td>
</tr>
</tbody>
</table>
97 Stereotypical crossing users Users who violate crossing procedures are not always male and in their twenties.

104 Weather: Fog The effectiveness of visual information is impaired by fog.

**Figure 24**
04: local users living next to the crossing have consistently undertaken risky behaviour when crossing at Maxey.

**Figure 25**
26: the level crossing sign, positioned on the left-hand side is obscured from the vehicle driver’s view.

**Figure 26**
88: the 30mph zone is positioned close to the crossing, after a 60mph zone on a long straight road.

---

**Table 6**
Lotham: CCTV

<table>
<thead>
<tr>
<th>Ref</th>
<th>Issue identified</th>
<th>Description</th>
<th>O</th>
<th>P</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Weather: Ice</td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Users familiarity with a crossing</td>
<td>Regular users and those living close to level crossings are more likely to undertake risky behaviour using the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Closure time</td>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Foliage on roadside</td>
<td>The effectiveness of information on the approach to the level crossing is reduced by overgrown foliage.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Days of the week</td>
<td>Risk taking behaviour at level crossings increases on working days.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Animals: Horses</td>
<td>Activated protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Observation of amber light</td>
<td>The length of activation of the amber light has little affect on the behaviour of vehicle drivers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Narrow roads</td>
<td>Narrow roads before and after the level crossing may result in drivers slowing and stopping while on the level crossing (figure 27).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Vehicle shortcuts</td>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers (figure 28).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Road markings</td>
<td>The effectiveness of drivers stopping in the correct location is impaired by worn road markings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Location near farms</td>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ref</td>
<td>Issue identified</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Users familiarity with a crossing</td>
<td>Regular users are more likely to undertake risky behaviour when crossing. Those living close to level crossings often behave less cautiously when using the crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Road junctions</td>
<td>Road junctions close to the level crossing may result in increased decision making, possible errors by vehicle drivers and blocking-back over the crossing (figure 30).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Vehicle approach speed</td>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Presence of rail staff</td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable impact on level crossing user behaviour.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Sunlight strobing</td>
<td>Sunlight passing through lines of trees positioned on the side of the road, imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Half barrier</td>
<td>Automatic half barriers facilitate vehicle drivers to undertake risk taking behaviour (figure 31).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>User perception of train speed and distance</td>
<td>Train speed and distance is underestimated by users, which may increase the decision making errors of users at level crossings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Foliage on roadside</td>
<td>The effectiveness of information on the approach to a level crossing is reduced by overgrown foliage.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Visitor parking</td>
<td>The position of visitor’s parked vehicles at a level crossing may affect the behaviour of other road users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Days of the week</td>
<td>Risk taking behaviour at level crossings increases on working days.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Animals: Horses</td>
<td>Activated protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Observation of amber light</td>
<td>The length of activation of the amber light has little affect on the behaviour of vehicle drivers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Vehicle shortcuts</td>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Location near farms</td>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing (figure 32).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Proximity of level crossing to another</td>
<td>Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Public houses</td>
<td>Crossing located on-route to public houses may result in increased violations of crossing procedures.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Straight roads</td>
<td>Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at a level crossing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Stereotypical crossing users</td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Weather: Fog</td>
<td>The effectiveness of visual information is impaired by fog.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 30**
06: two road junctions cross before leading to Bainton Green crossing. The complexity of this junction leads to vehicle drivers having to focus on a variety of different information cues, especially during rush-hours when this is used as a shortcut route.

**Figure 31**
24: Bainton Green is a half barrier crossing. Zig-zagging has been observed by locals.

**Figure 32**
72: the route over Bainton is used heavily by local farmers. The straight road and shortcut route combined with slow farming traffic may influence some vehicle drivers to overtake while approaching the crossing.
<table>
<thead>
<tr>
<th>Ref</th>
<th>Issue identified</th>
<th>Description</th>
<th>O</th>
<th>P</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Users familiarity with a crossing</td>
<td>Regular users and those living close to level crossings are more likely to undertake risky behaviour when using level crossings (figure 35).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Frequency of trains</td>
<td>Crossing with a low frequency of trains are likely to increase the risk taking behaviour of regular users (figure 36).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Regularity of trains</td>
<td>Variations in train schedules, such as engineering work, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Groups</td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Time of day</td>
<td>Risk taking behaviour increases during rush-hours, at midday and at the beginning and end of the school day.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Darkness</td>
<td>Unprotected crossings used during hours of darkness may lead to increased decision making errors by crossing users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>User perception of train speed and distance</td>
<td>Train speed and distance is underestimated by users, which may increase the decision making errors of users at level crossings.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Trespassing on rail structures</td>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Train speeds</td>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Sighting distance</td>
<td>Good sighting distance should indicate the crossing as high risk (figure 34).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Crossing utilisation</td>
<td>Level crossings with high crossing utilisation increases the risks to users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>Trespassers</td>
<td>Food and drink rubbish at a level crossing is often an indicator of young people using the crossing as a meeting place (figure 33).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>Noise</td>
<td>Noisy surroundings may impair the performance of users to detect trains at level crossings (figure 34).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 8**

*Fox Covert: FP*

30: railway construction material had been left alongside the crossing, with easy access for children.
94: evidence of food and drink rubbish indicated it was used as a meeting place.
33: the sighting distance is long in both directions, and from both sides of the crossing.
95: the local by-pass bridge in the distance produces considerable noise from passing vehicles.
04: local school children use this crossing on a regular basis. This cycle rider failed to look when crossing.
05: the cyclist also commented on the low frequency of trains, and often never seeing a train when crossing in the morning or evening.
5.4 Feasibility of ranking issues

The human factors issues identified from the validation exercise have not been ranked in terms of their importance or by level of risk. The interview technique provides an excellent source for establishing what issues do exist, however some issues may have more of an impact on certain individuals. Therefore any system of ranking would be greatly dependent upon how important they were to a local user.

5.5 Value of the validation exercise

The application of Observations, Physical evidence and Interviews has been successful in assigning human factors issues to level crossings. This process will be used as a guide for developing the tools and approaches for Inspectors.

A matrix of all database issues is provided in appendix B. It provides an overview of those issues assigned at each crossing and the method by which is was confirmed.
References

All references are coded to help identify the sources of information included within the database. Generally, coding is applied by using the first two letters of the authors' surname and then the first two letters of the document title.  


For documents with an organisation as the author, such as Health & Safety Executive, or Australian Transport Council, the organisations acronym will be used and then followed by the first two letters of the document title.  


Where a Railway Group Standard is referenced, the document code is the standards full reference number, i.e., [GC/RT5208].

For all World Wide Web sources without a specific author, for example an information sheet, the document code uses the first two letters of the web page title and is proceeded with www. I.e., www.betterroads.com/articles/brdec00a.htm, At-grade 9 incidents and fatalities continue to decline [www/at].


[bi/hu] Bibby, J. & Regan, J., 19 7, Human factors research into use of user-worked
level crossings - a report produced for the Health and Safety Executive, AEA 9 Technology, www.hse.gov.uk 9


[co/gu] Code of practice for the co-ordination of street works etc., Guidelines for Works at or near Railtrack level crossings: Appendix F, Street works at or near 9 level crossings9


[dft/in1] Department for Transport (date unknown), Influencing driver attitudes and behaviour (no.17), www.dft.gov.uk 9


[dft/oil] Department for Transport (date unknown), Older drivers: a literature review (no.25), www.dft.gov.uk 9


[fu/th] Fuller, R., 19 2, The psychology of road user behaviour, Department of 9 Psychology, Trinity College, Dublin9

GC/RT5208, 19 7, Civil Engineering Requirements for Level Crossings, issue 19

GE/RT8000, TW8, 2003, Level crossings, issue 19

[hse/th] Health & Safety Executive, 19 1, The Car Lane Accident, HMSO Books: 9 London9

[hse/tr] Health & Safety Executive, 2004, Train derailment at Ufton level crossing, near Ufton Nervet, Berkshire: HSE interim report, HSE website9

[he/ma] Heaton, J., 19 3, Making occupation crossings safer, Modern Railways, 9 19 3, issue 9, pp 531-319


[in/te] Technical tour: Delegate pack, 8th International Level Crossing Symposium 9 and Managing Trespass Seminar 2004, Sheffield, UK 9


[ma/ro] Maycock, G., Brocklebank, P.J. & Hall, R.D., 19 8, Road layout design standards and driver behaviour, TRL report no. 332 for Highways Agency9


[me/ac] Meeker, F., Fox, D. & Weber, C., 19 7, A comparison of driver behaviour at railroad grade crossings with two different protection systems, Accident Analysis 9 & Prevention, vol.29, issue 1, pp 11-16 9


[ne/ri] Newsome, L. R., 1974, Risk taking as a decision process in driving, TRL 9 report no. SR81, for Department of the Environment Transport Regions (now known as 9 Department for Transport)9

[no/pr] North Carolina Department of Transportation Rail Division, 19 , Prior driver performance and expressed attitudes towards risk factors as factors associated with railroad grade crossing violations, www.hsrc.unc.edu/research/human_9 driver.htm9


[ri/mo] Richards, S.H. & Heathington, K.W., 19 8, Motorist understanding of railroad-highway grade crossing traffic control devices and associated traffic laws, Traffic Control Devices 19 8, Transportation Board, Transportation Research 9 record 1160 9

RT/LS/S/012, 2002, Inspection and risk assessment forms for user-worked, footpath and bridleway level crossings, issue 3, Network Rail 9

RT/LS/P/026, 2002, Inspection and risk assessment methodology for user-worked, footpath and bridleway level crossings, issue 2, Network Rail 9

RT/E/S/11189, 2000, Level crossing ground plans (Railtrack Line specification), 9 Network Rail 9


RT/CE/S/040, 19 7, Level crossing surface systems (Railtrack line specification), 9 Network Rail 9

RT/D/P/061, 2004, Management of risk at level crossings, Network Rail 9

86
RT/E/S/10039, 2003, Operational requirements for miniature stop light level crossings, Network Rail 9


[sp/fa] Spicer, T., Fatal accidents & disability access at railway pedestrian crossings in Victoria, Australia, Department of Infrastructure, Australia. Paper 9 presented at the 8th International Level Crossings Symposium and Managing Trespass 9 Seminar 2004, Sheffield, UK 9

[ta/ac] Taylor, M.C., Hall, R.D. & Chatterjee, K., 19 6, Accidents at 3-arm traffic signals on urban single-carriageway roads, TRL report no. 135 for Department for 9 Transport9

[te/ca] Tenkink, E. & Van Der Horst, R., 19 0, Car driver behaviour at flashing light railroad grade crossings, Accident Analysis & Prevention, volume 2, issue 3, pp 229-9 239 9


[tr/e] TRL, 2002, A review of risks at a selection of automatic open level crossing sites and identification of safety improvements for various site conditions: Safety report, prepared for Railtrack (internal document only) 9


[vi/be] Vine, K. & King, C., 19 8, Berks and Hants level crossing modernisation feasibility study. MHA Associates for Railtrack Great Western. 9


of Products for the Consumer. Proceedings of the 26th Annual Conference of the 9 Ergonomics Society of Australia, Adelaide, Australia, pp 23-31


[wi/ac] Wittink, R.D., 1988, Accidents at level crossings: Contrary to popular belief, careless behaviour is not the only cause, Paper for the Passenger Transport Research Council

Appendices

A  Level crossing visits

This appendix is supplementary to section 2.3, Level crossing visits at the beginning of 9 this report. It provides photographs of 31 of the 45 level crossings visited. 9

B  HF issues by level crossing type

This appendix contains a list of the HF issues relevant to each level crossing type. 9
Appendix A: Level crossing visits

Bedford

Kempston Hardwick: ABCL

Millbrook Station: MCG

Stewartby Brickworks: MCG, Private Crossing Keeper

Stewartby Green Lane Station: MCG
Wootton Broadmead: AHB

Doncaster

Creykes: AHB

Dockhills: MCB CCTV

Eggborough: FP
Stainforth Road: MCB CCTV

Thorpe: AOCL

Hertford

Roydon Station: MCB CCTV

St.Margarets Station: MCB CCTV
Ware Station: MCB CCTV

Ware (a): FP

Ware (b): FP

Milton Keynes

Berry Lane: UWC+T
Bow Brickhill Station: AHB

Leighton Buzzard: National Heritage Railway, Open Crossing

Woburn Sands: FP

Woburn Sands Station: MCB
Peterborough

Bainton Green: AHB

Fox Covert: FP

Lolham Bridges: MCB CCTV

Lolham: FP
Appendix B: HF issues by crossing type

The following pages contain a list of the Human Factors issues by level crossing type.
## Level crossing type: AOCL

