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Rail Industry Standard on Signal Overrun Risk Evaluation and Assessment

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Rail Industry Standard

Rail Industry Standard on Signal Overrun Risk Evaluation and Assessment

Issue record

Issue	Date	Comments
One	December 2014	This document has been developed under project 10/028 to replace the out of scope requirements in GI/RT7006 and the guidance in GI/GN7606. The document sets out the industry's approach to the management of signal overrun risk, which is consistent with the application of the Common Safety Method on Risk Evaluation (CSM RA).

Superseded or replaced documents

The following Railway Group Standard is superseded or replaced, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GI/RT7006 issue one Prevention and Mitigation of Overruns – Risk Assessment	All	06 December 2014
GI/GN7606 issue one Guidance Note: Prevention and Mitigation of Overruns – Risk Assessment	All	06 December 2014

GI/RT7006 issue one Prevention and Mitigation of Overruns – Risk Assessment, ceases to be in force and is withdrawn as of 06 December 2014. GI/GN7606 issue one Guidance Note: Prevention and Mitigation of Overruns – Risk Assessment is withdrawn as of 06 December 2014.

Supply

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Part 1 Introduction

1.1 Purpose of this document

- 1.1.1 This document is a standard on signal overrun risk management, primarily aimed at infrastructure managers (IMs), railway undertakings (RUs), contracting entities and manufacturers, who have a legal obligation to manage the risk arising from a planned change to the railway system before the change is put into use.
- 1.1.2 The guidance is also relevant to IMs and RUs that have a legal obligation to cooperate with the proposer in order to manage risk.

1.2 Application of this document

- 1.2.1 A member of RSSB may choose to adopt all or part of this document through internal procedures or contract conditions. Where this is the case the member of RSSB will specify the nature and extent of application.
- 1.2.2 Compliance requirements and dates have not been specified, since these will be the subject of internal procedures or contract conditions.
- 1.2.3 This RIS is applicable only to changes on lines fitted with a lineside signalling system. Guidance on lineside signal aspects and indications, and the information they convey is given in GK/GN0658.
- 1.2.4 The requirements and guidance in this document cover:
- a) The signal overrun risk management process.
 - b) The choice of risk acceptance principle.
 - c) The use of explicit risk estimation as a risk acceptance principle.
- 1.2.5 The requirements in this document seek to reduce the potential for train-on-train collisions, and derailments on switches and crossings, arising from signal overruns.
- 1.2.6 The requirements in this document are based on the assumption that the lineside signalling layout is compatible with the train driving task, and that trains are operated in accordance with the relevant standards and operating procedures.
- 1.2.7 Compatibility requirements for lineside signalling systems are set out in Railway Group Standards (RGSs).
- 1.2.8 Requirements for signal overrun incident investigation are set out in GO/RT3119.
- 1.2.9 Recommendations relating to the risk assessment of buffer stops, arresting devices and end impact walls are set out in GC/RC5633.
- 1.2.10 Compatibility requirements for managing low adhesion between the wheel and rail are set out in GE/RT8040 and guidance is given in GE/GN8540. Signal overrun risk arising from low adhesion is not comprehensively addressed by signal overrun risk assessment and evaluation because:
- a) It is difficult to predict whether the effects will be localised or widespread.
 - b) Poor adhesion is an effect which is not necessarily present at any given site throughout the service life of the track and signalling.
 - c) A train that unexpectedly encounters a widespread area of poor rail head conditions might travel a considerable distance before coming to a stand (possibly passing more than one signal).

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1.3 Health and safety responsibilities

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1.4 The structure of this document

- 1.4.1 This document is set out as a series of requirements, in some cases followed by relevant guidance. The guidance is indicated by prefixing the paragraph number with the letter 'G'.

1.5 Copyright

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1.6 Approval and authorisation of this document

- 1.6.1 The content of this document was approved by Control Command and Signalling (CCS) Standards Committee on 21 August 2014.
- 1.6.2 This document was authorised by RSSB on 24 October 2014.

