



Operational Concept for the GB Mainline Railway

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Part 1 Introduction

1.1 Purpose

- 1.1.1 The purpose of this document is to provide the methodology for testing whether a proposal for rules change is within scope of rules (GE/RT8000 and other National Operations Publications). It achieves this by providing a link between the nine Fundamental Operating Principles (listed in Appendix A of this document) and:
- Railway Group Standards containing requirements for transport operators
 - operating rules and procedures for transport operators employees
 - processes required by transport operators within their safety management system.
- 1.1.2 The operational concept is a strategy approved by the Board of RSSB as relevant to Railway Group Standards (including National Operations Publications such as the Rule Book). It determines what should be made mandatory in National Operations Publications, so that it may be used to:
- review the relevance and effectiveness of existing controls and identify the need for any changes
 - provide scope that can guide proposals for changes to the way in which the railway is operated, and facilitate identification of consequential changes to Railway Group Standards or operating rules
 - support justification of change proposals
 - determine the priorities of change proposals
 - assist transport operators in reviewing their own standards and procedures.

1.2 Background

- 1.2.1 Railway operation is based on fundamental operating principles, articulated by senior railway industry operations managers, and endorsed by Traffic Operation and Management Standards Committee. The principles, in turn, are informed by the long collective experience of the railway industry, including its responses to legislation, lessons learned from accidents, and the introduction of new technologies.
- 1.2.2 The core aim of the principles is the safe and timely delivery of people and goods to their destination. The operational concept document describes what is necessary to implement the principles and deliver the core aim.
- 1.2.3 Operation of the mainline railway takes place within the framework and requirements of European legislation, for example the Railway Safety Directive, the Interoperability Directive, and the Traffic Operation and Management Technical Specification for Interoperability (TSI).
- 1.2.4 Within the European framework, railway operation is a functional sub-system covering 'the procedures and related equipment enabling a coherent operation of the different structural subsystems' (Railways Interoperability Directive 2008/57/EC). Operating rules and procedures provide the basis for human interaction with the sub-systems.

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- 1.2.5 The Railway Safety Directive has been implemented in UK domestic legislation by the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended) (ROGS).
- 1.2.6 The Safety Directive and ROGS impose a duty of cooperation equally on all operators of trains, and of the infrastructure, to ensure the safety of the railway. This requirement (building on the industry's existing managerial safety cooperation processes developed since 1994), is given practical effect on the mainline railway through compliance with requirements in Railway Group Standards governing the technical and procedural compatibility between transport operators' operations.
- 1.2.7 The railway also has a set of bye-laws that, for the purposes of this document, are part of the legislative framework, and cover issues such as public and passenger behaviour.
- 1.2.8 Cooperation between employees of transport operators is governed by operating rules at a national level that have been developed over more than 140 years.
- 1.2.9 The operational concept provides the basis for:
 - a) proposals to change the way the railway is operated and enabling consequential changes to Railway Group Standards or operating rules to be identified more easily
 - b) justifying measures intended to support delivery of the core aim, mandated in Railway Group Standards
 - c) justifying and providing a scope for operating rules
 - d) development and review of company standards and procedures by transport operators, as part of their safety management systems. This will enable individual transport operators to identify operational change that they can make to achieve a business benefit without having to involve other transport operators or invoking industry process.
- 1.2.10 The structure of the main body of this document is aligned with the fundamental principles, placing each principle in its context, and identifying the controls required for its practical application.

1.3 Scope

- 1.3.1 The scope of this document is:
 - a) traffic operation and management on the mainline railway, including shunting movements
 - b) warning and protection procedures for people required to work on or near running lines, in sidings and in depots.
- 1.3.2 The technical details of engineering systems, processes, and infrastructure equipment essential to the operation of the railway system as a whole are outside the scope of this operational concept but are referenced where relevant.

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- 1.3.3 As only the operational processes and procedures that control risk are referred to, it is assumed that staff are competent to apply the controls. European and UK legislation (general and industry specific) places responsibilities on employers in respect of the competence and fitness of staff to carry out what is required of them. The responsibilities are met using company systems for training and performance management.
- 1.3.4 A similar assumption has been made that rolling stock, infrastructure, and signalling equipment, has been provided in a way that is fit for purpose, and that it is functioning as designed (unless the control measure is specifically one to be applied when rolling stock or infrastructure is defective or has failed).
- 1.3.5 The fundamental operating principles do not explicitly reference accident investigation. However, the need for review of and (potentially) changes to operating practice, controls, or company procedures, may be identified as a result of effective investigation of accidents, 'near miss' incidents, and other dangerous occurrences. There are statutory requirements at European and UK levels for cooperation in such investigations. The duty of cooperation applies to other railway systems, which interface with the UK mainline railway. Procedures for managing the interfaces between them, therefore, must be within the common framework for cooperation set by European safety and interoperability legislation and ROGS. Detailed procedures are specific to each interface and are outside the scope of this document.

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Part 2 Fundamental Operating Principles

2.1 Separation of trains

Principle: *The method of signalling must maintain a space interval between trains that is safe.*

2.1.1 Context

- 2.1.1.1 The aim of this principle is to reduce the risk of collision between trains, by establishing a spatial envelope, or interval, around each train. This is normally achieved and maintained by train control and signalling systems, based on one train in one section of line at a time; it applies to train movements on single, double or multiple-track lines.
- 2.1.1.2 Train control and signalling systems are designed to make the space interval effective against collision with train movements from converging lines, as well as following and opposing movements of trains on the same line.
- 2.1.1.3 The principle encompasses situations in which, for operational reasons, the space interval between two trains is reduced or eliminated, either as part of regular planned operation (permissive working) or when it is necessary to use a train to assist another train which has failed. It does not include movements solely for the purpose of coupling or uncoupling.
- 2.1.1.4 Operating procedures using written or spoken instructions are applied when the signalling system cannot be used to preserve the effectiveness of the space interval:
 - a) for movements in the opposite direction to that for which the line is signalled
 - b) when the functionality of the system is partially or totally degraded, due to failure or planned disconnection.
- 2.1.1.5 Authority for train movements under normal and degraded conditions is discussed in section 2.2 of this operational concept document.