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>02</strong></td>
<td><strong>Driver distractions</strong></td>
</tr>
<tr>
<td></td>
<td>Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.</td>
</tr>
<tr>
<td><strong>03</strong></td>
<td><strong>Weather: Ice</strong></td>
</tr>
<tr>
<td></td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
<tr>
<td><strong>04</strong></td>
<td><strong>Users familiarity with a crossing</strong></td>
</tr>
<tr>
<td></td>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
<tr>
<td><strong>05</strong></td>
<td><strong>Frequency of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td><strong>06</strong></td>
<td><strong>Road junctions</strong></td>
</tr>
<tr>
<td></td>
<td>Road junctions close to the level crossing may result in increased decision making and errors by vehicle drivers, and blocking-back over the crossing.</td>
</tr>
<tr>
<td><strong>07</strong></td>
<td><strong>Vehicle approach speed</strong></td>
</tr>
<tr>
<td></td>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
</tr>
<tr>
<td><strong>08</strong></td>
<td><strong>Age of drivers</strong></td>
</tr>
<tr>
<td></td>
<td>Violations at level crossings may be influenced by the age of the local population.</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td><strong>Representation of HGV users</strong></td>
</tr>
<tr>
<td></td>
<td>HGV drivers form a disproportionately high number of incidents at level crossings.</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td><strong>Pedestrian access</strong></td>
</tr>
<tr>
<td></td>
<td>Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td><strong>Regularity of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>Groups</strong></td>
</tr>
<tr>
<td></td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td><strong>Time of day</strong></td>
</tr>
<tr>
<td></td>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td><strong>Visual clutter</strong></td>
</tr>
<tr>
<td></td>
<td>Superfluous information and roadside structures on the approach to the crossing may reduce the user’s detection of level crossing information and warning signs.</td>
</tr>
<tr>
<td><strong>16</strong></td>
<td><strong>Presence of rail staff</strong></td>
</tr>
<tr>
<td></td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>Understanding of warning lights</strong></td>
</tr>
<tr>
<td></td>
<td>The onset of the amber and proceeding red lights of the activated warning system lead to various vehicle driver behaviours at level crossings.</td>
</tr>
<tr>
<td><strong>18</strong></td>
<td><strong>Closure time</strong></td>
</tr>
<tr>
<td></td>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
</tr>
<tr>
<td><strong>20</strong></td>
<td><strong>Audible alarm</strong></td>
</tr>
<tr>
<td></td>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
</tr>
</tbody>
</table>
### Level crossing type: AOCL

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td><strong>Conspicuity of flashing lights</strong>&lt;br&gt;The effectiveness of flashing lights is limited by veiling glare, limited light output and their position.</td>
</tr>
<tr>
<td>26</td>
<td><strong>Foliage</strong>&lt;br&gt;The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td>28</td>
<td><strong>Position of warning lights</strong>&lt;br&gt;The effectiveness of warning lights is influenced by their position.</td>
</tr>
<tr>
<td>29</td>
<td><strong>Quantity of information</strong>&lt;br&gt;The quantity of signage information that can be read and understood decreases with road speed.</td>
</tr>
<tr>
<td>30</td>
<td><strong>Trespassing on rail structures</strong>&lt;br&gt;Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td>31</td>
<td><strong>Location near rail stations</strong>&lt;br&gt;Level crossings adjacent to rail stations influence the risk taking behaviour of vehicle drivers and other users.</td>
</tr>
<tr>
<td>32</td>
<td><strong>Train speeds</strong>&lt;br&gt;Low train speeds may increase the risk taking behaviour of users.</td>
</tr>
<tr>
<td>33</td>
<td><strong>Sighting distance</strong>&lt;br&gt;Good sighting distance should indicate the level crossing as high risk.</td>
</tr>
<tr>
<td>34</td>
<td><strong>Parked cars</strong>&lt;br&gt;Parked cars before and after the level crossing may result in drivers slowing and stopping while on the level crossing.</td>
</tr>
<tr>
<td>38</td>
<td><strong>Visitor parking</strong>&lt;br&gt;The position of visitors parked vehicles at a level crossing may affect the behaviour of other road drivers.</td>
</tr>
<tr>
<td>40</td>
<td><strong>Type of trains</strong>&lt;br&gt;Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
</tr>
<tr>
<td>42</td>
<td><strong>Days of the week</strong>&lt;br&gt;Risk taking behaviour at level crossings increases on working days.</td>
</tr>
<tr>
<td>43</td>
<td><strong>Suicide</strong>&lt;br&gt;Level crossings are a potential target for use by persons attempting to commit suicide</td>
</tr>
<tr>
<td>44</td>
<td><strong>Automatic open crossings</strong>&lt;br&gt;Automatic open level crossings result in increased risk taking behaviour, later in the crossing cycle.</td>
</tr>
<tr>
<td>48</td>
<td><strong>Observation of amber light</strong>&lt;br&gt;The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.</td>
</tr>
<tr>
<td>49</td>
<td><strong>Road access</strong>&lt;br&gt;Level crossings that provide the only access to routes either side of the crossing influences the risk taking behaviour of vehicle drivers.</td>
</tr>
<tr>
<td>50</td>
<td><strong>Passenger drop-off points</strong>&lt;br&gt;Non-designated passenger drop-off points close to level crossings affects the flow and behaviour of traffic approaching a level crossing.</td>
</tr>
<tr>
<td>Level crossing type: AOCL</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>---</td>
</tr>
<tr>
<td>51</td>
<td>See-through effect</td>
</tr>
<tr>
<td>Level crossing located in a dip or on a brow of a long straight road may result in increases of red-light running.</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>HGV drivers using rail station facilities</td>
</tr>
<tr>
<td>The effectiveness of information is reduced by HGV drivers parking in front of signs and warning devices.</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Events</td>
</tr>
<tr>
<td>Events increase the amount of irregular users at level crossings.</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Narrow roads</td>
</tr>
<tr>
<td>Narrow roads before and after the level crossing may result in vehicle drivers slowing and stopping while on the level crossing.</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Location near major roads</td>
</tr>
<tr>
<td>The risk of vehicle drivers blocking-back over the level crossing, or general risk taking behaviour is increased when the crossing is located on roads with direct access to major roads or motorways.</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Traffic calming systems</td>
</tr>
<tr>
<td>Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back.</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Foreign vehicle drivers</td>
</tr>
<tr>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Crossing surface</td>
</tr>
<tr>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Roadworks</td>
</tr>
<tr>
<td>Roadworks positioned up to 3 kilometres from the level crossing may still impact on vehicles blocking-back.</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Housing developments</td>
</tr>
<tr>
<td>Housing developments increase road traffic and level crossing use.</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Vehicle shortcuts</td>
</tr>
<tr>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Another train approaching</td>
</tr>
<tr>
<td>The ‘Another Train Coming if lights continue to show’ sign has minimal impact in providing vehicle drivers with sufficient information.</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Rural level crossings</td>
</tr>
<tr>
<td>The environmental context of a rural level crossing reduces the awareness of approaching vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Road markings</td>
</tr>
<tr>
<td>The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Number of train lines</td>
</tr>
<tr>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Location near farms</td>
</tr>
<tr>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Commercial traffic</td>
</tr>
<tr>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>74</td>
<td>Proximity of level crossing to another</td>
</tr>
<tr>
<td>Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Combined environmental features</td>
</tr>
<tr>
<td>Level crossings with a combination of environmental features, such as bends, hills, trees and hedges, may increase the decision making errors of vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Cats-eyes</td>
</tr>
<tr>
<td>Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night.</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Sign pictogram</td>
</tr>
<tr>
<td>The ‘Puffer’ sign does not convey any directly useful information to users.</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Road descents</td>
</tr>
<tr>
<td>Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Train enthusiasts</td>
</tr>
<tr>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>School parking</td>
</tr>
<tr>
<td>School drop-off and collection points close to level crossings affects the flow and behaviour of other vehicle drivers approaching the crossing.</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Proximity of different road speeds</td>
</tr>
<tr>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.</td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>Level crossing equipment</td>
</tr>
<tr>
<td>The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users.</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Position of information</td>
</tr>
<tr>
<td>Perception of a hazard is improved when information referencing the imminent danger are associated together.</td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>Vehicle speed zones</td>
</tr>
<tr>
<td>The position of incremental speed restriction signs influences the speed of vehicle drivers when approaching the crossing.</td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>Noise</td>
</tr>
<tr>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Straight roads</td>
</tr>
<tr>
<td>Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing.</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Stereotypical crossing users</td>
</tr>
<tr>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>Train arrival</td>
</tr>
<tr>
<td>Activation of the warning lights is used by passengers as a train arrival indicator.</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>Railway sidings</td>
</tr>
<tr>
<td>Alternative uses of railways sidings may alter the type of traffic using a level crossing.</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>Emergency services</td>
</tr>
<tr>
<td>Crossings located on routes used by emergency service vehicles may result in increased risk taking behaviour.</td>
<td></td>
</tr>
<tr>
<td>Level crossing type: AOCL</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Weather: Fog</strong></td>
<td></td>
</tr>
<tr>
<td>The effectiveness of visual information is impaired by fog.</td>
<td></td>
</tr>
<tr>
<td><strong>Public houses</strong></td>
<td></td>
</tr>
<tr>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
<td></td>
</tr>
<tr>
<td><strong>Animals: Horses</strong></td>
<td></td>
</tr>
<tr>
<td>Activated warnings at protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road vehicle users.</td>
<td></td>
</tr>
<tr>
<td><strong>Sunlight strobing</strong></td>
<td></td>
</tr>
<tr>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td><strong>Sightlines</strong></td>
<td></td>
</tr>
<tr>
<td>Restricted or blocked sightlines may encourage users to move past a point of safety.</td>
<td></td>
</tr>
</tbody>
</table>
**Level crossing type: AOCR**

**02** Driver distractions  
Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.

**03** Weather: Ice  
Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.

**04** Users familiarity with a crossing  
Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.

**05** Frequency of trains  
Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.

**06** Road junctions  
Road junctions close to the level crossing may result in increased decision making and errors by vehicle drivers, and blocking-back over the crossing.

**07** Vehicle approach speed  
The speed of the road traversing a level crossing is a factor in vehicle driver errors.

**08** Age of drivers  
Violations at level crossings may be influenced by the age of the local population.

**10** Representation of HGV users  
HGV drivers form a disproportionately high number of incidents at level crossings.

**11** Pedestrian access  
Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.

**12** Regularity of trains  
Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.

**13** Groups  
People in groups may undertake more risky behaviour, than when on their own.

**14** Time of day  
Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.

**15** Visual clutter  
Superfluous information and roadside structures on the approach to the crossing may reduce the user’s detection of level crossing information and warning signs.

**16** Presence of rail staff  
The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.

**17** Understanding of warning lights  
The onset of the amber and proceeding red lights of the activated warning system lead to various vehicle driver behaviours at level crossings.

