UIC SAFETY PLATFORM

Best practice for level crossing risk assessment

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Global Level Crossing Network

INTERNATIONAL UNION OF RAILWAYS

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Introduction

One of the biggest risks on railways across the world is where trains and road vehicles or people both use intersections known as 'grade or 'level' crossings. The international railway community shares best practice through UIC's [Global Level Crossing Network (GLCN)] and promotes safe use each year with an International Level Crossing Awareness Day ([ILCAD]). Other campaigns and the [Safer LC toolbox] help rail and road authorities to reduce the number of incidents and fatalities at the world's level crossings.

The UIC Safety Platform proposed that GLCN should identify best practice for risk assessment of grade/level crossings and promote adoption by member railways. This guide provides the best practice identified by that work.

The workstream was completed in two phases:

Phase 1 – Review current global working practices
Phase 2 – Creation of a best practice document

With the help of UIC members, the GLCN has identified "Seven Principles for Risk Assessing Level Crossings" which are highlighted in this document.

The UIC would like to thank the following members for contributing to this guidance:

GLCN recognised that the legal framework differs around the world. Some countries make risk assessment an explicit duty, others apply it to some crossings (e.g., on public roads) but not others, and a third group of railways have no duty in this area.

But whether a legal duty or not, there is evidence that countries using risk assessment at every level crossing have been able to better target resource towards most effective risk reduction. And reflecting the level of risk with the optimum design and safety features can both enable and persuade people to use them responsibly.

An example of a risk assessment process flow used by one contributor to this work is shown at Annex 1. But in seeking to keep the guide applicable in the widest range of railways, this guide covers principles rather than detail. The GLCN work has identified seven key principles for effective risk assessment of level crossings.

The Principles

1. Risk assess each individual crossing

2. The frequency of re-assessment should be guided by the risk at each crossing

3. Look beyond the level crossing

4. Think like the user

5. Engage with users and stakeholders

6. The numbers are useful, but they are not everything

7. Eliminate, Reduce, Control, Inform, Educate

1. Risk assess each individual crossing

Each level/grade crossing is different, they are in different surroundings, they are used by different people, each has different characteristics which must be identified, assessed and managed.

Important factors are the type of rail traffic, its frequency, speed, and whether different services are likely to cross at or near the crossing

The contributors to this work believe that railways treating each crossing as an individual asset and risk assessing each one separately are better able to manage the risk and make more informed decisions on prioritisation of safety improvement across all their crossings.

2. The frequency of re-assessment should be guided by the risk at each crossing

Risk assessments are refreshed at various intervals across the world from every year to every five years.

With resources limited for risk assessing all crossings, priority should be given to those deemed most risky: higher risk crossings should be risk assessed more frequently than those that are lower risk.

Level crossing use can vary at different times of year – with the crossing perhaps used by holiday traffic, for seasonal farming activity; or being affected by different weather or vegetation growth. Some railways therefore schedule each re-assessment to be in a different season; this provides the best understanding over a number of assessment cycles without absorbing disproportionate resource.

3. Look beyond the crossing

Risk at each level crossing is affected by the local surroundings, not just where the road or path crosses the railway. Many factors should be considered. For example:

a. Is it in a town, a city or in a rural area?

b. Do the local surroundings/amenities affect who is most likely to use the crossing?

c. Does the road layout make it more complicated to use the crossing?

d. How might the local weather affect the crossing use?

   i. Could vehicles skid due to snow/ice or heavy rain?

   ii. Could the crossing get flooded and trap vehicles?

   iii. Could visibility of trains be affected by low sun or fog?

To fully understand the risk at a crossing there is a need to look further than the obvious factors.

Consider whether the risk control measures used at the level crossing could impact other risks too. For example, if the signaller/traffic controller has to be involved, could that distract them from other tasks?

4. Think like the user

To understand the risk, it is best to identify who uses the crossing, how many users there are, how they will interact with and use the crossing and what will influence their decisions when using the crossing.

This requires an understanding of who uses the crossing, their characteristics, what they are doing or where are they going when using the crossing.