2.1.2 Controls - Operation under normal conditions

- 2.1.2.1 Train control and signalling systems must be supported by operating rules, as well as procedures specific to each system, to enable operators to maintain a safe space interval between trains within their area of control when the system is operating under normal conditions.
- 2.1.2.2 Permissive working must be limited to locations where it is authorised by the infrastructure manager. In the case of trains conveying passengers, permissive working must be limited to stations, for the purpose of joining trains or platform sharing.
- 2.1.2.3 Operating rules for permissive working must be designed to reduce the likelihood of:
 - a) collisions due to excessive speed during movements or insufficient space for the second train
 - b) incorrect response by a train driver to a signal or in-cab indication
 - c) incorrect response by a train driver to a signal or spoken message intended for another train.

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- 2.1.2.4 Operating rules for assisting a failed train (where permissive working is not available), must include:
- a) a requirement for prompt and accurate reporting of the failure and its location
 - b) a requirement for establishing a clear understanding between the signaller and train driver of the failed train about the direction from which assistance will come
 - c) safeguards against possible errors in locating the failed train
 - d) protocols for spoken communications between signaller and train drivers.
- 2.1.2.5 Operating rules must be applied to control movements in the opposite direction to that for which the line is signalled, to control the risks of collision and derailment from:
- a) unsignalled wrong-direction movements including single line working
 - b) movements between one line and another at each end of the section being used for the wrong direction movement
 - c) communication to train drivers of insufficient or incorrect information about movements to be made and conditions to be applied.
- 2.1.2.6 Wrong direction working procedures must take account of people working on or near the line being used, including those employed to display hand signals controlling train movements. The management of risks to people from moving trains is covered in section 2.8 of this operational concept document.
- 2.1.2.7 The interface between engineering works and moving trains is covered in section 2.3 of this operational concept document.

2.1.3 Controls – Operations under degraded conditions

- 2.1.3.1 When the functionality of the train control or signalling system is partially or totally degraded, operating rules must define the operating procedures necessary to ensure the maintenance of a safe space interval between trains.
- 2.1.3.2 The rules must provide for:
- a) the full range of foreseeable failure conditions, from simple to complex, and their consequences for the functionality of the system as a whole and its ability to maintain a safe interval between trains
 - b) establishing a clear understanding between signallers and train drivers about movements to be made and precautions to be taken during the movement to reduce the likelihood of collision
 - c) protocols for spoken communications between signaller and train drivers and any intermediaries involved in the passing of information.
- 2.1.3.3 Operating rules must be supported by a planned organisational response from the infrastructure manager, to mobilise the resources needed to implement the procedures.

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2.2 Movement authority for a train

Principle: *Before a train is allowed to start or continue moving, it must have an authority to move that clearly indicates the limit of that authority.*

2.2.1 Context

2.2.1.1 The safety benefits of a system for maintaining space intervals between trains (see section 2.1 of this operational concept document) are compromised if a train proceeds without an authority for its movement.

2.2.1.2 A movement authority consists of two elements: permission to begin the movement and a defined end point. In normal conditions, both elements are indicated to the train driver through the signalling system:

- a) as a visual display (for example, a lineside signal or cab display)
- b) by a token, released by the operation of the system, and given (physically or electronically) to the train driver, authorising entry onto a section of single line. The token is specific to that section of line.

2.2.1.3 The train driver's response to the signal, cab display or token is governed by knowledge of:

- a) how the signalling system in operation on the route indicates authority to proceed to train drivers
- b) what the indication means in relation to the end point of the movement.

2.2.1.4 In the event of a train proceeding without authority, the signaller may have some options for action to try to mitigate the risk of collision or derailment. In addition, most lines and trains are equipped with systems designed to intervene automatically, to stop or reduce the speed of the train, at the end point or within a safe distance thereafter (safety overlap) in the event of the train driver failing to respond correctly to the imminent end of a movement authority. Such systems do not remove responsibility from the train driver to control the train in compliance with the limits of any movement authority, permissible line speeds, and other route and train-related constraints.

2.2.1.5 When the signalling system cannot be used to authorise a movement or define its end point, spoken or written instructions are used instead, for example.

- a) The train is to enter a section of line to assist another train, which has failed.
- b) When a train is to travel in the opposite direction to that for which the line is signalled (wrong direction movements).
- c) When the movement is to enter, leave or take place wholly within a possession of the line granted to allow engineering work to take place.
- d) When there is a suspected infrastructure defect, obstruction or other reported problem potentially affecting the passage of trains (examination of the line).
- e) When the signalling system is defective or has been disconnected to allow engineering work to take place.
- f) Running under certain European Train Control System (ETCS) conditions.

2.2.1.6 For some shunting movements, the authority and its extent may be conveyed entirely by spoken instructions or hand signals, which may also be used to provide continuing confirmation of the authority.

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- 2.2.1.7 When the signalling system cannot be used to authorise a movement, a third party, such as a pilotman or a handsignaller, may be used to:
- pass movement instructions to train drivers
 - confirm to the signaller that the authorised movement has been completed successfully.

2.2.2 Controls

- 2.2.2.1 Signalling systems must be supported by operating rules as well as procedures specific to each system, which define how movement authority is given:
- when the signalling system is functioning normally
 - when the signalling system cannot be used to authorise a movement because:
 - the movement is to be made in the opposite direction to that for which the line is signalled
 - the movement is to be made into a section of line already occupied by a train, and permissive working is not available
 - the movement is to enter, leave or take place wholly within a possession of the line granted to allow engineering work to take place
 - the movement is to permit an examination of the line
 - the functionality of the system is partially or totally degraded.
 - when a shunting movement is to be made.
- 2.2.2.2 Operating rules, together with procedures specific to each system, must be provided for use when the signalling system cannot be used to authorise a movement or indicate its end point. The rules must ensure that all involved in authorising and carrying out train movements understand clearly:
- who is responsible for authorising movements
 - the means by which authority will be given to the train driver
 - the end point of each movement
 - any special conditions applicable to it, such as restrictions on speed or the need for successful completion of the movement to be reported to the signaller.
- 2.2.2.3 Signallers, train drivers and other train operating staff must be provided with a clear understanding of the following.
- The meaning of signal indications or displays (including hand signals).
 - The terms used to describe signalling equipment.
 - The terms used in spoken and written instructions.
- 2.2.2.4 Operating rules must include protocols for clear communication between all those involved in procedures to authorise train movements, using spoken or written instructions.