**18** Closure time  
The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.

**20** Audible alarm  
Second audible warning tone is not detected and/or understood by level crossing users.
<table>
<thead>
<tr>
<th>Level crossing type: AOCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
</tr>
<tr>
<td><strong>Conspicuity of flashing lights</strong></td>
</tr>
<tr>
<td>The effectiveness of flashing lights is limited by veiling glare, limited light output and their position.</td>
</tr>
<tr>
<td>26</td>
</tr>
<tr>
<td><strong>Foliage</strong></td>
</tr>
<tr>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td>28</td>
</tr>
<tr>
<td><strong>Position of warning lights</strong></td>
</tr>
<tr>
<td>The effectiveness of warning lights is influenced by their position.</td>
</tr>
<tr>
<td>29</td>
</tr>
<tr>
<td><strong>Quantity of information</strong></td>
</tr>
<tr>
<td>The quantity of signage information that can be read and understood decreases with road speed.</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td><strong>Trespassing on rail structures</strong></td>
</tr>
<tr>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td>31</td>
</tr>
<tr>
<td><strong>Location near rail stations</strong></td>
</tr>
<tr>
<td>Level crossings adjacent to rail stations influence the risk taking behaviour of vehicle drivers and other users.</td>
</tr>
<tr>
<td>32</td>
</tr>
<tr>
<td><strong>Train speeds</strong></td>
</tr>
<tr>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
</tr>
<tr>
<td>33</td>
</tr>
<tr>
<td><strong>Sighting distance</strong></td>
</tr>
<tr>
<td>Good sighting distance should indicate the level crossing as high risk.</td>
</tr>
<tr>
<td>34</td>
</tr>
<tr>
<td><strong>Parked cars</strong></td>
</tr>
<tr>
<td>Parked cars before and after the level crossing may result in drivers slowing and stopping while on the level crossing.</td>
</tr>
<tr>
<td>38</td>
</tr>
<tr>
<td><strong>Visitor parking</strong></td>
</tr>
<tr>
<td>The position of visitors parked vehicles at a level crossing may affect the behaviour of other road drivers.</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td><strong>Type of trains</strong></td>
</tr>
<tr>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
</tr>
<tr>
<td>42</td>
</tr>
<tr>
<td><strong>Days of the week</strong></td>
</tr>
<tr>
<td>Risk taking behaviour at level crossings increases on working days.</td>
</tr>
<tr>
<td>43</td>
</tr>
<tr>
<td><strong>Suicide</strong></td>
</tr>
<tr>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
</tr>
<tr>
<td>44</td>
</tr>
<tr>
<td><strong>Automatic open crossings</strong></td>
</tr>
<tr>
<td>Automatic open level crossings result in increased risk taking behaviour, later in the crossing cycle.</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td><strong>Observation of amber light</strong></td>
</tr>
<tr>
<td>The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.</td>
</tr>
<tr>
<td>49</td>
</tr>
<tr>
<td><strong>Road access</strong></td>
</tr>
<tr>
<td>Level crossings that provide the only access to routes either side of the crossing influences the risk taking behaviour of vehicle drivers.</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td><strong>Passenger drop-off points</strong></td>
</tr>
<tr>
<td>Non-designated passenger drop-off points close to level crossings affects the flow and behaviour of traffic approaching a level crossing.</td>
</tr>
<tr>
<td>Level crossing type: AOCR</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>51</strong> See-through effect</td>
</tr>
<tr>
<td>Level crossing located in a dip or on a brow of a long straight road may result in increases of red-light running.</td>
</tr>
<tr>
<td><strong>52</strong> HGV drivers using rail station facilities</td>
</tr>
<tr>
<td>The effectiveness of information is reduced by HGV drivers parking in front of signs and warning devices.</td>
</tr>
<tr>
<td><strong>53</strong> Events</td>
</tr>
<tr>
<td>Events increase the amount of irregular users at level crossings.</td>
</tr>
<tr>
<td><strong>54</strong> Narrow roads</td>
</tr>
<tr>
<td>Narrow roads before and after the level crossing may result in vehicle drivers slowing and stopping while on the level crossing.</td>
</tr>
<tr>
<td><strong>56</strong> Location near major roads</td>
</tr>
<tr>
<td>The risk of vehicle drivers blocking-back over the level crossing, or general risk taking behaviour is increased when the crossing is located on roads with direct access to major roads or motorways.</td>
</tr>
<tr>
<td><strong>57</strong> Traffic calming systems</td>
</tr>
<tr>
<td>Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back.</td>
</tr>
<tr>
<td><strong>59</strong> Foreign vehicle drivers</td>
</tr>
<tr>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
</tr>
<tr>
<td><strong>61</strong> Crossing surface</td>
</tr>
<tr>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
</tr>
<tr>
<td><strong>62</strong> Roadworks</td>
</tr>
<tr>
<td>Roadworks positioned up to 3 kilometres from the level crossing may still impact on vehicles blocking-back.</td>
</tr>
<tr>
<td><strong>60</strong> Housing developments</td>
</tr>
<tr>
<td>Housing developments increase road traffic and level crossing use.</td>
</tr>
<tr>
<td><strong>64</strong> Vehicle shortcuts</td>
</tr>
<tr>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
</tr>
<tr>
<td><strong>66</strong> Another train approaching</td>
</tr>
<tr>
<td>The ‘Another Train Coming if lights continue to show’ sign has minimal impact in providing vehicle drivers with sufficient information.</td>
</tr>
<tr>
<td><strong>69</strong> Rural level crossings</td>
</tr>
<tr>
<td>The environmental context of a rural level crossing reduces the awareness of approaching vehicle drivers.</td>
</tr>
<tr>
<td><strong>70</strong> Road markings</td>
</tr>
<tr>
<td>The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.</td>
</tr>
<tr>
<td><strong>71</strong> Number of train lines</td>
</tr>
<tr>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
</tr>
<tr>
<td><strong>72</strong> Location near farms</td>
</tr>
<tr>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
</tr>
<tr>
<td><strong>73</strong> Commercial traffic</td>
</tr>
<tr>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
</tr>
</tbody>
</table>
### Level crossing type: AOCR

<table>
<thead>
<tr>
<th>74</th>
<th>Proximity of level crossing to another</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>79</th>
<th>Combined environmental features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level crossings with a combination of environmental features, such as bends, hills, trees and hedges, may increase the decision making errors of vehicle drivers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>80</th>
<th>Cats-eyes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>81</th>
<th>Sign pictogram</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The ‘Puffer’ sign does not convey any directly useful information to users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>83</th>
<th>Road descents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>86</th>
<th>Train enthusiasts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>87</th>
<th>School parking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>School drop-off and collection points close to level crossings affects the flow and behaviour of other vehicle drivers approaching the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>88</th>
<th>Proximity of different road speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>89</th>
<th>Level crossing equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>90</th>
<th>Position of information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perception of a hazard is improved when information referencing the imminent danger are associated together.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>91</th>
<th>Vehicle speed zones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The position of incremental speed restriction signs influences the speed of vehicle drivers when approaching the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>95</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>96</th>
<th>Straight roads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>97</th>
<th>Stereotypical crossing users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>98</th>
<th>Train arrival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activation of the warning lights is used by passengers as a train arrival indicator.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>102</th>
<th>Railway sidings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative uses of railways sidings may alter the type of traffic using a level crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>103</th>
<th>Emergency services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crossings located on routes used by emergency service vehicles may result in increased risk taking behaviour.</td>
</tr>
<tr>
<td>Number</td>
<td>Category</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------</td>
</tr>
<tr>
<td>104</td>
<td><strong>Weather: Fog</strong></td>
</tr>
<tr>
<td>75</td>
<td><strong>Public houses</strong></td>
</tr>
<tr>
<td>45</td>
<td><strong>Animals: Horses</strong></td>
</tr>
<tr>
<td>23</td>
<td><strong>Sunlight strobing</strong></td>
</tr>
<tr>
<td>99</td>
<td><strong>Sightlines</strong></td>
</tr>
</tbody>
</table>
### Level crossing type: ABCL

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>02</strong></td>
<td><strong>Driver distractions</strong></td>
</tr>
<tr>
<td></td>
<td>Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.</td>
</tr>
<tr>
<td><strong>03</strong></td>
<td><strong>Weather: Ice</strong></td>
</tr>
<tr>
<td></td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
<tr>
<td><strong>04</strong></td>
<td><strong>Users familiarity with a crossing</strong></td>
</tr>
<tr>
<td></td>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
<tr>
<td><strong>05</strong></td>
<td><strong>Frequency of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td><strong>06</strong></td>
<td><strong>Road junctions</strong></td>
</tr>
<tr>
<td></td>
<td>Road junctions close to the level crossing may result in increased decision making and errors by vehicle drivers, and blocking-back over the crossing.</td>
</tr>
<tr>
<td><strong>07</strong></td>
<td><strong>Vehicle approach speed</strong></td>
</tr>
<tr>
<td></td>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
</tr>
<tr>
<td><strong>08</strong></td>
<td><strong>Age of drivers</strong></td>
</tr>
<tr>
<td></td>
<td>Violations at level crossings may be influenced by the age of the local population.</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td><strong>Representation of HGV users</strong></td>
</tr>
<tr>
<td></td>
<td>HGV drivers form a disproportionately high number of incidents at level crossings.</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td><strong>Pedestrian access</strong></td>
</tr>
<tr>
<td></td>
<td>Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>Groups</strong></td>
</tr>
<tr>
<td></td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td><strong>Time of day</strong></td>
</tr>
<tr>
<td></td>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td><strong>Visual clutter</strong></td>
</tr>
<tr>
<td></td>
<td>Superfluous information and roadside structures on the approach to the crossing may reduce the user’s detection of level crossing information and warning signs.</td>
</tr>
<tr>
<td><strong>16</strong></td>
<td><strong>Presence of rail staff</strong></td>
</tr>
<tr>
<td></td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>Understanding of warning lights</strong></td>
</tr>
<tr>
<td></td>
<td>The onset of the amber and proceeding red lights of the activated warning system lead to various vehicle driver behaviours at level crossings.</td>
</tr>
<tr>
<td><strong>18</strong></td>
<td><strong>Closure time</strong></td>
</tr>
<tr>
<td></td>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
</tr>
<tr>
<td><strong>20</strong></td>
<td><strong>Audible alarm</strong></td>
</tr>
<tr>
<td></td>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
</tr>
<tr>
<td><strong>22</strong></td>
<td><strong>Conspicuity of flashing lights</strong></td>
</tr>
<tr>
<td></td>
<td>The effectiveness of flashing lights is limited by veiling glare, limited light output and their position.</td>
</tr>
<tr>
<td>Level crossing type: ABCL</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>26 Foliage</td>
<td></td>
</tr>
<tr>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
<td></td>
</tr>
<tr>
<td>28 Position of warning lights</td>
<td></td>
</tr>
<tr>
<td>The effectiveness of warning lights is influenced by their position.</td>
<td></td>
</tr>
<tr>
<td>29 Quantity of information</td>
<td></td>
</tr>
<tr>
<td>The quantity of signage information that can be read and understood decreases with road speed.</td>
<td></td>
</tr>
<tr>
<td>30 Trespassing on rail structures</td>
<td></td>
</tr>
<tr>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
<td></td>
</tr>
<tr>
<td>31 Location near rail stations</td>
<td></td>
</tr>
<tr>
<td>Level crossings adjacent to rail stations influence the risk taking behaviour of vehicle drivers and other users.</td>
<td></td>
</tr>
<tr>
<td>34 Parked cars</td>
<td></td>
</tr>
<tr>
<td>Parked cars before and after the level crossing may result in drivers slowing and stopping while on the level crossing.</td>
<td></td>
</tr>
<tr>
<td>38 Visitor parking</td>
<td></td>
</tr>
<tr>
<td>The position of visitors parked vehicles at a level crossing may affect the behaviour of other road drivers.</td>
<td></td>
</tr>
<tr>
<td>40 Type of trains</td>
<td></td>
</tr>
<tr>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
</tr>
<tr>
<td>42 Days of the week</td>
<td></td>
</tr>
<tr>
<td>Risk taking behaviour at level crossings increases on working days.</td>
<td></td>
</tr>
<tr>
<td>43 Suicide</td>
<td></td>
</tr>
<tr>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
<td></td>
</tr>
<tr>
<td>48 Observation of amber light</td>
<td></td>
</tr>
<tr>
<td>The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.</td>
<td></td>
</tr>
<tr>
<td>49 Road access</td>
<td></td>
</tr>
<tr>
<td>Level crossings that provide the only access to routes either side of the crossing influences the risk taking behaviour of vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>50 Passenger drop-off points</td>
<td></td>
</tr>
<tr>
<td>Non-designated passenger drop-off points close to level crossings affects the flow and behaviour of traffic approaching a level crossing.</td>
<td></td>
</tr>
<tr>
<td>51 See-through effect</td>
<td></td>
</tr>
<tr>
<td>Level crossing located in a dip or on a brow of a long straight road may result in increases of red-light running.</td>
<td></td>
</tr>
<tr>
<td>52 HGV drivers using rail station facilities</td>
<td></td>
</tr>
<tr>
<td>The effectiveness of information is reduced by HGV drivers parking in front of signs and warning devices.</td>
<td></td>
</tr>
<tr>
<td>53 Events</td>
<td></td>
</tr>
<tr>
<td>Events increase the amount of irregular users at level crossings.</td>
<td></td>
</tr>
<tr>
<td>54 Narrow roads</td>
<td></td>
</tr>
<tr>
<td>Narrow roads before and after the level crossing may result in vehicle drivers slowing and stopping while on the level crossing.</td>
<td></td>
</tr>
</tbody>
</table>
### Level crossing type: ABCL

<table>
<thead>
<tr>
<th>56</th>
<th>Location near major roads</th>
</tr>
</thead>
</table>
The risk of vehicle drivers blocking-back over the level crossing, or general risk taking behaviour is increased when the crossing is located on roads with direct access to major roads or motorways.