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Part 2 Application of this Document

2.1 Scope of application

2.1.1 The requirements in this RIS shall be applied to all changes with the potential to affect signal overrun risk.

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- G 2.1.1.1 Rationale: The application of the RIS is good practice and is scalable. It is capable of being used in a proportionate way for any change with a potential impact on signal overrun risk, irrespective of whether the change is considered to be significant in the legal sense.
- G 2.1.1.2 The requirements in this RIS are consistent with the application of the Common Safety Method on Risk Evaluation and Assessment (CSM RA) to control the hazard of a train passing a stop signal without authority, where the hazard is caused by either:
- a) A train driver misreading or misinterpreting lineside signalling system displays.
- Or
- b) A train driver misjudging the braking requirement on approach to a stop signal due to causal factors on the approach to the signal.
- G 2.1.1.3 Commission Regulation (EC) No 352/2009 ('the regulation') requires the application of the CSM RA 'to any change of the railway system in a Member State ... which is considered to be significant within the meaning of Article 4 of this regulation. Such changes may be of a technical, operational or organisational nature'. The regulation includes a flowchart setting out the risk management and independent assessment process to be followed, in Annex I of the Appendix.
- G 2.1.1.4 The CSM RA is applied before a change is taken into use, to confirm that the change will have no adverse effect on the safe operation of the railway system (safe integration).
- G 2.1.1.5 Guidance on the application of the CSM RA to railway projects is given in GE/GN8640, GE/GN8641, GE/GN8642, GE/GN8643, GE/GN8644 and GE/GN8645.
- G 2.1.1.6 Detailed advice on the regulation's requirements, its scope and the significance test that triggers the requirement to apply the CSM RA in full, is set out in the Office of Rail Regulation (ORR) guidance on the application of the common safety method (CSM) on risk evaluation and assessment (December 2012).
- G 2.1.1.7 The responsibilities of the proposer (see definitions) of a change to the railway system and of the other actors (see definitions) who have a legal obligation to cooperate with the proposer in order to manage shared risk are set out in detail in Annex I section 1 of the regulation.
- G 2.1.1.8 At the start of the project it is important to establish:
- a) Who is the proposer.
- And
- b) Which parties are actors.
- G 2.1.1.9 For changes that affect signal overrun risk, the proposer may be either an IM or an RU.

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- G 2.1.1.10 The signal overrun risk evaluation and assessment process set out in this RIS is intended to address the following requirements in the regulation in Annex I:

'1.1.5 ... the risk assessment process shall fall within the responsibility of the proposer. In particular the proposer shall decide, with agreement of the actors concerned, who will be in charge of fulfilling the safety requirements resulting from the risk assessment. This decision shall depend on the type of safety measures selected to control the risks to an acceptable level.'

1.1.6 The first step of the risk management process shall be to identify in a document, to be drawn up by the proposer, the different actors' tasks, as well as their risk management activities. The proposer shall coordinate close collaboration between the different actors involved, according to their respective tasks, in order to manage the hazards and their associated safety measures.

1.2.1 For each interface relevant to the system under assessment and without prejudice to specifications of interfaces defined in relevant TSIs, the rail-sector actors concerned shall cooperate in order to identify and manage jointly the hazards and related safety measures that need to be handled at these interfaces. The management of shared risks at the interfaces shall be coordinated by the proposer.

1.2.2 When, in order to fulfil a safety requirement, an actor identifies the need for a safety measure that it cannot implement itself, it shall, after agreement with another actor, transfer the management of the related hazard to the latter...

1.2.5 When agreement cannot be found between two or more actors it is the responsibility of the proposer to find an adequate solution.'