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- 2.2.2.5 Operating rules must prescribe the actions to be taken by signallers to mitigate the risks of collision or derailment in the event of a train proceeding without movement authority.
- 2.2.2.6 The circumstances in which train drivers are permitted to pass a signal at danger on their own authority must be defined in operating rules. The rules must define the limits of such a movement and any conditions to be applied, such as restrictions on speed.

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2.3 Obstruction of the line: level crossings and infrastructure work

Principle: *Trains proceeding over any portion of line must not be obstructed in a way that threatens their safety.*

2.3.1 Context

2.3.1.1 This principle addresses the risks of collision and derailment when the line is obstructed or becomes unsafe in two operational situations.

- a) A road vehicle or large animals obstructing a level crossing.
- b) Work being carried out on the infrastructure obstructs the line or otherwise makes it unsafe for trains.

2.3.1.2 Obstruction of the line at a level crossing can occur when:

- a) a road vehicle driver has failed to stop in compliance with road signs, signals or barriers, intended to stop road traffic going onto the railway when trains are approaching
- b) large, low or slow-moving vehicles or animals are using a crossing without the person in charge first obtaining appropriate permission from the supervising signaller
- c) level crossing equipment has not operated correctly.

2.3.1.3 Measures for reducing the likelihood of collisions on level crossings have been developed by the railway industry in cooperation with relevant government bodies over many years. Responsibilities for implementing and maintaining such measures are defined in legislation relating to highways, railways, and health and safety.

2.3.1.4 Operating rules are used:

- a) to govern control of level crossings by a signaller or crossing keeper under normal conditions
- b) when large, low or slow-moving vehicles or animals are to move across an automatic or user operated crossing, to permit the signaller supervising the crossing to stop trains before they reach the crossing
- c) when the controls at a level crossing under normal conditions require action by train drivers to ensure the safe passage of trains (local monitoring)
- d) to mitigate the risks to train movements when level crossing equipment cannot operate to its full functionality.

2.3.1.5 This principle does not include pedestrian (footpath) crossings: the interface between members of the public and trains at all level crossings is referenced in section 2.8 of this operational concept document.

2.3.1.6 Work to maintain, repair or replace railway infrastructure may obstruct or make a line unsafe for trains to pass over it. The hazards may be a result of the nature of the work (for example, removal of rails) or the equipment and materials required for the work (for example, cranes or excavators obstructing an adjacent line as they operate; assembled track panels awaiting installation).

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- 2.3.1.7 The movement of trains associated with infrastructure work, including on-track machines and plant, into and within the blocked section of line, are subject to similar derailment and collision hazards as other train movements past the site of work.
- 2.3.1.8 The normal method of mitigating the risks to train movements unconnected with infrastructure work is segregation, by blocking the section of line affected by the work and diverting trains to unaffected adjacent lines. When the work requires complete closure of the route, train services are either diverted to other routes or suspended. Complete segregation is not possible for movements required in connection with the work.
- 2.3.1.9 Where one line remains unaffected by the work, segregation may be achieved by working trains over it in both directions (single line working).
- 2.3.1.10 Responsibility for authorising train movements into and within the blocked line is transferred from the signaller to a person appointed to take charge of the blocked section, who is also responsible for confirming to the signaller that the blockage has been set up as planned and permitting the work to start. Trains cannot leave the blocked section without the signaller's permission.
- 2.3.1.11 Work on the infrastructure, particularly where it requires a line to be blocked, requires advanced planning, as far as possible, to put into place:
- a) the necessary controls, before the work begins, to prevent increased risks of collision and derailment arising from the work
 - b) responsibilities for implementing and maintaining the controls that are allocated to competent people
 - c) adequate systems for communications between signallers and people appointed to control train movements into, within, and out of the blockage
 - d) timely publication of changes to train operating schedules resulting from infrastructure work, to affected transport operators.
- 2.3.1.12 Advanced planning is not possible in emergencies, for example, after an accident or severe weather incident, but contingency plans should provide the basic structure for managing such events in a controlled way.

2.3.2 Controls – Level Crossings

- 2.3.2.1 Operating rules must publish descriptions of the types of level crossing in use and the lineside signs and signalling equipment affecting train movements towards crossings.
- 2.3.2.2 Route information provided to train drivers must include the location of level crossings.
- 2.3.2.3 Operating rules are required, to mitigate the risks from obstructions of the line during normal operation, for:
- a) level crossings under the control of a signaller or crossing keeper
 - b) automatic or user-operated level crossings where users are required to contact the supervising signaller before crossing with large, low or slow-moving vehicles or animals
 - c) automatic level crossings requiring local monitoring by train drivers.

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- 2.3.2.4 Operating rules are required to prevent an increase in risks to the safe passage of trains when a level crossing cannot be operated normally because:
- level crossing equipment or associated signalling equipment is defective or has been disconnected to permit engineering work to be carried out
 - a movement is to be made over the crossing in the wrong direction and signalling controls are not provided
 - the crossing is within a section of line which has been blocked to permit engineering work, and movements by works trains or on-track plant require it to be locally controlled.

2.3.3 Controls – Infrastructure work

- 2.3.3.1 Operating rules for managing infrastructure work must define:
- the criteria for deciding whether work requires a blockage of the line or can be done without blocking the line to trains
 - the responsibilities of signallers and people in charge of arrangements for blocking the line and controlling movements of trains towards, into, and within the blockage
 - procedures for blocking the line to prevent trains entering the blockage (unless required for the work)
 - procedures for preventing trains outside the blockage colliding with equipment or materials in use within the blockage
 - procedures for control of train movements over the entrance to and exit from the blocked section of line
 - procedures for control of movements of trains and on-track plant within the blockage, to prevent:
 - collisions within the blockage
 - unauthorised movements from the blockage towards a line open to traffic
 - unauthorised movements within the blockage proceeding within a portion of line rendered unsafe by the work.
 - protocols for clear communication between signallers, people in charge, train drivers and others involved in:
 - setting up and removing a blockage of the line
 - controlling train movements passing the blockage on lines open to traffic
 - controlling train movements entering, within and leaving the blockage.
 - procedures for preventing trains colliding with equipment or materials in use or stored once the blockage has been removed.