<table>
<thead>
<tr>
<th>57</th>
<th>Traffic calming systems</th>
</tr>
</thead>
</table>
Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back.

<table>
<thead>
<tr>
<th>59</th>
<th>Foreign vehicle drivers</th>
</tr>
</thead>
</table>
Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.

<table>
<thead>
<tr>
<th>61</th>
<th>Crossing surface</th>
</tr>
</thead>
</table>
Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.

<table>
<thead>
<tr>
<th>62</th>
<th>Roadworks</th>
</tr>
</thead>
</table>
Roadworks positioned up to 3 kilometres from the level crossing may still impact on vehicles blocking-back.

<table>
<thead>
<tr>
<th>63</th>
<th>Housing developments</th>
</tr>
</thead>
</table>
Housing developments increase road traffic and level crossing use.

<table>
<thead>
<tr>
<th>64</th>
<th>Vehicle shortcuts</th>
</tr>
</thead>
</table>
Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.

<table>
<thead>
<tr>
<th>66</th>
<th>Another train approaching</th>
</tr>
</thead>
</table>
The ‘Another Train Coming if lights continue to show’ sign has minimal impact in providing vehicle drivers with sufficient information.

<table>
<thead>
<tr>
<th>69</th>
<th>Rural level crossings</th>
</tr>
</thead>
</table>
The environmental context of a rural level crossing reduces the awareness of approaching vehicle drivers.

<table>
<thead>
<tr>
<th>70</th>
<th>Road markings</th>
</tr>
</thead>
</table>
The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.

<table>
<thead>
<tr>
<th>71</th>
<th>Number of train lines</th>
</tr>
</thead>
</table>
Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.

<table>
<thead>
<tr>
<th>72</th>
<th>Location near farms</th>
</tr>
</thead>
</table>
High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.

<table>
<thead>
<tr>
<th>73</th>
<th>Commercial traffic</th>
</tr>
</thead>
</table>
Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.

<table>
<thead>
<tr>
<th>74</th>
<th>Proximity of level crossing to another</th>
</tr>
</thead>
</table>
Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.

<table>
<thead>
<tr>
<th>79</th>
<th>Combined environmental features</th>
</tr>
</thead>
</table>
Level crossings with a combination of environmental features, such as bends, hills, trees and hedges, may increase the decision making errors of vehicle drivers.

<table>
<thead>
<tr>
<th>80</th>
<th>Cats-eyes</th>
</tr>
</thead>
</table>
Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night.

<table>
<thead>
<tr>
<th>83</th>
<th>Road descents</th>
</tr>
</thead>
</table>
Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers.
<table>
<thead>
<tr>
<th>86</th>
<th>Level crossing type: ABCL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Train enthusiasts</td>
</tr>
<tr>
<td></td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>87</th>
<th>School parking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>School drop-off and collection points close to level crossings affects the flow and behaviour of other vehicle drivers approaching the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>88</th>
<th>Proximity of different road speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>89</th>
<th>Level crossing equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>90</th>
<th>Position of information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perception of a hazard is improved when information referencing the imminent danger are associated together.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>91</th>
<th>Vehicle speed zones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The position of incremental speed restriction signs influences the speed of vehicle drivers when approaching the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>95</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>96</th>
<th>Straight roads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>97</th>
<th>Stereotypical crossing users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>98</th>
<th>Train arrival</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activation of the warning lights is used by passengers as a train arrival indicator.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>102</th>
<th>Railway sidings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative uses of railways sidings may alter the type of traffic using a level crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>103</th>
<th>Emergency services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crossings located on routes used by emergency service vehicles may result in increased risk taking behaviour.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>104</th>
<th>Weather: Fog</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The effectiveness of visual information is impaired by fog.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>75</th>
<th>Public houses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>45</th>
<th>Animals: Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activated warnings at protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road vehicle users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>23</th>
<th>Sunlight strobing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
</tr>
<tr>
<td>Level crossing type: AHB</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>02</strong> Driver distractions</td>
<td></td>
</tr>
<tr>
<td>Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>03</strong> Weather: Ice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>04</strong> Users familiarity with a crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>05</strong> Frequency of trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>06</strong> Road junctions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road junctions close to the level crossing may result in increased decision making and errors by vehicle drivers, and blocking-back over the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>07</strong> Vehicle approach speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>08</strong> Age of drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violations at level crossings may be influenced by the age of the local population.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>10</strong> Representation of HGV users</th>
</tr>
</thead>
<tbody>
<tr>
<td>HGV drivers form a disproportionately high number of incidents at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>11</strong> Pedestrian access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>12</strong> Regularity of trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>13</strong> Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>14</strong> Time of day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>15</strong> Visual clutter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superfluous information and roadside structures on the approach to the crossing may reduce the user’s detection of level crossing information and warning signs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>16</strong> Presence of rail staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>17</strong> Understanding of warning lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>The onset of the amber and proceeding red lights of the activated warning system lead to various vehicle driver behaviours at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>18</strong> Closure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>20</strong> Audible alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
</tr>
<tr>
<td>Level crossing type: AHB</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>22</strong> Conspicuity of flashing lights</td>
</tr>
<tr>
<td>The effectiveness of flashing lights is limited by veiling glare, limited light output and their position.</td>
</tr>
<tr>
<td><strong>24</strong> Half barrier</td>
</tr>
<tr>
<td>Automatic half barriers facilitate vehicle drivers to undertake risk taking behaviour.</td>
</tr>
<tr>
<td><strong>25</strong> Users perception of train speed &amp; distance</td>
</tr>
<tr>
<td>Train speed and distance is underestimated by users, which may result in increased decision making errors by users at level crossings.</td>
</tr>
<tr>
<td><strong>26</strong> Foliage</td>
</tr>
<tr>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td><strong>28</strong> Position of warning lights</td>
</tr>
<tr>
<td>The effectiveness of warning lights is influenced by their position.</td>
</tr>
<tr>
<td><strong>29</strong> Quantity of information</td>
</tr>
<tr>
<td>The quantity of signage information that can be read and understood decreases with road speed.</td>
</tr>
<tr>
<td><strong>30</strong> Trespassing on rail structures</td>
</tr>
<tr>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td><strong>31</strong> Location near rail stations</td>
</tr>
<tr>
<td>Level crossings adjacent to rail stations influence the risk taking behaviour of vehicle drivers and other users.</td>
</tr>
<tr>
<td><strong>32</strong> Train speeds</td>
</tr>
<tr>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
</tr>
<tr>
<td><strong>33</strong> Sighting distance</td>
</tr>
<tr>
<td>Good sighting distance should indicate the level crossing as high risk.</td>
</tr>
<tr>
<td><strong>34</strong> Parked cars</td>
</tr>
<tr>
<td>Parked cars before and after the level crossing may result in drivers slowing and stopping while on the level crossing.</td>
</tr>
<tr>
<td><strong>38</strong> Visitor parking</td>
</tr>
<tr>
<td>The position of visitors parked vehicles at a level crossing may affect the behaviour of other road drivers.</td>
</tr>
<tr>
<td><strong>40</strong> Type of trains</td>
</tr>
<tr>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
</tr>
<tr>
<td><strong>42</strong> Days of the week</td>
</tr>
<tr>
<td>Risk taking behaviour at level crossings increases on working days.</td>
</tr>
<tr>
<td><strong>43</strong> Suicide</td>
</tr>
<tr>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
</tr>
<tr>
<td><strong>48</strong> Observation of amber light</td>
</tr>
<tr>
<td>The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.</td>
</tr>
<tr>
<td><strong>49</strong> Road access</td>
</tr>
<tr>
<td>Level crossings that provide the only access to routes either side of the crossing influences the risk taking behaviour of vehicle drivers.</td>
</tr>
</tbody>
</table>
**Level crossing type: AHB**

<table>
<thead>
<tr>
<th>50</th>
<th>Passenger drop-off points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-designated passenger drop-off points close to level crossings affects the flow and behaviour of traffic approaching a level crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>51</th>
<th>See-through effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossing located in a dip or on a brow of a long straight road may result in increases of red-light running.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>52</th>
<th>HGV drivers using rail station facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The effectiveness of information is reduced by HGV drivers parking in front of signs and warning devices.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>53</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events increase the amount of irregular users at level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>54</th>
<th>Narrow roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow roads before and after the level crossing may result in vehicle drivers slowing and stopping while on the level crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>56</th>
<th>Location near major roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>The risk of vehicle drivers blocking-back over the level crossing, or general risk taking behaviour is increased when the crossing is located on roads with direct access to major roads or motorways.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>57</th>
<th>Traffic calming systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>59</th>
<th>Foreign vehicle drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>60</th>
<th>Bus stops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unofficial bus stops in the level crossing lay-by, affects the behaviour of large or slow vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>61</th>
<th>Crossing surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>62</th>
<th>Roadworks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadworks positioned up to 3 kilometres from the level crossing may still impact on vehicles blocking-back.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>63</th>
<th>Housing developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing developments increase road traffic and level crossing use.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>64</th>
<th>Vehicle shortcuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>66</th>
<th>Another train approaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ‘Another Train Coming if lights continue to show’ sign has minimal impact in providing vehicle drivers with sufficient information.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>69</th>
<th>Rural level crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>The environmental context of a rural level crossing reduces the awareness of approaching vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>70</th>
<th>Road markings</th>
</tr>
</thead>
<tbody>
<tr>
<td>The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>71</th>
<th>Number of train lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
<td></td>
</tr>
</tbody>
</table>
**Level crossing type: AHB**

<table>
<thead>
<tr>
<th>72</th>
<th>Location near farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>73</th>
<th>Commercial traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>74</th>
<th>Proximity of level crossing to another</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>76</th>
<th>Pedestrians on vehicular crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large volumes of pedestrians and cyclists using road level crossings ignore the activated warning information and barriers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>79</th>
<th>Combined environmental features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings with a combination of environmental features, such as bends, hills, trees and hedges, may increase the decision making errors of vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>80</th>
<th>Cats-eyes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>83</th>
<th>Road descents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>86</th>
<th>Train enthusiasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>87</th>
<th>School parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>School drop-off and collection points close to level crossings affects the flow and behaviour of other vehicle drivers approaching the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>88</th>
<th>Proximity of different road speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>89</th>
<th>Level crossing equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>90</th>
<th>Position of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception of a hazard is improved when information referencing the imminent danger are associated together.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>91</th>
<th>Vehicle speed zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>The position of incremental speed restriction signs influences the speed of vehicle drivers when approaching the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>95</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>96</th>
<th>Straight roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>97</th>
<th>Stereotypical crossing users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>98</th>
<th>Train arrival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation of the warning lights is used by passengers as a train arrival indicator.</td>
<td></td>
</tr>
</tbody>
</table>
### Level crossing type: AHB

<table>
<thead>
<tr>
<th>102</th>
<th>Railway sidings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative uses of railways sidings may alter the type of traffic using a level crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>103</th>
<th>Emergency services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossings located on routes used by emergency service vehicles may result in increased risk taking behaviour.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>104</th>
<th>Weather: Fog</th>
</tr>
</thead>
<tbody>
<tr>
<td>The effectiveness of visual information is impaired by fog.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>75</th>
<th>Public houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>45</th>
<th>Animals: Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activated warnings at protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road vehicle users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>23</th>
<th>Sunlight strobing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>
Level crossing type: MCG