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Part 3 System Definition and Hazard Identification

3.1 Information requirements for system definition

- 3.1.1 The proposer shall consult with actors by sharing the following information, where relevant to each preferred change option, that has the potential to affect signal overrun risk, before seeking approval for the change:
- a) The objective (intended purpose) of the change.
 - b) The railway system functions and elements affected by the change, including:
 - i) Lineside signalling system functions and elements.
 - ii) Train driving functions and elements.
 - iii) Train dispatch functions and elements.
 - iv) Train service pattern and frequency.
 - v) Rolling stock functions and performance.
 - c) The system boundary, including changes to:
 - i) Lineside signalling systems.
 - ii) Track layout.
 - iii) Permissible speeds.
 - iv) Gradients.
 - v) Station platforms.
 - vi) Level crossings.
 - vii) Fixed infrastructure features (for example, bridges and tunnels).
 - viii) Automatic train protection (ATP) systems.
 - ix) Train protection and warning (AWS / TPWS) systems.
 - x) Electrification systems.
 - xi) The vehicles being operated.
 - xii) Rolling stock systems.
 - xiii) Train consists.
 - xiv) Operational procedures.
 - d) Physical and functional interfaces affected by the change, where these are relevant to the train driving task, including:
 - i) Lineside signalling system interfaces.
 - ii) Train dispatch system interfaces.
 - iii) Train protection system interfaces.
 - e) Changes that affect the system environment, where these are relevant to signal overrun risk.

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- f) Changes to existing signal overrun risk safety measures, including:
 - i) ATP systems.
 - ii) AWS / TPWS systems.
 - iii) Train braking systems.
 - iv) Sanding arrangements.
 - v) Safe overrun distances and conflict points.
 - vi) Trapping protection.
 - vii) In-cab control and display systems.
 - viii) Working timetables.
 - ix) Train driving policy and procedures.
 - x) Train dispatch procedures.
 - g) Assumptions which shall determine the limits for the risk assessment, including:
 - i) The parts of the railway that will not change.
 - ii) The operational rules and procedures that will not change.
 - iii) Passenger loadings.
-

- G 3.1.1.1 Rationale: The consultation makes information about the scope of potential change available to the proposer and actors before the project takes a decision to proceed with single option development. The information includes changes to human, technical and operational features of the railway system and their interfaces within and outside of the system boundary.
- G 3.1.1.2 Rationale: Proposers and actors require this information to:
 - a) Understand what cooperation will be required.
 - b) Understand their responsibilities for jointly managing the hazards and related safety measures at the interfaces.
 - c) Identify when a change to the lineside signalling system or the operational context has the potential to increase signal overrun risk.
- G 3.1.1.3 Rationale: The proposer requires this information to:
 - a) Develop the system definition.
 - b) Determine whether or not the change is significant within the meaning of the regulation and so whether independent assessment is required.
 - c) Identify the circumstances in which the hazard of a train passing a stop signal without authority can occur.
 - d) Inform decisions about approval.
- G 3.1.1.4 The criteria for creating a system definition are set out in Annex I section 2.1.2 of the regulation.