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- 2.3.3.2 Where one line remains unaffected by the work and is to be used to run trains in both directions but is not signalled for bi-directional working, single line working procedures must be implemented to mitigate additional risks of collision during movements in the wrong direction (see section 2.1 of this operational concept document).
- 2.3.3.3 The protection of people working on or near the line from the hazards presented by moving trains is covered in section 2.8 of this operational concept document.

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2.4 Line obstructed or in an unsafe condition

Principle: *Trains must be prevented from proceeding onto a portion of line if it is known or suspected that it would not be safe for them to pass.*

2.4.1 Context

2.4.1.1 The starting point of this principle is that a section of line is known or suspected to be unsafe for trains to pass over it. Controls to ensure the safety of the infrastructure for train movements will have been overcome or circumvented; the controls described here are designed to prevent the threat to train movements presented by an obstruction or unsafe condition being realised.

2.4.1.2 The operational controls to contain and mitigate the risks to trains from an unsafe condition or an obstruction on the line address three principal elements.

- a) Prompt and accurate reporting of information about the problem (or suspected problem) to people controlling train movements.
- b) Action to prevent trains from approaching the affected location.
- c) Confirmation that safe conditions for train movements have been re-established, before movements are permitted to resume (including any restrictions to be imposed on movements).

2.4.1.3 Evidence of an actual or suspected hazard may come from:

- a) reporting of an event which has occurred, for example, a train failure, derailment, collision or bridge strike by a road vehicle, trespasser placing an obstruction on the line
- b) reports of the precursors of an event or symptoms of an unsafe condition, such as rough riding, low rail adhesion, deformation of cutting sides after heavy rain, floodwater or lying snow on the line, or an irregular sequence of signal aspects
- c) control systems, such as an unexpected indication that a section of line is occupied by a train, or tripping of overhead line, or third rail equipment.

2.4.1.4 Establishing the precise nature of the hazard and its potential impact on the safety of train movements may require further information, obtained from a technical or operational assessment. In some circumstances, a train driver may be asked to check and report on the section of line by driving over it (an examination of the line).

2.4.1.5 Resumption of train movements depends upon the restoration of the appropriate conditions for their safety. Conditions sufficient to permit movements to resume safely can be established by applying additional temporary controls when:

- a) a visual examination of the site following a report of an infrastructure defect has not revealed a hazard (temporary control: precautionary restrictions, such as reduced speed, until a more detailed technical examination has been carried out)
- b) there is a hazard but the risk to the safety of trains has been assessed as low (temporary control: precautionary restrictions, such as reduced speed or manual operation of points, until repairs have been carried out)

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- c) the problem is due solely to a malfunction of signalling equipment (temporary control: alternative procedures for authorising train movements until the malfunction is corrected – see section 2.2 of this operational concept document).

2.4.1.6 Once the risks to train movements presented by the hazard have been controlled, the further management of the incident or defect and the investigation of causes are outside the scope of this operational concept. Contingency plans will be activated by transport operators for managing the wider effects of incidents which result in serious disruption to rail traffic.

2.4.1.7 Mitigation of risks to trains arising from work to remove the hazard and restore the infrastructure is the subject of section 2.3 of this operational concept document.

2.4.1.8 The protection of trains from the identified hazard remains paramount but, within the boundaries of that requirement, it is desirable that train movements are resumed as soon as possible to mitigate the adverse effects on railway operations of congestion, delay, and prolonged operation under degraded conditions, which may increase the likelihood of human error.

2.4.2 Controls

2.4.2.1 Operating rules must define, for people involved in train or station operations and infrastructure work:

- a) what could constitute a hazard to train movements
- b) the requirements and procedures for reporting hazards to train movements
- c) the actions they must take to stop trains approaching the affected location, or any restrictions to be imposed on train movements.

2.4.2.2 Operating rules must provide a framework to enable signallers and operations controllers to obtain more detailed information and technical advice, to provide them with an accurate assessment of the reported hazard and its potential impact on the safety of train movements.

2.4.2.3 Operating rules must define the circumstances in which a train may be used to examine the line to obtain more information about a reported hazard, and the necessary operating procedures.

2.4.2.4 Operating rules must specify temporary controls to be applied to train movements when:

- a) a visual examination of the site has not revealed a hazard, following a report of an infrastructure defect
- b) a hazard has been assessed as presenting a sufficiently low risk to the safety of trains to permit movements to resume, but work is required to eliminate the hazard
- c) the hazard has been found to be a malfunction of signalling equipment (requirements for authorising train movements when the signalling system cannot be used because of defects are described in section 2.2 of this operational concept document)
- d) a line is affected by floodwater or snow.
- e) there are exceptional rail head conditions.

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- 2.4.2.5 Operating rules must specify the criteria to be applied when deciding if it is safe to permit train movements over a line that is affected by floodwater or snow.

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2.5 Conditions for safe movement of trains

Principle: *Trains must not be allowed to begin or continue their journeys until it is clear that it is safe for them to do so.*

2.5.1 Context

2.5.1.1 This principle concerns the train and its readiness for movement. It encompasses:

- a) the braking capacity of the train
- b) the speed at which the train is permitted to travel
- c) the formation of the train: vehicle couplings and connections for braking and other control systems
- d) the identification, loading and securing of freight
- e) the provision of adequate information to train preparation and operating staff
- f) the boarding of passengers, securing of external doors and safe dispatch of the train.

2.5.1.2 In addition, the train must have authority for movement (see section 2.2 of this operational concept document).

2.5.1.3 The safety of the infrastructure over which the train will travel is the subject of sections 2.3 and 2.4 of this operational concept document. Compatibility between rail vehicles and the infrastructure is the subject of section 2.6 of this operational concept document.