User data can be collected through a manual count or through video census. Video is preferred as it allows a longer period of time to be assessed and creates a better understanding of how the user interacts with the crossing.

When thinking like the user it is also important to consider factors like the speed at which people walk, reaction times for decision making and what in the local vicinity might influence a user's decision.

For example, if the crossing leads to, or is near, a school, children who are more easily distracted or do not make decisions like a rational adult will affect the risk at the crossing. Even parents, rushing to pick up a young child from school on time may take more risk, so they are not late.

Similarly, if the crossing is on private property, e.g., as part of a farm, the user may use the crossing so often they think they know when the trains traverse a crossing and become complacent.

When identifying how to control the risk at a level crossing it is important to understand what other risks may be imported through changing user behaviour.

Accident investigations (e.g. Rail Accident Investigation Branch - Athelney March 2013; Rail Accident Investigation Branch - Motts Lane January 2013) have highlighted the time required to wait while a crossing was 'closed' due to a passing train may influence the user's willingness to wait; users who know there is a long wait time might attempt to beat the train or ignore lights and barriers.

Risk assessment should consider whether users will understand the instructions of how to use the crossing safely.

- Are they easy to follow?
- Can someone who doesn't speak or read your primary language still understand them?
- Do they know which information is important?

It is key that risk assessments look at the crossing through the eyes of a user, only then will the assessor understand the risk the level crossing poses.

5. Engage with stakeholders and users

This work has identified that engaging a wide range of stakeholders in the risk assessment process is important.

As a minimum, level crossing risk assessments should always involve:

- Rail infrastructure manager
- Road infrastructure manager
- Local traffic authority
- Private land-owners (where the crossing is situated on their land)

Those who could be involved in level crossing risk assessments include:

- Train operating companies
- Members of the public
- Local groups who may have been identified through census (e.g., horse riding schools)

All these stakeholders will hold vital information about the crossing and its use, and in some circumstances may be responsible for some of the control measures required to control crossing risk.

6. The numbers are useful, but they are not everything

Many countries use quantified risk assessment: using numbers to determine crossing risk.

Using the data from census activity about how many cars, heavy goods vehicles, cyclists, pedestrians etc use the crossing, coupled with information on the number of trains that pass over the crossing helps determine the 'Traffic Moment', which is the product of the number of level crossing users and the amount of rail traffic. The more frequent one or both of these, the greater the opportunity for an accident.

The proportion of 'barrier down time' is also relevant: the longer a crossing is closed to road traffic, the greater the inconvenience to users and the likelihood of unsafe acts.

Historical incident data can be used to consider how likely a future accident is, and the scale of consequence. Whilst it would be useful to use the historical data for each crossing this isn't always possible, so some countries use historical event data and correlate it by crossing type allowing a wider data set to be used for quantitative analysis.

However, using the quantified data is not enough. Information about how the crossing is used, where it is situated, who uses it, how they use it and why previous accidents have occurred is key.

Quantified data helps inform the crossing risk assessment and is extremely helpful when prioritising action and which crossings to improve first.

Qualitative information allows for further structured expert judgement to be made about each individual crossing's risk.

7. Eliminate, Reduce, Control, Inform, Educate

Not all risk controls are equal. Some are more effective and sustainable than others. Those which depend on reliable human behaviour are normally the least effective. When determining how to manage the risk identified at level crossings, it is best practice to prioritise controls from the top of this list and only if the higher one is not possible, consider the next.

Eliminate the risk – Close the crossing

Reduce the risk – Limit the number or type of users, reduce the likelihood that a train and a crossing user will meet

Control – Use engineering or technology to influence crossing user decision making; better information allows users to make better decisions

