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Group of Experts on Improving Safety at Level Crossings

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Programme of Work:

Risk management of level crossings

This paper, prepared by the Chair, is intended as a first draft to be refined and expanded upon for inclusion in the first draft strategic report planned for initial review at the Seventh Session of GE1 in March 2016.

Discussion Paper / Risk Management at Level Crossings for GE1 Members

1. In order to improve and professionalise the process of managing the safety of Level Crossings a small number of organisations have introduced an end to end risk management regime. The level and sophistication of these varies and is often dependent on the resources allocated to managing this process. Although the process flow is standardised the bespoke nature of the subject matter requires some specialist expertise.
2. Introducing this new capability enables managers to prioritise investment and to justify this to stakeholders through greater transparency and rational for the decision making process. Investment opportunities are limited and it is critical to address the key areas of safety and risk when allocating these limited funds.
3. It also enables managers to agree and then deliver against strategic plans and for a greater assurance process to review these plans and the output of the risk management process.
4. This paper is intended to share some of this good practice and to recommend that a Risk Management Regime is part of a strategic plan for managing Level Crossings safely.
5. **Risk management** is the identification, assessment, and prioritization of risks (defined in ISO 31000 as *the effect of uncertainty on objectives*). Followed by the treatment of those risks.
6. Risk sources are more often identified and located not only in infrastructural or technological assets and tangible variables, but also in human factor variables, mental states and decision making. The interaction between human factors and tangible aspects of risk highlights the need to focus closely on human factors as one of the main drivers for risk management.
7. Human Factors is already part of the scope of this programme of work and is considered more fully in one of the six GE1 sub groups.
8. Certain aspects of many of the risk management standards have come under criticism for having no measurable improvement on risk, whereas the confidence in estimates and decisions seem to increase. Again a small number of responsible organisations have used bespoke Level Crossing risk models to measure risk changes. Others have used models such as accident prevention models to rank and or prioritise their Level Crossings.
9. In ideal risk management, a prioritization process is followed whereby the risks with the greatest loss (or impact) and the greatest probability of occurring are handled first, and risks with lower probability of occurrence and lower loss are handled in descending order. In practice the process of assessing overall risk can be difficult, and balancing resources used to mitigate between risks with a high probability of occurrence but lower loss versus a risk with high loss but lower probability of occurrence can often be mishandled.
10. One of the main challenges for any organisation considering implementing a Risk Management Regime for Level Crossings is the scale and volume of the task to introduce a suitable and sufficient process at potentially thousands of locations. Many of these in remote locations with little knowledge of key inputs required to assess risk or capability to do this at regular intervals.
11. For example; intangible risk management identifies a new type of a risk that has a 100% probability of occurring but is ignored by the organisation due to a lack of

identification ability. For example, when deficient knowledge is applied to a situation, a knowledge risk materializes.

12. Situated at the interface between road and rail Level Crossings have many interdependencies between different and often multiple organisations. Relationship risk appears when ineffective collaboration occurs.

13. Process-engagement risk may be an issue when ineffective operational procedures are applied.

14. Level crossings often have knowledge gaps and incomplete or unknown data sets. Outside of the asset inventory little may be captured or understood about the main risk drivers. The lack of consistent validation creates the knowledge gap which makes the risk management process much more challenging.

15. There are a number of reasons for this. Many safety critical industries have successfully introduced much tighter controls and processes for risk management. The nuclear industry, oil, gas and even construction have been at the forefront of improvements to Health & Safety and greater assurance as part of an improved approach to managing risk. This has generally been driven by accidents and investigations and stakeholder concerns and pressure. The rail industry has faced many similar challenges and has had to prioritise these.

16. Risk management also faces difficulties in allocating resources. This is the idea of opportunity cost. Resources spent on risk management could have been spent on more profitable activities. Again, ideal risk management minimises spending (or manpower or other resources) and also minimises the negative effects of risks.