2.5.1.4 Significant hazardous events which are addressed in this section are:

- a) collision or derailment resulting from the failure of a train to stop when required
- b) derailment caused by exceeding the maximum speed permitted for any vehicle on the train
- c) uncontrolled release of hazardous substances caused by failings in identifying, securing or marshalling dangerous goods traffic
- d) collision or derailment caused by inadequately secured or incorrectly loaded goods moving on or falling from freight vehicles during transit
- e) collision with equipment mounted on an on-track machine, which has not been properly stowed or secured after completion of its work
- f) collision with unsecured doors of containers, freight or passenger vehicles
- g) derailment of a freight vehicle because of unevenly distributed loads
- h) injury to passengers trapped by train doors or falling from moving trains.

2.5.1.5 A framework of controls over the transport of dangerous goods is defined in international and UK regulations. Railway Group Standards and operating rules apply the national and international regulatory requirements to rail operations on the GB mainline network.

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- 2.5.1.6 Passenger trains are equipped with engineering controls to minimise the risks of injury to passengers from closing train doors or premature movement of a train, or insecure doors: these include interlocking of the door closure mechanism and traction power control, sensors to detect obstructions in closing doors and centralised door locking. Some types of doors present a hazard to trains on an adjacent line when not fully closed.
- 2.5.1.7 Although the full range of controls appropriate to the type of train will be applied before the journey begins, some will be repeated en route, when the formation of the train is changed or when passengers leave or join the train.

2.5.2 Controls – All trains

- 2.5.2.1 Trains must not be permitted to start a journey unless there is sufficient braking capacity available for the complete train.
- 2.5.2.2 Vehicles without operative automatic brakes or through pipes (including locomotives, on-track machines and multiple units being hauled unpowered in a freight train) must not be moved on the mainline network unless additional safeguards are applied, which must be published in operating rules and operating instructions.
- 2.5.2.3 The continuity of the operation of the brake system throughout the train must be tested, either when it is being prepared for service or before it starts its journey, and after any work to correct a brake defect during the journey. Brake continuity must also be proved by testing in accordance with the relevant rolling stock requirements when the formation of a train is changed during its journey.
- 2.5.2.4 The sufficiency of the operation of the braking system must be assured in winter weather conditions by company instructions specific to the train.
- 2.5.2.5 The requirements for testing brake continuity must be prescribed in operating rules. Test procedures appropriate for the types of train or vehicle operated must be provided to train preparation and operating staff.
- 2.5.2.6 Information must be made available to people responsible for train preparation about the permitted speed of each vehicle on the train, and train drivers must be informed of the permitted speed of the complete train.
- 2.5.2.7 A temporary reduction in permitted speed imposed on one or more vehicles, which requires a reduction in the permitted speed of the complete train, must be notified before its journey begins, to:
- a) train preparers
 - b) train crew
 - c) signallers and operations controllers on the route it will take.
- 2.5.2.8 Operating instructions for coupling vehicles or multiple units, including the correct connection of brake and other control systems, must be provided for train preparation and operating staff.
- 2.5.2.9 The controls applicable when rail vehicles are defective are covered in section 2.7 of this operational concept document.

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2.5.3 Controls – Freight trains

- 2.5.3.1 General requirements for the loading and preparation of freight trains must be defined in operating rules. Operating instructions, appropriate to the type of traffic and wagons they deal with, must be provided to people responsible for the loading and preparation of freight trains covering:
- a) securing a load to prevent it from moving around or falling from a wagon during transit
 - b) distributing the load evenly on each wagon
 - c) accessing or identifying and recording information about the wagon and its load required for safe train formation and movement
 - d) ensuring the train has sufficient braking capacity
 - e) identifying and labelling dangerous goods
 - f) the separation of incompatible dangerous goods
 - g) obtaining confirmation that wagons containing dangerous goods have been securely closed
 - h) safety checks and documentation prior to departure
 - i) the dispatch of freight trains.
- 2.5.3.2 Operating rules and the operating instructions for on-track machines and on-track plant must prescribe the safety checks to be carried out prior to movement. On-track plant is not permitted to be moved in rail mode outside possessions.
- 2.5.3.3 For each wagon which is to be marshalled in a train, those responsible for the preparation and operation of the train must have access to the following information.
- a) Its braking capacity.
 - b) Its status (loaded or empty).
 - c) Its weight.
 - d) Its permitted speed.
 - e) Details of loads requiring special conditions for movement.
 - f) Any reported vehicle defects.
 - g) Whether it is carrying dangerous goods (or it is an empty dangerous goods tank which has not been purged).
- 2.5.3.4 Train drivers, train preparation staff, signallers and operations controllers must be informed of loads which require special conditions to be applied to their movement because of their size, weight or hazardous nature. Operating rules must define procedures for the authorisation, checking and safe movement of such loads.
- 2.5.3.5 To mitigate the risks in the event of an incident involving dangerous goods, operating rules for those responsible for freight train preparation and operation, and traffic control, must define requirements for:

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- a) separating dangerous goods from other traffic
- b) reporting and managing dangerous goods incidents.

2.5.3.6 Freight train drivers must be provided with the following information before starting a journey.

- a) The formation of their train, including its brake force, weight and length.
- b) The lowest maximum permitted speed of any vehicle in the train.
- c) The route availability of the vehicles in the train.
- d) Details of any dangerous goods being conveyed.
- e) Special conditions applicable to the movement of any load or vehicle being conveyed.
- f) Vehicles in the train which have defects requiring a reduction in speed of the train.
- g) Vehicles in the train without operative automatic brakes.

The information must be updated when the formation is changed or the status of vehicles is changed (for example, loaded to empty).

2.5.3.7 Equipment mounted on on-track machines, or engineering plant which is to be removed from a possession by freight train, must be stowed so as to prevent collision with trains on adjacent lines.

2.5.4 Controls – Passenger trains

2.5.4.1 Information must be provided to train crew about stopping points at station platforms and instructions for the operation of door controls at platforms not long enough to accommodate the complete train.

2.5.4.2 Operating rules must provide instructions to be applied when a train overruns a station platform at which it is scheduled to stop.

2.5.4.3 Operating rules must prescribe the requirements for train dispatch at stations. People (including train crew) involved in the dispatch of passenger trains from stations must also be provided with operating instructions specific to the stations where they work, the rolling stock in use and train operating arrangements covering:

- a) dispatch procedures for all trains using the station and any equipment to be used to carry them out
- b) the allocation of responsibilities in the train dispatch process between platform staff and train crew
- c) locations where more than one railway undertaking uses the station.