<table>
<thead>
<tr>
<th></th>
<th>Weather: Ice</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Users familiarity with a crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Frequency of trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Presence of rail staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Foliage</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Trespassing on rail structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Days of the week</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Risk taking behaviour at level crossings increases on working days.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Suicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Foreign vehicle drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Crossing surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Housing developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>Housing developments increase road traffic and level crossing use.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Vehicle shortcuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Number of train lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Location near farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Proximity of level crossing to another</th>
</tr>
</thead>
<tbody>
<tr>
<td>74</td>
<td>Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Train enthusiasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>86</td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Proximity of different road speeds</strong></td>
<td>High road speeds in close proximity to a level crossing on a lower speed road influence the speed at which vehicle drivers approach the crossing.</td>
</tr>
<tr>
<td><strong>Position of information</strong></td>
<td>Perception of a hazard is improved when information referencing the imminent danger are associated together.</td>
</tr>
<tr>
<td><strong>Stereotypical crossing users</strong></td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
</tr>
<tr>
<td><strong>Railway sidings</strong></td>
<td>Alternative uses of railways sidings may alter the type of traffic using a level crossing.</td>
</tr>
<tr>
<td><strong>Emergency services</strong></td>
<td>Crossings located on routes used by emergency service vehicles may result in increased risk taking behaviour.</td>
</tr>
<tr>
<td><strong>Weather: Fog</strong></td>
<td>The effectiveness of visual information is impaired by fog.</td>
</tr>
<tr>
<td><strong>Public houses</strong></td>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
</tr>
<tr>
<td><strong>Sunlight strobing</strong></td>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
</tr>
</tbody>
</table>
### Level crossing type: MCB

<table>
<thead>
<tr>
<th>02</th>
<th>Driver distractions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>03</th>
<th>Weather: Ice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>04</th>
<th>Users familiarity with a crossing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>05</th>
<th>Frequency of trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>06</th>
<th>Road junctions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road junctions close to the level crossing may result in increased decision making and errors by vehicle drivers, and blocking-back over the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>07</th>
<th>Vehicle approach speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>08</th>
<th>Age of drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violations at level crossings may be influenced by the age of the local population.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>Representation of HGV users</th>
</tr>
</thead>
<tbody>
<tr>
<td>HGV drivers form a disproportionately high number of incidents at level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11</th>
<th>Pedestrian access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>13</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14</th>
<th>Time of day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15</th>
<th>Visual clutter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superfluous information and roadside structures on the approach to the crossing may reduce the user’s detection of level crossing information and warning signs.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16</th>
<th>Presence of rail staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17</th>
<th>Understanding of warning lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>The onset of the amber and proceeding red lights of the activated warning system lead to various vehicle driver behaviours at level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>18</th>
<th>Closure time</th>
</tr>
</thead>
<tbody>
<tr>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>20</th>
<th>Audible alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>22</th>
<th>Conspicuity of flashing lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>The effectiveness of flashing lights is limited by veiling glare, limited light output and their position.</td>
<td></td>
</tr>
</tbody>
</table>
**Level crossing type: MCB**

<table>
<thead>
<tr>
<th>Page</th>
<th>Topic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>Foliage</td>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td>28</td>
<td>Position of warning lights</td>
<td>The effectiveness of warning lights is influenced by their position.</td>
</tr>
<tr>
<td>30</td>
<td>Trespassing on rail structures</td>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td>31</td>
<td>Location near rail stations</td>
<td>Level crossings adjacent to rail stations influence the risk taking behaviour of vehicle drivers and other users.</td>
</tr>
<tr>
<td>34</td>
<td>Parked cars</td>
<td>Parked cars before and after the level crossing may result in drivers slowing and stopping while on the level crossing.</td>
</tr>
<tr>
<td>38</td>
<td>Visitor parking</td>
<td>The position of visitors parked vehicles at a level crossing may affect the behaviour of other road drivers.</td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
</tr>
<tr>
<td>42</td>
<td>Days of the week</td>
<td>Risk taking behaviour at level crossings increases on working days.</td>
</tr>
<tr>
<td>43</td>
<td>Suicide</td>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
</tr>
<tr>
<td>48</td>
<td>Observation of amber light</td>
<td>The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.</td>
</tr>
<tr>
<td>49</td>
<td>Road access</td>
<td>Level crossings that provide the only access to routes either side of the crossing influences the risk taking behaviour of vehicle drivers.</td>
</tr>
<tr>
<td>50</td>
<td>Passenger drop-off points</td>
<td>Non-designated passenger drop-off points close to level crossings affects the flow and behaviour of traffic approaching a level crossing.</td>
</tr>
<tr>
<td>51</td>
<td>See-through effect</td>
<td>Level crossing located in a dip or on a brow of a long straight road may result in increases of red-light running.</td>
</tr>
<tr>
<td>52</td>
<td>HGV drivers using rail station facilities</td>
<td>The effectiveness of information is reduced by HGV drivers parking in front of signs and warning devices.</td>
</tr>
<tr>
<td>53</td>
<td>Events</td>
<td>Events increase the amount of irregular users at level crossings.</td>
</tr>
<tr>
<td>54</td>
<td>Narrow roads</td>
<td>Narrow roads before and after the level crossing may result in vehicle drivers slowing and stopping while on the level crossing.</td>
</tr>
<tr>
<td>56</td>
<td>Location near major roads</td>
<td>The risk of vehicle drivers blocking-back over the level crossing, or general risk taking behaviour is increased when the crossing is located on roads with direct access to major roads or motorways.</td>
</tr>
</tbody>
</table>
## Level crossing type: MCB

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>Traffic calming systems</td>
</tr>
<tr>
<td></td>
<td>Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back.</td>
</tr>
<tr>
<td>59</td>
<td>Foreign vehicle drivers</td>
</tr>
<tr>
<td></td>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
</tr>
<tr>
<td>61</td>
<td>Crossing surface</td>
</tr>
<tr>
<td></td>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
</tr>
<tr>
<td>62</td>
<td>Roadworks</td>
</tr>
<tr>
<td></td>
<td>Roadworks positioned up to 3 kilometres from the level crossing may still impact on vehicles blocking-back.</td>
</tr>
<tr>
<td>63</td>
<td>Housing developments</td>
</tr>
<tr>
<td></td>
<td>Housing developments increase road traffic and level crossing use.</td>
</tr>
<tr>
<td>64</td>
<td>Vehicle shortcuts</td>
</tr>
<tr>
<td></td>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
</tr>
<tr>
<td>66</td>
<td>Rural level crossings</td>
</tr>
<tr>
<td></td>
<td>The environmental context of a rural level crossing reduces the awareness of approaching vehicle drivers.</td>
</tr>
<tr>
<td>70</td>
<td>Road markings</td>
</tr>
<tr>
<td></td>
<td>The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.</td>
</tr>
<tr>
<td>71</td>
<td>Number of train lines</td>
</tr>
<tr>
<td></td>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
</tr>
<tr>
<td>72</td>
<td>Location near farms</td>
</tr>
<tr>
<td></td>
<td>High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing.</td>
</tr>
<tr>
<td>73</td>
<td>Commercial traffic</td>
</tr>
<tr>
<td></td>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
</tr>
<tr>
<td>74</td>
<td>Proximity of level crossing to another</td>
</tr>
<tr>
<td></td>
<td>Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers.</td>
</tr>
<tr>
<td>79</td>
<td>Combined environmental features</td>
</tr>
<tr>
<td></td>
<td>Level crossings with a combination of environmental features, such as bends, hills, trees and hedges, may increase the decision making errors of vehicle drivers.</td>
</tr>
<tr>
<td>80</td>
<td>Cats-eyes</td>
</tr>
<tr>
<td></td>
<td>Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night.</td>
</tr>
<tr>
<td>83</td>
<td>Road descents</td>
</tr>
<tr>
<td></td>
<td>Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers.</td>
</tr>
<tr>
<td>86</td>
<td>Train enthusiasts</td>
</tr>
<tr>
<td></td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
</tr>
<tr>
<td>87</td>
<td>School parking</td>
</tr>
<tr>
<td></td>
<td>School drop-off and collection points close to level crossings affects the flow and behaviour of other vehicle drivers approaching the crossing.</td>
</tr>
</tbody>
</table>
**Level crossing type: MCB**

| 88 | Proximity of different road speeds |
|    | High road speeds in close proximity to a level crossing on a lower speed road influence the speed at which vehicle drivers approach the crossing. |

| 89 | Level crossing equipment |
|    | The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users. |

| 90 | Position of information |
|    | Perception of a hazard is improved when information referencing the imminent danger are associated together. |

| 91 | Vehicle speed zones |
|    | The position of incremental speed restriction signs influence the speed of vehicle drivers when approaching the crossing. |

| 96 | Straight roads |
|    | Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing. |

| 97 | Stereotypical crossing users |
|    | Users who violate crossing procedures are not always male and in their twenties. |

| 98 | Train arrival |
|    | Activation of the warning lights is used by passengers as a train arrival indicator. |

| 101 | Signal box: detection of objects |
|     | Certain conditions impair the signaller's ability to detect objects on the level crossing. |

| 102 | Railway sidings |
|     | Alternative uses of railways sidings may alter the type of traffic using a level crossing. |

| 103 | Emergency services |
|     | Crossings located on routes used by emergency service vehicles may result in increased risk taking behaviour. |

| 104 | Weather: Fog |
|     | The effectiveness of visual information is impaired by fog. |

| 92 | Double train lines |
|    | The space between two sets of double train lines provides users with a refuge point. |

| 84 | Signal box: camera angle |
|    | Position of the camera at a level crossing influences the signaller's ability to detect objects. |

| 75 | Public houses |
|    | Crossings located on route to public houses may result in increased violations of crossing procedures. |

| 45 | Animals: Horses |
|    | Activated warnings at protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road vehicle users. |

| 09 | Signal box: track side workers |
|    | High-visibility clothing appears white on black & white monitors. |

| 23 | Sunlight strobing |
|    | Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers. |
# Level crossing type: MCB+CCTV

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>02</strong></td>
<td><strong>Driver distractions</strong></td>
</tr>
<tr>
<td>Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.</td>
<td></td>
</tr>
<tr>
<td><strong>03</strong></td>
<td><strong>Weather: Ice</strong></td>
</tr>
<tr>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
<td></td>
</tr>
<tr>
<td><strong>04</strong></td>
<td><strong>Users familiarity with a crossing</strong></td>
</tr>
<tr>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
<td></td>
</tr>
<tr>
<td><strong>05</strong></td>
<td><strong>Frequency of trains</strong></td>
</tr>
<tr>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
<td></td>
</tr>
<tr>
<td><strong>06</strong></td>
<td><strong>Road junctions</strong></td>
</tr>
<tr>
<td>Road junctions close to the level crossing may result in increased decision making and errors by vehicle drivers, and blocking-back over the crossing.</td>
<td></td>
</tr>
<tr>
<td><strong>07</strong></td>
<td><strong>Vehicle approach speed</strong></td>
</tr>
<tr>
<td>The speed of the road traversing a level crossing is a factor in vehicle driver errors.</td>
<td></td>
</tr>
<tr>
<td><strong>08</strong></td>
<td><strong>Age of drivers</strong></td>
</tr>
<tr>
<td>Violations at level crossings may be influenced by the age of the local population.</td>
<td></td>
</tr>
<tr>
<td><strong>10</strong></td>
<td><strong>Representation of HGV users</strong></td>
</tr>
<tr>
<td>HGV drivers form a disproportionately high number of incidents at level crossings.</td>
<td></td>
</tr>
<tr>
<td><strong>11</strong></td>
<td><strong>Pedestrian access</strong></td>
</tr>
<tr>
<td>Pedestrian and passengers are more likely to undertake risky behaviour at vehicular level crossings where bridges are not provided.</td>
<td></td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>Groups</strong></td>
</tr>
<tr>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
<td></td>
</tr>
<tr>
<td><strong>14</strong></td>
<td><strong>Time of day</strong></td>
</tr>
<tr>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
<td></td>
</tr>
<tr>
<td><strong>15</strong></td>
<td><strong>Visual clutter</strong></td>
</tr>
<tr>
<td>Superfluous information and roadside structures on the approach to the crossing may reduce the user’s detection of level crossing information and warning signs.</td>
<td></td>
</tr>
<tr>
<td><strong>16</strong></td>
<td><strong>Presence of rail staff</strong></td>
</tr>
<tr>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
<td></td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>Understanding of warning lights</strong></td>
</tr>
<tr>
<td>The onset of the amber and proceeding red lights of the activated warning system lead to various vehicle driver behaviours at level crossings.</td>
<td></td>
</tr>
<tr>
<td><strong>18</strong></td>
<td><strong>Closure time</strong></td>
</tr>
<tr>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
<td></td>
</tr>
<tr>
<td><strong>20</strong></td>
<td><strong>Audible alarm</strong></td>
</tr>
<tr>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
<td></td>
</tr>
<tr>
<td><strong>22</strong></td>
<td><strong>Conspicuity of flashing lights</strong></td>
</tr>
<tr>
<td>The effectiveness of flashing lights is limited by veiling glare, limited light output and their position.</td>
<td></td>
</tr>
</tbody>
</table>
### Level crossing type: MCB+CCTV

| 26 | Foliage |
The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.