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- G 3.1.1.5 Operational changes that have the potential to increase signal overrun risk, include:
- a) Changes to the overall concept of operation.
 - b) Changes proposed by the infrastructure manager (network), for example:
 - i) Method of signalling.
 - ii) Working timetable.
 - c) Changes proposed by the infrastructure manager (stations), for example:
 - i) The train dispatch system.
 - ii) Train stopping positions.
 - d) Changes proposed by railway undertakings, for example:
 - i) Method of train dispatch.
 - ii) Train driving policy.
 - iii) Trainborne risk mitigation measures (including a driver's reminder appliance).
- G 3.1.1.6 Environmental factors that have the potential to increase signal overrun risk, include:
- a) Inadequate ambient lighting conditions (readability).
 - b) Adverse effects from railway neighbours.
 - c) Poor rail head conditions.
- G 3.1.1.7 Recognised industry practice is to consult, prior to approval, using the following documents:
- a) Draft track and signalling layout sketches.
 - b) Train performance specification.
 - c) Company operating policy.
 - d) Timetable specification.
 - e) Concept of operation.
- G 3.1.1.8 Further guidance about lineside signalling system interfaces is given in GE/GN8537, GK/GN0658 and GK/GN0645.
- G 3.1.1.9 Further guidance about mechanical train stop systems (a type of ATP system) is given in GE/GN8618.
- G 3.1.1.10 Further guidance about TPWS interfaces is given in GE/GN8675.
- G 3.1.1.11 Further guidance about train dispatch system interfaces is given in GE/GN8560.
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- 3.1.2 Approval shall take account of the extent to which each viable option has the potential to control the hazard of a train passing a stop signal without authority, by either:
- a) Eliminating signal overrun risk.
- Or
- b) Reducing signal overrun risk to acceptable levels.
-
- G 3.1.2.1 Rationale: Approval should identify a design option that is capable of being delivered economically and capable of controlling signal overrun risk.
- G 3.1.2.2 The aim of the project should be to select a viable option that will be capable of being safely integrated into the railway system (a prerequisite of taking into use).
- G 3.1.2.3 A range of viable options may influence signal overrun risk to a lesser or greater extent, for example:
- a) An option to provide a flyover at a junction would have the potential to eliminate some of the signal overrun risk that would otherwise be retained at a flat junction.
- And
- b) A project to significantly increase the frequency of trains on an existing route might include timetable options that would decrease the number of potential conflicts at a junction. Account should be taken of the frequency of late and / or early running trains which could invalidate this control option.
- G 3.1.2.4 Further example signal overrun risk mitigations are set out in Appendix C.
-
- 3.2 Hazard classification**
- 3.2.1 The proposer shall identify whether the planned change alters the risk associated with the hazard of a train passing a stop signal without authority.
-
- G 3.2.1.1 Rationale: The proposer is in charge of the risk management process and is responsible for identifying and classifying all the hazards associated with the change.
- G 3.2.1.2 The criteria for hazard identification, hazard classification, the creation of a hazard record and the role of expert judgement in fulfilling this requirement are set out in Annex I section 2.2 of the regulation.
-
- 3.2.2 The hazard of a train passing a stop signal without authority shall be evaluated by application of a risk acceptance principle.
-
- G 3.2.2.1 Rationale: The regulation uses the term 'broadly acceptable' to identify those hazards which need not be evaluated further. 'Broadly acceptable' applies to those hazards where the risk is, to all intents and purposes, insignificant or negligible. Neither of these criteria apply in the context of signal overrun risk and therefore one of the three risk acceptance principles applies.
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- 3.2.3 The proposer shall identify the signals where the hazard of a train passing a stop signal without authority is potentially affected by the planned change.
-
- G 3.2.3.1 Rationale: The proposer needs to understand which stop signals require signal overrun risk evaluation and assessment.
- G 3.2.3.2 The planned change has the potential to alter the conditions of this hazard if any of the following apply:
- a) A new signal is introduced.
 - b) An existing signal is modified in form or function.
 - c) The operational context in which an existing signal operates is changed.
 - d) A new hazard is introduced between the stop signal and next signal.
 - e) An existing hazard is changed or relocated.
- G 3.2.3.3 The proposer should not discount a small change in the risk without considering whether an accumulation of small changes over time results in an increase in signal overrun risk beyond that which is acceptable.
- G 3.2.3.4 Change factors include:
- a) Readability, including:
 - i) The signal aspects and indications presented by the signal.
 - ii) Signal reading times and readable distances.
 - iii) Signal configuration.
 - b) Interpretability of the information conveyed by the signal aspects and indications.
 - c) Driveability, including:
 - i) Signal spacing.
 - ii) Cautionary aspect sequences.
 - d) The signalling braking distances.
 - e) Existing signal overrun risk controls (for example, signalling overlap length, trapping protection, AWS / TPWS functionality).
 - f) The safe overrun distance (SOD) / distance to point of conflict.
 - g) Gradients.
 - h) Frequency that trains approach the signal.
 - i) Likelihood that drivers could experience a stop aspect.
 - j) Changes to a station platform on the approach to the signal.
 - k) Dispatch operations.
 - l) Train driving procedures.
 - m) Type of rolling stock operated on the route.