2.5.4.4 Train drivers of locomotive-hauled passenger trains (other than fixed formation trains for 'push-pull' operation) must be provided with the following information before starting a journey.

- a) The formation of their train, including its brake force, weight and length.
- b) The lowest maximum permitted speed of any vehicle in the train.

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- c) The route availability of the vehicles in the train.
- d) Whether there are any vehicles in the train which have defects requiring a reduction in speed of the train.
- e) Whether there are any vehicles in the train on which the automatic brake is not operative.

The information must be updated when the formation is changed.

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2.6 Compatibility of rolling stock and infrastructure

Principle: *Trains must only be allowed to operate over any portion of line as long as the rolling stock is compatible with the infrastructure on that portion of line.*

2.6.1 Context

- 2.6.1.1 This principle is concerned with confirming the compatibility of a train with the infrastructure of the route over which it is planned to operate, before its movement is authorised.
- 2.6.1.2 Authorisation for a vehicle to operate on the GB mainline railway is the outcome of an acceptance and registration process which complies with European directives, UK statutory requirements and Railway Group Standards. The absence of formal acceptance and registration (with or without restrictions, which have been recorded) will normally be identified to train preparation and operating staff from information systems, before a vehicle is marshalled in a train.
- 2.6.1.3 Compatibility between rolling stock and infrastructure is affected primarily by:
- the dimensions of a vehicle and any load placed on it and clearances between the vehicle and the infrastructure or vehicles on adjacent tracks (gauging)
 - the weight of a vehicle and the capacity of the infrastructure (principally underline bridges) to bear it (route availability)
 - the signalling system.
- 2.6.1.4 The Route Availability (RA) system provides a consistent and simple method for assessing the compatibility of the weight of rail vehicles with the capacity of underline bridges (other than bridges defined as 'long span').
- 2.6.1.5 Route availability is expressed as an RA number for the infrastructure on each route and for each rail vehicle (including locomotives). A vehicle with a RA number higher than that of a section of route cannot operate over that section (for example, a vehicle assessed as RA 8 cannot operate over a route assessed as RA7) unless special conditions can be applied to mitigate risks of failure of the infrastructure and derailment of the train.
- 2.6.1.6 The RA of a freight wagon may vary according to the weight of its payload, whereas passenger vehicles are always assessed for design mass under exceptional payload for RA purposes.
- 2.6.1.7 Some signalling systems rely on interaction between train and infrastructure sub-systems, rather than lineside signals, to maintain separation between trains and authorise train movements. Trains without compatible equipment cannot normally operate on such routes.
- 2.6.1.8 Examples of other factors affecting compatibility include:
- the available braking capacity of the train
 - the weight of the complete train (in relation to the particular route or the type of locomotive to be used to haul the train)
 - the weight of several heavy vehicles (such as locomotives) being moved together in a train
 - the length of the complete train

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- e) train protection or warning systems installed on the infrastructure or the train
 - f) uncertainty about the capability of a rail vehicle to operate train detection systems, including track circuits, axle counters, and treadles
 - g) electric traction systems on trains and infrastructure
 - h) the provision of in-cab communications systems.
- 2.6.1.9 In some cases, the risks arising from incompatibility with the infrastructure can be mitigated by applying special conditions of travel to a train movement (exceptional loads procedures), such as:
- a) reducing the permitted speed of the vehicle (which may require a reduction in the permitted speed of the train as a whole)
 - b) reducing the gross weight of a freight wagon by restricting the payload to below the maximum specified for the infrastructure
 - c) changing the route to provide the necessary clearances or compatible route availability
 - d) blocking an adjacent line during the passage of a wide ('out of gauge') load.
- 2.6.1.10 The infrastructure manager is responsible for defining conditions of travel to be applied to movements of a rail vehicle because of the size or weight of the vehicle or its load¹.
- 2.6.1.11 The overall length of a train (including any locomotives) will affect compatibility with the infrastructure, for example when the train cannot be accommodated safely within passing loops on a single line or at locations where the train is scheduled to call. Unless special arrangements are agreed between the railway undertaking and the infrastructure manager, the normal control is to reduce the length of the train to meet the authorised length for the route.
- 2.6.1.12 Where passenger trains are too long for station platforms (and the cost of extending the platform cannot be justified), the risks of injury to passengers from alighting where there is no platform can be mitigated by engineering controls to prevent the affected doors opening (selective door opening).

2.6.2 Controls

- 2.6.2.1 The controls outlined in section 2.5 of this operational concept document are applicable to this principle, in respect of:
- a) sufficiency of braking capacity
 - b) information required by train preparers and operating staff about each vehicle in a train.
- 2.6.2.2 In addition, people responsible for the preparation and operation of freight trains must be informed of the route availability of each vehicle to be included in the train and of the route over which the train is to travel.

¹ Loads may also be categorised as exceptional and moved under special conditions because of their hazardous nature, although the vehicle in which they are carried is compatible with the infrastructure – see section 3.5 of this operational concept document.

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- 2.6.2.3 The infrastructure manager must publish, for each section of its infrastructure:
- the route availability
 - details of locations where clearances between trains and structures or other trains are restricted
 - maximum permitted train lengths
 - maximum train weights
 - gradients and where they change
 - permissible speeds
 - signalling systems
 - power supply capacity
 - any other information required by signallers, operations controllers and railway undertakings' staff, to enable them to ensure compatibility between trains and infrastructure.
- 2.6.2.4 Operating rules must include:
- the means of informing train drivers of permissible speeds
 - the means of informing train drivers of temporary and emergency speed restrictions
 - the procedure for informing those responsible for freight train preparation and movement (including signallers and operations controllers) of the conditions of travel to be applied to exceptional loads
 - instructions for train drivers and signallers for the movement of rail vehicles which cannot be relied on to operate train detection systems
 - a method which enables train preparation and operating staff to calculate the weight and route availability of a vehicle when this cannot be provided by automated means.
- 2.6.2.5 Passenger train crew must be provided with instructions for the operation of train doors at platforms which are not long enough to accommodate the complete train.