| 28 | Position of warning lights |
The effectiveness of warning lights is influenced by their position.

| 30 | Trespassing on rail structures |
Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.

| 34 | Parked cars |
Parked cars before and after the level crossing may result in drivers slowing and stopping while on the level crossing.

| 38 | Visitor parking |
The position of visitors parked vehicles at a level crossing may affect the behaviour of other road drivers.

| 40 | Type of trains |
Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.

| 42 | Days of the week |
Risk taking behaviour at level crossings increases on working days.

| 43 | Suicide |
Level crossings are a potential target for use by persons attempting to commit suicide.

| 48 | Observation of amber light |
The length of activation time of the amber light has little affect on the behaviour of the vehicle driver.

| 49 | Road access |
Level crossings that provide the only access to routes either side of the crossing influences the risk taking behaviour of vehicle drivers.

| 50 | Passenger drop-off points |
Non-designated passenger drop-off points close to level crossings affects the flow and behaviour of traffic approaching a level crossing.

| 51 | See-through effect |
Level crossing located in a dip or on a brow of a long straight road may result in increases of red-light running.

| 52 | HGV drivers using rail station facilities |
The effectiveness of information is reduced by HGV drivers parking in front of signs and warning devices.

| 53 | Events |
Events increase the amount of irregular users at level crossings.

| 54 | Narrow roads |
Narrow roads before and after the level crossing may result in vehicle drivers slowing and stopping while on the level crossing.

| 56 | Location near major roads |
The risk of vehicle drivers blocking-back over the level crossing, or general risk taking behaviour is increased when the crossing is located on roads with direct access to major roads or motorways.

| 57 | Traffic calming systems |
Road traffic calming systems on the approaches to a level crossing may increase the risk of vehicles blocking-back.
### Level crossing type: MCB+CCTV

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td><strong>Foreign vehicle drivers</strong></td>
</tr>
<tr>
<td></td>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
</tr>
</tbody>
</table>

| 61 | **Crossing surface** |
|   | Uneven and slippery level crossing surface may present a potential hazard to those using the crossing. |

| 62 | **Roadworks** |
|   | Roadworks positioned up to 3 kilometres from the level crossing may still impact on vehicles blocking-back. |

| 63 | **Housing developments** |
|   | Housing developments increase road traffic and level crossing use. |

| 64 | **Vehicle shortcuts** |
|   | Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers. |

| 69 | **Rural level crossings** |
|   | The environmental context of a rural level crossing reduces the awareness of approaching vehicle drivers. |

| 70 | **Road markings** |
|   | The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings. |

| 71 | **Number of train lines** |
|   | Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians. |

| 72 | **Location near farms** |
|   | High volumes of farm traffic impact on the speed and behaviour of other vehicles traversing the crossing. |

| 73 | **Commercial traffic** |
|   | Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour. |

| 74 | **Proximity of level crossing to another** |
|   | Level crossings located in close proximity to another may influence the risk taking behaviour of vehicle drivers. |

| 79 | **Combined environmental features** |
|   | Level crossings with a combination of environmental features, such as bends, hills, trees and hedges, may increase the decision making errors of vehicle drivers. |

| 80 | **Cats-eyes** |
|   | Deteriorated ‘cats-eyes’ on the approach or on the level crossing may reduce the vehicle driver’s ability to negotiate the road layout at night. |

| 83 | **Road descents** |
|   | Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers. |

| 86 | **Train enthusiasts** |
|   | To view trains closely, people undertake risky behaviour at level crossings. |

| 87 | **School parking** |
|   | School drop-off and collection points close to level crossings affects the flow and behaviour of other vehicle drivers approaching the crossing. |

| 88 | **Proximity of different road speeds** |
|   | High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing. |
**Level crossing type: MCB+CCTV**

<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
<td><strong>Level crossing equipment</strong></td>
</tr>
<tr>
<td></td>
<td>The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td>90</td>
<td><strong>Position of information</strong></td>
</tr>
<tr>
<td></td>
<td>Perception of a hazard is improved when information referencing the imminent danger are associated together.</td>
</tr>
<tr>
<td>91</td>
<td><strong>Vehicle speed zones</strong></td>
</tr>
<tr>
<td></td>
<td>The position of incremental speed restriction signs influences the speed of vehicle drivers when approaching the crossing.</td>
</tr>
<tr>
<td>96</td>
<td><strong>Straight roads</strong></td>
</tr>
<tr>
<td></td>
<td>Straight roads increase the opportunities for vehicle drivers to undertake risky behaviour, to avoid having to wait at the level crossing.</td>
</tr>
<tr>
<td>97</td>
<td><strong>Stereotypical crossing users</strong></td>
</tr>
<tr>
<td></td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
</tr>
<tr>
<td>98</td>
<td><strong>Train arrival</strong></td>
</tr>
<tr>
<td></td>
<td>Activation of the warning lights is used by passengers as a train arrival indicator.</td>
</tr>
<tr>
<td>101</td>
<td><strong>Signal box: detection of objects</strong></td>
</tr>
<tr>
<td></td>
<td>Certain conditions impair the signallers ability to detect objects on the level crossing.</td>
</tr>
<tr>
<td>102</td>
<td><strong>Railway sidings</strong></td>
</tr>
<tr>
<td></td>
<td>Alternative uses of railways sidings may alter the type of traffic using a level crossing.</td>
</tr>
<tr>
<td>103</td>
<td><strong>Emergency services</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings located on routes used by emergency service vehicles may result in increased risk taking behaviour.</td>
</tr>
<tr>
<td>104</td>
<td><strong>Weather: Fog</strong></td>
</tr>
<tr>
<td></td>
<td>The effectiveness of visual information is impaired by fog.</td>
</tr>
<tr>
<td>92</td>
<td><strong>Double train lines</strong></td>
</tr>
<tr>
<td></td>
<td>The space between two sets of double train lines provides users with a refuge point.</td>
</tr>
<tr>
<td>84</td>
<td><strong>Signal box: camera angle</strong></td>
</tr>
<tr>
<td></td>
<td>Position of the camera at a level crossing influences the signallers ability to detect objects.</td>
</tr>
<tr>
<td>75</td>
<td><strong>Public houses</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
</tr>
<tr>
<td>45</td>
<td><strong>Animals: Horses</strong></td>
</tr>
<tr>
<td></td>
<td>Activated warnings at protected level crossings may result in undesirable behaviour by horses, and influence the behaviour of other road vehicle users.</td>
</tr>
<tr>
<td>09</td>
<td><strong>Signal box: track side workers</strong></td>
</tr>
<tr>
<td></td>
<td>High-visibility clothing appears white on black &amp; white monitors.</td>
</tr>
<tr>
<td>23</td>
<td><strong>Sunlight strobing</strong></td>
</tr>
<tr>
<td></td>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
</tr>
</tbody>
</table>
## Level crossing type: UWC

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>01</strong></td>
<td><strong>Phone box instructions</strong></td>
</tr>
<tr>
<td></td>
<td>Unclear phone instructions provided within phone boxes at UWC may result in users failing to communicate with the signaller.</td>
</tr>
<tr>
<td><strong>03</strong></td>
<td><strong>Weather: Ice</strong></td>
</tr>
<tr>
<td></td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
<tr>
<td><strong>04</strong></td>
<td><strong>Users familiarity with a crossing</strong></td>
</tr>
<tr>
<td></td>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
<tr>
<td><strong>05</strong></td>
<td><strong>Frequency of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td><strong>Regularity of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>Groups</strong></td>
</tr>
<tr>
<td></td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
<tr>
<td><strong>16</strong></td>
<td><strong>Presence of rail staff</strong></td>
</tr>
<tr>
<td></td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
<tr>
<td><strong>19</strong></td>
<td><strong>Open gates</strong></td>
</tr>
<tr>
<td></td>
<td>Open gates increases the risk to approaching users.</td>
</tr>
<tr>
<td><strong>21</strong></td>
<td><strong>Darkness</strong></td>
</tr>
<tr>
<td></td>
<td>Unprotected crossings used during the hours of darkness may lead to increased decision making errors by crossing users.</td>
</tr>
<tr>
<td><strong>25</strong></td>
<td><strong>Users perception of train speed &amp; distance</strong></td>
</tr>
<tr>
<td></td>
<td>Train speed and distance is underestimated by users, which may result in increased decision making errors by users at level crossings.</td>
</tr>
<tr>
<td><strong>26</strong></td>
<td><strong>Foliage</strong></td>
</tr>
<tr>
<td></td>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td><strong>27</strong></td>
<td><strong>Harvesting time</strong></td>
</tr>
<tr>
<td></td>
<td>Harvesting time influences the risk taking behaviour of UWC users.</td>
</tr>
<tr>
<td><strong>30</strong></td>
<td><strong>Trespassing on rail structures</strong></td>
</tr>
<tr>
<td></td>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td><strong>32</strong></td>
<td><strong>Train speeds</strong></td>
</tr>
<tr>
<td></td>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
</tr>
<tr>
<td><strong>33</strong></td>
<td><strong>Sighting distance</strong></td>
</tr>
<tr>
<td></td>
<td>Good sighting distance should indicate the level crossing as high risk.</td>
</tr>
<tr>
<td><strong>36</strong></td>
<td><strong>Telephone use</strong></td>
</tr>
<tr>
<td></td>
<td>Level crossing users failure to use the telephone is a factor in incidents at UWC crossings.</td>
</tr>
<tr>
<td><strong>37</strong></td>
<td><strong>Traffic moment</strong></td>
</tr>
<tr>
<td></td>
<td>High levels of traffic moment at user worked crossings increase the chances of an incident.</td>
</tr>
</tbody>
</table>
### Level crossing type: UWC

<table>
<thead>
<tr>
<th>39</th>
<th>Crossing utilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings with high crossing utilisation increases the risks to users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>40</th>
<th>Type of trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>43</th>
<th>Suicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>46</th>
<th>Gate crossing procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>The requirement to open and close the gate, following a procedure of crossing the tracks five times, is a factor in why gates are left open at UWC’s.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>55</th>
<th>Contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landowners failure to inform new contractors of the procedures and restrictions for using their vehicles across the level crossing may increase the risk of an incident.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>58</th>
<th>Diversification in farming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversification in farming increases public access to user-worked crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>61</th>
<th>Crossing surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>64</th>
<th>Vehicle shortcuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>65</th>
<th>Crossing instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambiguous crossing instructions may result in users failing to undertake the correct crossing procedure.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>67</th>
<th>Animals: Dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestrained dogs may impair their owners concentration while on the level crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>68</th>
<th>Contacting the signaller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unclear ‘user-type’ information may result in users failing to contact the signaller prior to crossing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>71</th>
<th>Number of train lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>73</th>
<th>Commercial traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>77</th>
<th>Decision point</th>
</tr>
</thead>
<tbody>
<tr>
<td>An obvious decision point is critical for users at unprotected level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>78</th>
<th>Signal sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long signal sections increase the risk taking behaviour of users at UWC’s.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>86</th>
<th>Train enthusiasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>88</th>
<th>Proximity of different road speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.</td>
<td></td>
</tr>
</tbody>
</table>
### Level crossing type: UWC

<table>
<thead>
<tr>
<th>Code</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td>Distance between gates</td>
<td>The overall distance between UWC gates and the distance between the gate and first train line effects the risk taking behaviour of vehicle users.</td>
</tr>
<tr>
<td>95</td>
<td>Noise</td>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
</tr>
<tr>
<td>97</td>
<td>Stereotypical crossing users</td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
</tr>
<tr>
<td>100</td>
<td>Communication with signaller</td>
<td>The dialogue between the level crossing user and the signaller may impact on the behaviour of the user.</td>
</tr>
<tr>
<td>104</td>
<td>Weather: Fog</td>
<td>The effectiveness of visual information is impaired by fog.</td>
</tr>
<tr>
<td>75</td>
<td>Public houses</td>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
</tr>
<tr>
<td>23</td>
<td>Sunlight strobing</td>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
</tr>
<tr>
<td>99</td>
<td>Sightlines</td>
<td>Restricted or blocked sightlines may encourage users to move past a point of safety.</td>
</tr>
</tbody>
</table>
## Level crossing type: UWC+T