17. For the most part, these methods consist of the following elements, performed, more or less, in the following order.

- Identify, characterize threats;
- Assess the vulnerability of critical assets to specific threats;
- Determine the Risk (i.e. the expected likelihood and consequences of specific types of events on specific assets);
- Identify ways to reduce those risks;
- Prioritise risk reduction measures based on a strategy.

Principles of risk management

The International Organization for Standardization (ISO) identifies the following principles of risk management:

18. Risk management should:
- Create value – resources expended to mitigate risk should be less than the consequence of inaction, or (as in value engineering), the gain should exceed the pain;
 - Be an integral part of organizational processes;
 - Be part of decision making process;
 - Explicitly address uncertainty and assumptions;
 - Be a systematic and structured process;

- Be based on the best available information;
- Be tailorable;
- Take human factors into account;
- Be transparent and inclusive;
- Be dynamic, iterative and responsive to change;
- Be capable of continual improvement and enhancement;
- Be continually or periodically re-assessed;

Process

19. According to the standard ISO 31000 "Risk management – Principles and guidelines on implementation," the process of risk management consists of several steps as discussed:

Identification

20. After establishing the context, the next step in the process of managing risk is to identify potential risks. Risks are about events that, when triggered, cause problems or benefits. Hence, risk identification can start with the source of our problems and those of our competitors (benefit), or with the problem itself

Risk Assessment

21. Once risks have been identified, they must then be assessed as to their potential severity of impact and to the probability of occurrence. These quantities can be either simple to measure, in the case of the value of a lost building, or impossible to know for sure in the case of the probability of an unlikely event occurring. Therefore, in the assessment process it is critical to make the best educated decisions in order to properly prioritize the implementation of the risk management plan.

22. The fundamental difficulty in risk assessment is determining the rate of occurrence since statistical information is not available on all kinds of past incidents at Level Crossings. Nevertheless, risk assessment should produce such information for the management of the organization that the primary risks are easy to understand and that the risk management decisions may be prioritised.

23. According to ISO/IEC 27001, the stage immediately after completion of the risk assessment phase consists of preparing a Risk Treatment Plan, which should document the decisions about how each of the identified risks should be handled. Mitigation of risks often means selection of controls, which should be documented in a Statement of Applicability, which identifies which particular control objectives and controls from the standard have been selected, and why.

Hazard Prevention

24. Hazard prevention refers to the prevention of risks in an emergency. The first and most effective stage of hazard prevention is the elimination of hazards. If this takes too long, is too costly, or is otherwise impractical, the second stage is mitigation. Elimination of

hazards at Level Crossings usually means closing the crossing or removing the asset completely.

Risk Reduction

25. Risk reduction or "optimization" involves reducing the severity of the loss or the likelihood of the loss from occurring.

Risk Management Plan

26. Select appropriate controls or countermeasures to measure each risk. Current Level Crossing Risk Models use Algorithms to do this. Risk mitigation needs to be approved by the appropriate level of management. The risk management plan should propose applicable and effective controls for Level Crossings. A good risk management plan should contain a schedule for control implementation and responsible persons for those actions.

Implementation

27. Implementation follows all of the planned methods for mitigating the effect of the risks.

Review and Evaluation of the Plan

28. Initial risk management plans will never be perfect. Practice, experience, and actual loss results will necessitate changes in the plan and contribute information to allow possible different decisions to be made in dealing with the risks being faced.

29. Risk analysis results and management plans should be updated periodically. There are two primary reasons for this:

- To evaluate whether the previously selected controls are still applicable and effective
- To evaluate the possible risk level changes

Recommendations (for discussion)

- For member states to implement a Risk Management Regime for Level Crossings using the processes and principles as defined by ISO 30001
- To introduce a process for Risk Assessment that may not necessarily require field visits and can be completed using static data and data available from third party sources.

Note: This does not mean data should not be collected on site if the resource and capability exists to do so. It is an attempt to create an incremental improvement in process based on the realistic resource constraints and considerations of nations with different economic profiles.

- To introduce a way of measuring risk and measuring risk reduction pre and post implementation.
- To introduce Risk Management training for staff

- To use this new capability to develop strategic plans based on risk reduction
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