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2.7 Hazards to safe operation from unsafe trains

Principle: *Trains must not continue to operate after they have been found to be unsafe in any respect, until measures have been taken to allow them to continue safely.*

2.7.1 Context

2.7.1.1 This principle addresses the hazards presented by events which occur on a train and prevent it from continuing normally. The types of event are:

- a) A defect arising in an on-train system or component which affects the safe operation of the train or could, if remedial action is not taken, affect the safety of other trains.
- b) A fire on the train.
- c) An uncontrolled release of a hazardous substance from a freight vehicle (dangerous goods incident).
- d) A displaced or insecure load on a freight vehicle.

2.7.1.2 The three primary controls are:

- a) Prompt and accurate reporting of information about the event, suspected or confirmed, to people controlling train movements.
- b) Action to prevent the approach of other trains if the event presents a hazard to them.
- c) Confirmation that safe conditions for train movements have been re-established (including any restrictions to be imposed on movements), before the affected train or vehicle is moved or other stopped trains are permitted to restart.

2.7.1.3 Other controls are intended to prevent trains starting a journey or leaving a maintenance location with defects which should be detected during routine maintenance, or by checks made before entering service.

2.7.1.4 The framework for managing the consequences of a rolling stock defect is provided by a specific company contingency plan, prepared by each railway undertaking in co-operation with the infrastructure manager and other railway undertakings using the same routes. The plan should enable decisions about where defective trains can be moved, for example, to allow passengers to detrain, or for repairs, to be predictable, consistent and timely. The plan should also permit risk-based decisions to be made about retaining defective trains in service in some circumstances, when the alternatives may increase overall risks to passenger safety. The minimum requirements for such contingency plans are defined in Railway Group Standards.

2.7.1.5 When a defect cannot be rectified by the train driver and the train has to be moved elsewhere for repairs, the conditions to be applied to the movement focus on the speed at which the defective train is permitted to travel and the distance of the movement. For each incident, the definition of each parameter depends on the importance to safe train operations of the defective system or component.

2.7.1.6 Limitations on distance for a movement may be expressed as a location, for example, a maintenance depot, or a defined point in the operating schedule for the train, such as the completion of one journey or the complete programme of journeys for a day. With more serious defects, the first movement may have to be limited to a station where passengers can be detrained.

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- 2.7.1.7 For some types of defect or system isolation, the increased risks during onward train movements can be temporarily mitigated by using an additional person with operating competence related to the purpose of the defective or isolated system.
- 2.7.1.8 Fires on moving trains can spread quickly. The primary hazard is to passengers and train crew on board the affected train but, once it has stopped, other risks may arise:
- Injury to passengers who may have left the train in an uncontrolled way, onto an adjacent line open to trains.
 - Injury to train crew or members of the emergency services who may be examining the train, extinguishing the fire or assisting passengers.
 - The potentially injurious effects of heat, fumes or explosion on a passing train, buildings or property, if the fire is in a train carrying flammable or toxic commodities.

The chain of reporting a fire may involve the emergency services (who may also be alerted directly by passengers or members of the public).

- 2.7.1.9 A dangerous goods incident may result from a fire, collision or derailment, as well as a defect in the vehicle carrying the substance. The chain of reporting will normally involve a specialist technical advisor and the emergency services: specialists may be needed to resolve the incident and confirm that the site is safe. Until then, trains on adjacent lines may be stopped and, in some cases, people in properties near to the railway evacuated.
- 2.7.1.10 A displaced or insecure load on a freight vehicle has the potential for collision with another train or with lineside structures or derailment. Trains on an adjacent line must be stopped. It is usually preferable to move the vehicle and its load under special conditions to a location clear of running lines, where it can be replaced or secured correctly, or transhipped, rather than increase delay to other trains.

2.7.2 Controls

- 2.7.2.1 Operating rules must define the procedures for prompt reporting of:
- defects in on-train systems or components which affect the safe operation of the train or could affect the safety of other trains
 - fires on trains
 - dangerous goods incidents
 - displaced loads.
- 2.7.2.2 The controls to be applied to stop other trains approaching a location where the line may be obstructed or unsafe are referenced in section 2.4 of this operational concept document.
- 2.7.2.3 The controls to be applied to protect train crew or other staff from trains on adjacent lines, when they are examining or working on the outside of a defective train, are referenced in section 2.8 of this operational concept document.

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- 2.7.2.4 The general controls for managing dangerous goods incidents referenced in section 2.5 of this operational concept document are applicable; controls to protect train crew from adverse effects on their health resulting from a release of dangerous goods must also be defined in operating rules and operating instructions for conveying specific types of dangerous goods.
- 2.7.2.5 Operating rules, supported by maintenance and train preparation instructions for each type or class of vehicle, must:
- prescribe the requirements to be met, in respect of on-train equipment, before trains or vehicles are permitted to enter service
 - define the circumstances in which trains or vehicles may be permitted to enter service with defects or isolations which could affect their safe movement, and the additional safeguards which must be applied to mitigate increased risks which arise as a consequence.
- 2.7.2.6 Requirements for checking the continuity of the automatic brake are referenced in section 2.5 of this operational concept document.
- 2.7.2.7 The controls applicable to the safe loading of freight trains and the identification and secure closure of dangerous goods consignments are referenced in section 2.5 of this operational concept document.
- 2.7.2.8 When a train or vehicle which has become defective has to be moved on the mainline railway, instructions for its movement must specify:
- the maximum speed for the movement
 - the point at which the train is to be taken out of service or other controls applied, such as detraining passengers, remarshalling or turning the train
 - any additional safeguards to be applied to the movement.
- Instructions to train drivers about the movement of a defective train must be given by signallers.
- 2.7.2.9 Operating rules governing the response of train crew to fires on trains (in addition to the requirements to report the event immediately and to prevent other trains approaching) must cover:
- preferred types of location to stop a train which is on fire
 - fires on trains carrying dangerous goods
 - fires on trains carrying passengers
 - actions to prevent the spread of fire
 - assessment and reporting of the condition of the train after the fire is extinguished, in advance of decisions about its onward movement.
- 2.7.2.10 Actions to be taken in response to a report of a dangerous goods incident must be prescribed by operating rules, supported by instructions specific to the goods involved, provided by the consignor or the railway undertaking.