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>01</strong></td>
<td><strong>Phone box instructions</strong></td>
</tr>
<tr>
<td></td>
<td>Unclear phone instructions provided within phone boxes at UWC may result in users failing to communicate with the signaller.</td>
</tr>
<tr>
<td><strong>03</strong></td>
<td><strong>Weather: Ice</strong></td>
</tr>
<tr>
<td></td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
<tr>
<td><strong>04</strong></td>
<td><strong>Users familiarity with a crossing</strong></td>
</tr>
<tr>
<td></td>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
<tr>
<td><strong>05</strong></td>
<td><strong>Frequency of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td><strong>Regularity of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>Groups</strong></td>
</tr>
<tr>
<td></td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
<tr>
<td><strong>16</strong></td>
<td><strong>Presence of rail staff</strong></td>
</tr>
<tr>
<td></td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
<tr>
<td><strong>19</strong></td>
<td><strong>Open gates</strong></td>
</tr>
<tr>
<td></td>
<td>Open gates increases the risk to approaching users.</td>
</tr>
<tr>
<td><strong>21</strong></td>
<td><strong>Darkness</strong></td>
</tr>
<tr>
<td></td>
<td>Unprotected crossings used during the hours of darkness may lead to increased decision making errors by crossing users.</td>
</tr>
<tr>
<td><strong>25</strong></td>
<td><strong>Users perception of train speed &amp; distance</strong></td>
</tr>
<tr>
<td></td>
<td>Train speed and distance is underestimated by users, which may result in increased decision making errors by users at level crossings.</td>
</tr>
<tr>
<td><strong>26</strong></td>
<td><strong>Foliage</strong></td>
</tr>
<tr>
<td></td>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td><strong>27</strong></td>
<td><strong>Harvesting time</strong></td>
</tr>
<tr>
<td></td>
<td>Harvesting time influences the risk taking behaviour of UWC users.</td>
</tr>
<tr>
<td><strong>30</strong></td>
<td><strong>Trespassing on rail structures</strong></td>
</tr>
<tr>
<td></td>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td><strong>32</strong></td>
<td><strong>Train speeds</strong></td>
</tr>
<tr>
<td></td>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
</tr>
<tr>
<td><strong>33</strong></td>
<td><strong>Sighting distance</strong></td>
</tr>
<tr>
<td></td>
<td>Good sighting distance should indicate the level crossing as high risk.</td>
</tr>
<tr>
<td><strong>36</strong></td>
<td><strong>Telephone use</strong></td>
</tr>
<tr>
<td></td>
<td>Level crossing users failure to use the telephone is a factor in incidents at UWC crossings.</td>
</tr>
<tr>
<td><strong>37</strong></td>
<td><strong>Traffic moment</strong></td>
</tr>
<tr>
<td></td>
<td>High levels of traffic moment at user worked crossings increase the chances of an incident.</td>
</tr>
<tr>
<td>Topic</td>
<td>Details</td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Level crossing type: UWC+T</strong></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Crossing utilisation</td>
</tr>
<tr>
<td>Level crossings with high crossing utilisation increases the risks to users.</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Type of trains</td>
</tr>
<tr>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Suicide</td>
</tr>
<tr>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Gate crossing procedure</td>
</tr>
<tr>
<td>The requirement to open and close the gate, following a procedure of crossing the tracks five times, is a factor in why gates are left open at UWC’s.</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Contractors</td>
</tr>
<tr>
<td>Landowners failure to inform new contractors of the procedures and restrictions for using their vehicles across the level crossing may increase the risk of an incident.</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Diversification in farming</td>
</tr>
<tr>
<td>Diversification in farming increases public access to user-worked crossings.</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Crossing surface</td>
</tr>
<tr>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Vehicle shortcuts</td>
</tr>
<tr>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Crossing instructions</td>
</tr>
<tr>
<td>Ambiguous crossing instructions may result in users failing to undertake the correct crossing procedure.</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Animals: Dogs</td>
</tr>
<tr>
<td>Unrestrained dogs may impair their owners concentration while on the level crossing.</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Contacting the signaller</td>
</tr>
<tr>
<td>Unclear ‘user-type’ information may result in users failing to contact the signaller prior to crossing.</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Number of train lines</td>
</tr>
<tr>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Commercial traffic</td>
</tr>
<tr>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Decision point</td>
</tr>
<tr>
<td>An obvious decision point is critical for users at unprotected level crossings.</td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Signal sections</td>
</tr>
<tr>
<td>Long signal sections increase the risk taking behaviour of users at UWC’s.</td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Train enthusiasts</td>
</tr>
<tr>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Proximity of different road speeds</td>
</tr>
<tr>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.</td>
<td></td>
</tr>
</tbody>
</table>
**Level crossing type: UWC+T**

<table>
<thead>
<tr>
<th>93</th>
<th>Distance between gates</th>
</tr>
</thead>
<tbody>
<tr>
<td>The overall distance between UWC gates and the distance between the gate and first train line effects the risk taking behaviour of vehicle users.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>95</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>97</th>
<th>Stereotypical crossing users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>100</th>
<th>Communication with signaller</th>
</tr>
</thead>
<tbody>
<tr>
<td>The dialogue between the level crossing user and the signaller may impact on the behaviour of the user.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>104</th>
<th>Weather: Fog</th>
</tr>
</thead>
<tbody>
<tr>
<td>The effectiveness of visual information is impaired by fog.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>75</th>
<th>Public houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>23</th>
<th>Sunlight strobing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>99</th>
<th>Sightlines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restricted or blocked sightlines may encourage users to move past a point of safety.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Level crossing type: UWC+MWL</strong></td>
<td></td>
</tr>
<tr>
<td><strong>02</strong></td>
<td><strong>Driver distractions</strong></td>
</tr>
<tr>
<td>Distractions on the approach to a level crossing may impair the performance of both vehicle and train drivers.</td>
<td></td>
</tr>
<tr>
<td><strong>03</strong></td>
<td><strong>Weather: Ice</strong></td>
</tr>
<tr>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
<td></td>
</tr>
<tr>
<td><strong>04</strong></td>
<td><strong>Users familiarity with a crossing</strong></td>
</tr>
<tr>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
<td></td>
</tr>
<tr>
<td><strong>05</strong></td>
<td><strong>Frequency of trains</strong></td>
</tr>
<tr>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
<td></td>
</tr>
<tr>
<td><strong>08</strong></td>
<td><strong>Age of drivers</strong></td>
</tr>
<tr>
<td>Violations at level crossings may be influenced by the age of the local population.</td>
<td></td>
</tr>
<tr>
<td><strong>12</strong></td>
<td><strong>Regularity of trains</strong></td>
</tr>
<tr>
<td>Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
<td></td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>Groups</strong></td>
</tr>
<tr>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
<td></td>
</tr>
<tr>
<td><strong>16</strong></td>
<td><strong>Presence of rail staff</strong></td>
</tr>
<tr>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
<td></td>
</tr>
<tr>
<td><strong>18</strong></td>
<td><strong>Closure time</strong></td>
</tr>
<tr>
<td>The amount of time the user expects to wait at the level crossing may influence their risk taking behaviour.</td>
<td></td>
</tr>
<tr>
<td><strong>19</strong></td>
<td><strong>Open gates</strong></td>
</tr>
<tr>
<td>Open gates increases the risk to approaching users.</td>
<td></td>
</tr>
<tr>
<td><strong>20</strong></td>
<td><strong>Audible alarm</strong></td>
</tr>
<tr>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
<td></td>
</tr>
<tr>
<td><strong>26</strong></td>
<td><strong>Foliage</strong></td>
</tr>
<tr>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
<td></td>
</tr>
<tr>
<td><strong>27</strong></td>
<td><strong>Harvesting time</strong></td>
</tr>
<tr>
<td>Harvesting time influences the risk taking behaviour of UWC users.</td>
<td></td>
</tr>
<tr>
<td><strong>28</strong></td>
<td><strong>Position of warning lights</strong></td>
</tr>
<tr>
<td>The effectiveness of warning lights is influenced by their position.</td>
<td></td>
</tr>
<tr>
<td><strong>30</strong></td>
<td><strong>Trespassing on rail structures</strong></td>
</tr>
<tr>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
<td></td>
</tr>
<tr>
<td><strong>32</strong></td>
<td><strong>Train speeds</strong></td>
</tr>
<tr>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
<td></td>
</tr>
<tr>
<td><strong>33</strong></td>
<td><strong>Sighting distance</strong></td>
</tr>
<tr>
<td>Good sighting distance should indicate the level crossing as high risk.</td>
<td></td>
</tr>
<tr>
<td>Level crossing type: UWC+MWL</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Telephone use</strong></td>
<td></td>
</tr>
<tr>
<td>Level crossing users failure to use the telephone is a factor in incidents at UWC crossings.</td>
<td></td>
</tr>
<tr>
<td><strong>Traffic moment</strong></td>
<td></td>
</tr>
<tr>
<td>High levels of traffic moment at user worked crossings increase the chances of an incident.</td>
<td></td>
</tr>
<tr>
<td><strong>Crossing utilisation</strong></td>
<td></td>
</tr>
<tr>
<td>Level crossings with high crossing utilisation increases the risks to users.</td>
<td></td>
</tr>
<tr>
<td><strong>Type of trains</strong></td>
<td></td>
</tr>
<tr>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
</tr>
<tr>
<td><strong>Days of the week</strong></td>
<td></td>
</tr>
<tr>
<td>Risk taking behaviour at level crossings increases on working days.</td>
<td></td>
</tr>
<tr>
<td><strong>Suicide</strong></td>
<td></td>
</tr>
<tr>
<td>Level crossings are a potential target for use by persons attempting to commit suicide.</td>
<td></td>
</tr>
<tr>
<td><strong>Gate crossing procedure</strong></td>
<td></td>
</tr>
<tr>
<td>The requirement to open and close the gate, following a procedure of crossing the tracks five times, is a factor in why gates are left open at UWC’s.</td>
<td></td>
</tr>
<tr>
<td><strong>Violations at MWL</strong></td>
<td></td>
</tr>
<tr>
<td>Over estimation of warning time and underestimation of crossing leads to risk taking behaviour.</td>
<td></td>
</tr>
<tr>
<td><strong>Contractors</strong></td>
<td></td>
</tr>
<tr>
<td>Landowners failure to inform new contractors of the procedures and restrictions for using their vehicles across the level crossing may increase the risk of an incident.</td>
<td></td>
</tr>
<tr>
<td><strong>Diversification in farming</strong></td>
<td></td>
</tr>
<tr>
<td>Diversification in farming increases public access to user-worked crossings.</td>
<td></td>
</tr>
<tr>
<td><strong>Foreign vehicle drivers</strong></td>
<td></td>
</tr>
<tr>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
<td></td>
</tr>
<tr>
<td><strong>Crossing surface</strong></td>
<td></td>
</tr>
<tr>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
<td></td>
</tr>
<tr>
<td><strong>Vehicle shortcuts</strong></td>
<td></td>
</tr>
<tr>
<td>Level crossings on roads used as shortcuts result in increased risk taking behaviour by vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td><strong>Crossing instructions</strong></td>
<td></td>
</tr>
<tr>
<td>Ambiguous crossing instructions may result in users failing to undertake the correct crossing procedure.</td>
<td></td>
</tr>
<tr>
<td><strong>Animals: Dogs</strong></td>
<td></td>
</tr>
<tr>
<td>Unrestrained dogs may impair their owners concentration while on the level crossing.</td>
<td></td>
</tr>
<tr>
<td><strong>Road markings</strong></td>
<td></td>
</tr>
<tr>
<td>The effectiveness of vehicle drivers stopping in the correct location is impaired by worn road markings.</td>
<td></td>
</tr>
<tr>
<td><strong>Number of train lines</strong></td>
<td></td>
</tr>
<tr>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
<td></td>
</tr>
</tbody>
</table>
### Level crossing type: UWC+MWL