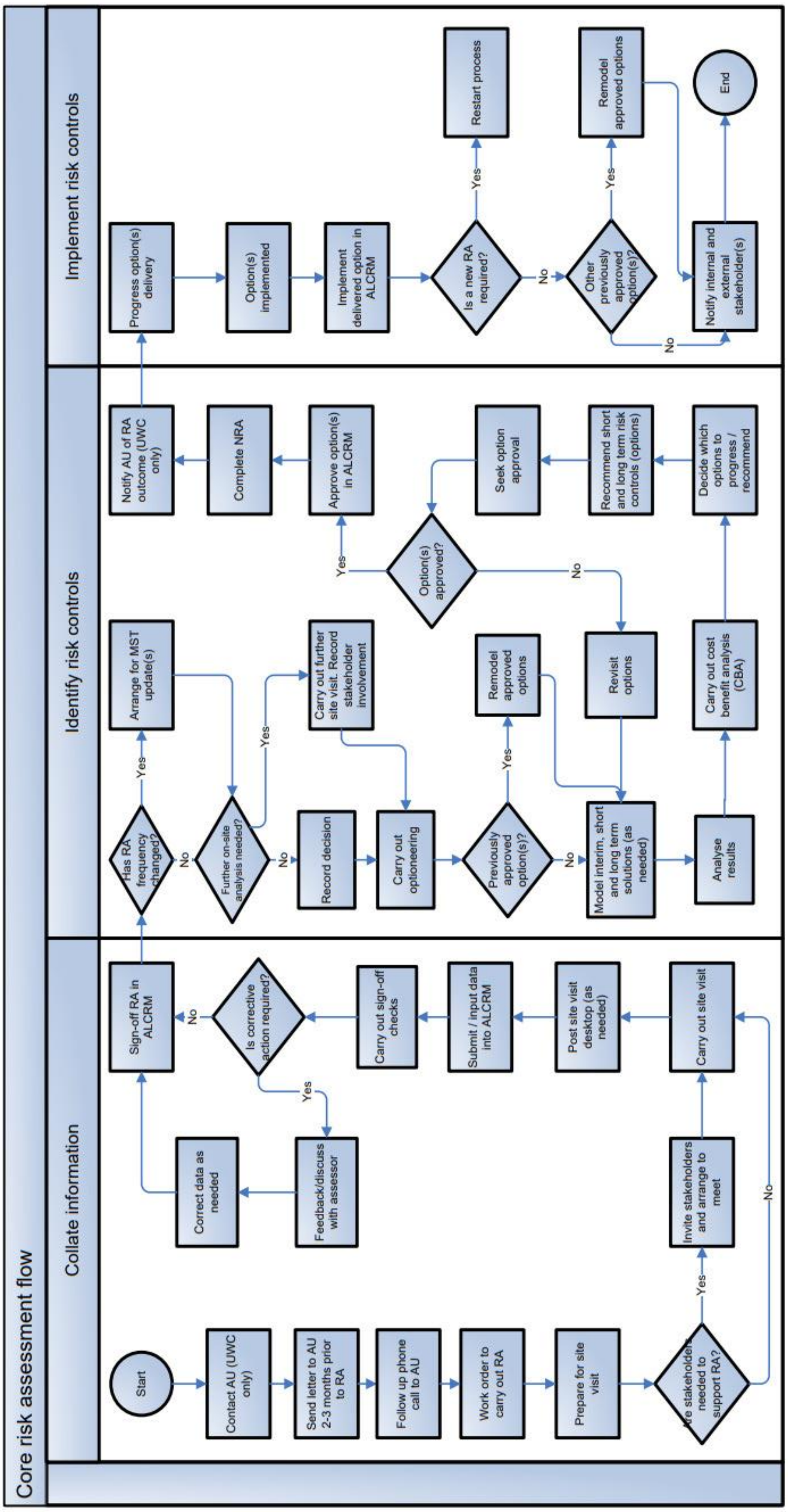
Inform – Use signage to inform crossing users how to use the crossing safely

Educate and Enforce – Crossing safety campaigns, safety awareness events, messaging in schools, re-education after misuse to influence user behaviour before they arrive at the crossing; and enforcement to persuade offenders and others to change behaviour.

Using these seven principles will enable railways in any country to best understand and control the risks at level/grade crossings. Those leading the risk assessments will need the right skills and access to the best available data. Acting on the risk assessments with the right control measures for the specific factors identified is the most effective way to reduce the risks to both users and trains at level crossings

Annex 1

An example of a risk assessment process flow used by Network Rail



Annex 2

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