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>73</td>
<td><strong>Commercial traffic</strong></td>
</tr>
<tr>
<td></td>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
</tr>
<tr>
<td>86</td>
<td><strong>Train enthusiasts</strong></td>
</tr>
<tr>
<td></td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
</tr>
<tr>
<td>88</td>
<td><strong>Proximity of different road speeds</strong></td>
</tr>
<tr>
<td></td>
<td>High road speeds in close proximity to a level crossing on a lower speed road influences the speed at which vehicle drivers approach the crossing.</td>
</tr>
<tr>
<td>89</td>
<td><strong>Level crossing equipment</strong></td>
</tr>
<tr>
<td></td>
<td>The reliability and/or perception of reliability of the level crossing equipment affects the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td>93</td>
<td><strong>Distance between gates</strong></td>
</tr>
<tr>
<td></td>
<td>The overall distance between UWC gates and the distance between the gate and first train line effects the risk taking behaviour of vehicle users.</td>
</tr>
<tr>
<td>95</td>
<td><strong>Noise</strong></td>
</tr>
<tr>
<td></td>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
</tr>
<tr>
<td>97</td>
<td><strong>Stereotypical crossing users</strong></td>
</tr>
<tr>
<td></td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
</tr>
<tr>
<td>104</td>
<td><strong>Weather: Fog</strong></td>
</tr>
<tr>
<td></td>
<td>The effectiveness of visual information is impaired by fog.</td>
</tr>
<tr>
<td>75</td>
<td><strong>Public houses</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
</tr>
<tr>
<td>23</td>
<td><strong>Sunlight strobing</strong></td>
</tr>
<tr>
<td></td>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
</tr>
<tr>
<td>99</td>
<td><strong>Sightlines</strong></td>
</tr>
<tr>
<td></td>
<td>Restricted or blocked sightlines may encourage users to move past a point of safety.</td>
</tr>
<tr>
<td>Title</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Level crossing type: OC</strong></td>
<td></td>
</tr>
<tr>
<td>01  Phone box instructions</td>
<td>Unclear phone instructions provided within phone boxes at UWC may result in users failing to communicate with the signaller.</td>
</tr>
<tr>
<td>03  Weather: Ice</td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
<tr>
<td>04  Users familiarity with a crossing</td>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
<tr>
<td>05  Frequency of trains</td>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td>12  Regularity of trains</td>
<td>Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
</tr>
<tr>
<td>13  Groups</td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
<tr>
<td>14  Time of day</td>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
</tr>
<tr>
<td>16  Presence of rail staff</td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
<tr>
<td>19  Open gates</td>
<td>Open gates increases the risk to approaching users.</td>
</tr>
<tr>
<td>20  Audible alarm</td>
<td>Second audible warning tone is not detected and/or understood by level crossing users.</td>
</tr>
<tr>
<td>21  Darkness</td>
<td>Unprotected crossings used during the hours of darkness may lead to increased decision making errors by crossing users.</td>
</tr>
<tr>
<td>25  Users perception of train speed &amp; distance</td>
<td>Train speed and distance is underestimated by users, which may result in increased decision making errors by users at level crossings.</td>
</tr>
<tr>
<td>26  Foliage</td>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td>27  Harvesting time</td>
<td>Harvesting time influences the risk taking behaviour of UWC users.</td>
</tr>
<tr>
<td>30  Trespassing on rail structures</td>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td>32  Train speeds</td>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
</tr>
<tr>
<td>33  Sighting distance</td>
<td>Good sighting distance should indicate the level crossing as high risk.</td>
</tr>
<tr>
<td>Level crossing type: OC</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>39 Crossing utilisation</td>
<td></td>
</tr>
<tr>
<td>Level crossings with high crossing utilisation increases the risks to users.</td>
<td></td>
</tr>
<tr>
<td>40 Type of trains</td>
<td></td>
</tr>
<tr>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
<td></td>
</tr>
<tr>
<td>43 Suicide</td>
<td></td>
</tr>
<tr>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
<td></td>
</tr>
<tr>
<td>46 Gate crossing procedure</td>
<td></td>
</tr>
<tr>
<td>The requirement to open and close the gate, following a procedure of crossing the tracks five times, is a factor in why gates are left open at UWC’s.</td>
<td></td>
</tr>
<tr>
<td>53 Events</td>
<td></td>
</tr>
<tr>
<td>Events increase the amount of irregular users at level crossings.</td>
<td></td>
</tr>
<tr>
<td>55 Contractors</td>
<td></td>
</tr>
<tr>
<td>Landowners failure to inform new contractors of the procedures and restrictions for using their vehicles across the level crossing may increase the risk of an incident.</td>
<td></td>
</tr>
<tr>
<td>61 Crossing surface</td>
<td></td>
</tr>
<tr>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
<td></td>
</tr>
<tr>
<td>63 Housing developments</td>
<td></td>
</tr>
<tr>
<td>Housing developments increase road traffic and level crossing use.</td>
<td></td>
</tr>
<tr>
<td>67 Animals: Dogs</td>
<td></td>
</tr>
<tr>
<td>Unrestrained dogs may impair their owners concentration while on the level crossing.</td>
<td></td>
</tr>
<tr>
<td>71 Number of train lines</td>
<td></td>
</tr>
<tr>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
<td></td>
</tr>
<tr>
<td>73 Commercial traffic</td>
<td></td>
</tr>
<tr>
<td>Level crossings with high volumes of commercial traffic may result in increased risk taking behaviour.</td>
<td></td>
</tr>
<tr>
<td>77 Decision point</td>
<td></td>
</tr>
<tr>
<td>An obvious decision point is critical for users at unprotected level crossings.</td>
<td></td>
</tr>
<tr>
<td>83 Road descents</td>
<td></td>
</tr>
<tr>
<td>Level crossings located at the end of a descent may result in increased red-light running by vehicle drivers.</td>
<td></td>
</tr>
<tr>
<td>86 Train enthusiasts</td>
<td></td>
</tr>
<tr>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
<td></td>
</tr>
<tr>
<td>95 Noise</td>
<td></td>
</tr>
<tr>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
<td></td>
</tr>
<tr>
<td>97 Stereotypical crossing users</td>
<td></td>
</tr>
<tr>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
<td></td>
</tr>
<tr>
<td>104 Weather: Fog</td>
<td></td>
</tr>
<tr>
<td>The effectiveness of visual information is impaired by fog.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>75</td>
<td><strong>Public houses</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
</tr>
<tr>
<td>23</td>
<td><strong>Sunlight strobing</strong></td>
</tr>
<tr>
<td></td>
<td>Sunlight passing through lines of trees positioned on the side of the road imparts a strobing effect on the road which may impair the visibility of vehicle drivers.</td>
</tr>
<tr>
<td>99</td>
<td><strong>Sightlines</strong></td>
</tr>
<tr>
<td></td>
<td>Restricted or blocked sightlines may encourage users to move past a point of safety.</td>
</tr>
<tr>
<td>Level crossing type: FC</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>03</strong></td>
<td><strong>Weather: Ice</strong></td>
</tr>
<tr>
<td></td>
<td>Icy weather conditions on the approach, exit and on the crossing affects the behaviour of crossing users.</td>
</tr>
<tr>
<td><strong>04</strong></td>
<td><strong>Users familiarity with a crossing</strong></td>
</tr>
<tr>
<td></td>
<td>Regular users and those living close to level crossings are more likely to undertake risk taking behaviour when using the crossing.</td>
</tr>
<tr>
<td><strong>05</strong></td>
<td><strong>Frequency of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Crossings with a low frequency of trains are likely to increase the risk taking behaviour of regular users.</td>
</tr>
<tr>
<td><strong>12</strong></td>
<td><strong>Regularity of trains</strong></td>
</tr>
<tr>
<td></td>
<td>Variations in train schedules, such as engineering works, unexpected delays to train services, and line speed restrictions etc., all contribute to fluctuations in trains passing a point at a supposedly ‘known’ time.</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>Groups</strong></td>
</tr>
<tr>
<td></td>
<td>People in groups may undertake more risky behaviour, than when on their own.</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td><strong>Time of day</strong></td>
</tr>
<tr>
<td></td>
<td>Risk taking at level crossings increases during rush-hours, at midday and at the beginning and end of the school day.</td>
</tr>
<tr>
<td><strong>16</strong></td>
<td><strong>Presence of rail staff</strong></td>
</tr>
<tr>
<td></td>
<td>The presence of rail staff in high-visibility clothing can have an undesirable influence on level crossing user behaviour.</td>
</tr>
<tr>
<td><strong>19</strong></td>
<td><strong>Open gates</strong></td>
</tr>
<tr>
<td></td>
<td>Open gates increases the risk to approaching users.</td>
</tr>
<tr>
<td><strong>21</strong></td>
<td><strong>Darkness</strong></td>
</tr>
<tr>
<td></td>
<td>Unprotected crossings used during the hours of darkness may lead to increased decision making errors by crossing users.</td>
</tr>
<tr>
<td><strong>25</strong></td>
<td><strong>Users perception of train speed &amp; distance</strong></td>
</tr>
<tr>
<td></td>
<td>Train speed and distance is underestimated by users, which may result in increased decision making errors by users at level crossings.</td>
</tr>
<tr>
<td><strong>26</strong></td>
<td><strong>Foliage</strong></td>
</tr>
<tr>
<td></td>
<td>The effectiveness of information on the approach to and at the level crossing is reduced by overgrown foliage.</td>
</tr>
<tr>
<td><strong>28</strong></td>
<td><strong>Position of warning lights</strong></td>
</tr>
<tr>
<td></td>
<td>The effectiveness of warning lights is influenced by their position.</td>
</tr>
<tr>
<td><strong>30</strong></td>
<td><strong>Trespassing on rail structures</strong></td>
</tr>
<tr>
<td></td>
<td>Rail structures located at the entrance and exit areas to crossings that appear suitable for climbing may result in undesirable risk taking behaviour by members of the public.</td>
</tr>
<tr>
<td><strong>32</strong></td>
<td><strong>Train speeds</strong></td>
</tr>
<tr>
<td></td>
<td>Low train speeds may increase the risk taking behaviour of users.</td>
</tr>
<tr>
<td><strong>33</strong></td>
<td><strong>Sighting distance</strong></td>
</tr>
<tr>
<td></td>
<td>Good sighting distance should indicate the level crossing as high risk.</td>
</tr>
<tr>
<td><strong>35</strong></td>
<td><strong>Position of safety</strong></td>
</tr>
<tr>
<td></td>
<td>Insufficient space between trackside gate and rail results in potential obstruction of track by bicycles and pushchairs.</td>
</tr>
<tr>
<td><strong>39</strong></td>
<td><strong>Crossing utilisation</strong></td>
</tr>
<tr>
<td></td>
<td>Level crossings with high crossing utilisation increases the risks to users.</td>
</tr>
</tbody>
</table>
Level crossing type: FC

<table>
<thead>
<tr>
<th></th>
<th>Type of trains</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Train lines with high frequency of both freight and passenger services may influence the risk taking behaviour of users.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Suicide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level crossings are a potential target for use by persons attempting to commit suicide</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Foreign vehicle drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Areas with high levels of foreign vehicle drivers may have increases in decision making errors at level crossings. This may be more evident during seasonal periods.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Crossing surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uneven and slippery level crossing surface may present a potential hazard to those using the crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Housing developments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Housing developments increase road traffic and level crossing use.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Animals: Dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unrestrained dogs may impair their owners concentration while on the level crossing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Number of train lines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single train lines may increase the risk taking behaviour of both vehicle drivers and pedestrians.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Decision point</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>An obvious decision point is critical for users at unprotected level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Train enthusiasts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To view trains closely, people undertake risky behaviour at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Trespassers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food and drink rubbish at a level crossing is often an indicator of young people using the crossing as a meeting place.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Noisy surroundings may impair the performance of the users to detect trains at level crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Stereotypical crossing users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Users who violate crossing procedures are not always male and in their twenties.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Weather: Fog</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The effectiveness of visual information is impaired by fog.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Public houses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crossings located on route to public houses may result in increased violations of crossing procedures.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Sightlines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Restricted or blocked sightlines may encourage users to move past a point of safety.</td>
</tr>
</tbody>
</table>