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- 2.7.2.11 Procedures for managing incidents when loads have become displaced or are insecure must be prescribed in operating rules. The conditions applicable to the movement of vehicles whose load may obstruct an adjacent line or exceed the infrastructure gauge are referenced in section 2.5 of this operational concept document.

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2.8 Keeping people away from moving trains

Principle: *People must be kept at a safe distance from moving trains.*

2.8.1 Context

2.8.1.1 This principle addresses the interface between people and moving trains:

- a) when work is carried out on or near running lines, sidings and in depots, including walking on or near a line to or from the site of the work (including a defective train or rail vehicle)
- b) at stations and level crossings used by members of the public.

2.8.1.2 In this context, 'work' includes patrolling or inspecting over a distance along the infrastructure as well as working at a static location and it includes tasks which are carried out by an unaccompanied worker.

2.8.1.3 Work on railway infrastructure and infrastructure equipment should be planned in advance, unless unforeseen failures or damage have to be rectified. The allocation of responsibilities for implementing procedures to mitigate the risks to people from moving trains is part of the planning process, as is the route by which workers access and leave the site of work.

2.8.1.4 To keep a safe distance between moving trains and people on or near any line it is necessary to physically separate them and their work from moving trains (protection procedures) or, when separation cannot be provided, warn them of an approaching train, in sufficient time for them to stop work and move to a position of safety (warning procedures).

2.8.1.5 Rail-borne plant, on-track machines and trains essential for infrastructure work may have to be moved within areas designated as protected for the safety of staff. Controls are necessary, in the form of warnings and restrictions on the speed of movements.

2.8.1.6 Working on a line open to trains and relying on warning procedures places constraints on the type of work that can be done (it must not compromise the infrastructure subsystems – track and signalling) and the equipment that can be used (it must be easily and quickly portable to a position where it will not form an obstruction to a passing train). The need for easily accessible positions of safety when trains approach restricts the locations where warning procedures can be used.

2.8.1.7 Section 2.3 of this operational concept document covers the hazards to trains which arise from infrastructure work.

2.8.1.8 A number of railway operating tasks place members of the workforce at risk of injury from moving trains:

- a) Manual coupling and uncoupling of rail vehicles and controlling shunting movements, because the nature of the work precludes the use of protection or warning procedures.
- b) Communication between train drivers and signallers, when there is no alternative to the train driver leaving the cab or the signaller leaving the signal box (for example, a train driver has to use a signal post telephone; a signaller has to hand a token for a single line section to a train driver).

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- c) Train drivers checking the outside of their train for a fault or damage or changing cabs, when this cannot be done without the train driver going on or near a running line.
 - d) Manual operation of level crossing gates (the release of the gates is not always interlocked with stop signals controlling the approach of trains to a level crossing).
 - e) Retrieving objects from the line at a station platform, where there may be no position of safety.
- 2.8.1.9 Rolling stock technical staff examining or repairing defective trains stopped on a running line are at risk of injury from other trains, when gaining access to the defective train as well as working on it. The preferred safeguard is to move the defective train to a location away from a running line but this cannot always be done.
- 2.8.1.10 The hazards of moving defective rail vehicles are covered in section 2.7 of this operational concept document.
- 2.8.1.11 The provision of walking routes to enable safe access to a permanent place of work is derived from health and safety legislation. Publication of walking routes is a local management responsibility.
- 2.8.1.12 The application of this principle to the interface between members of the public and trains at stations is limited to the actions which station or train operating staff can take if someone appears to be at risk from trains; controls in Railway Group Standards or operating rules cannot be applied directly to members of the public.
- 2.8.1.13 Measures for warning and protecting users of level crossings (including footpath and bridleway crossings) are defined in legislation relating to highways, railways and health and safety²; implementation is the responsibility of the infrastructure manager. Legislation also places responsibilities on road users. However, controls at some automatic level crossings, where road and rail traffic is light, rely on local monitoring of the crossing by train drivers.
- 2.8.1.14 The potential hazards to the safety of trains from the actions of road users at level crossings are covered by section 2.3 of this operational concept document.
- 2.8.2 Controls – railway workforce (All activities on or near the line)**
- 2.8.2.1 Operating rules for the safety of people on or near the line must include:
- a) requirements (which may be general or task-specific in application) for the personal safety of individuals and work groups
 - b) definition of terms used to identify common features of railway infrastructure and equipment
 - c) an explanation of ‘on or near the line’

² Advice on controls for use at all level crossings, including footpath and bridleway crossings, is contained in Level crossings: a guide for managers, designers and operators, published by the Office of Rail Regulation.

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- d) an explanation of signs used to warn the workforce of common hazards to their safety or prohibit access to an area unless protection procedures have been implemented
- e) the procedures for protecting or warning people working on or near the line
- f) the responsibilities for setting up and maintaining protection or warning procedures
- g) the procedures for mitigating hazards from trains to workers walking to or from a temporary work location (including a defective train), when there is no alternative to walking on or near the line
- h) communication protocols for safety messages passed between people working on or near running lines, those with responsibilities under protection and warning procedures, signallers and train crew.

2.8.3 Controls – railway workforce (Infrastructure work)

- 2.8.3.1 People responsible for planning work must be provided with information about appropriate access points to the railway infrastructure, and the safest route between the access point and the location of the planned work.
- 2.8.3.2 People responsible for implementing and managing procedures to protect or warn people carrying out infrastructure work must be provided with local information which will enable them to apply effective protection or warning arrangements.
- 2.8.3.3 Operating rules must prescribe the conditions to be applied to the movements of engineering trains or on-track plant and machinery in an area which is protected for the safety of the workforce.
- 2.8.3.4 Operating rules must include procedures to be applied by people working alone.

2.8.4 Controls – railway workforce (Manual coupling or uncoupling of rail vehicles and controlling shunting movements)

- 2.8.4.1 Operating rules must:
 - a) describe the procedures for controlling train movements
 - b) define responsibilities for authorising and controlling train movements
 - c) define protocols for speech messages and hand signals

2.8.5 Controls – railway workforce (Examination or repair of a train or rail vehicle)

- 2.8.5.1 Operating rules must define procedures for protecting:
 - a) train drivers who have to examine the outside of a train adjacent to a running line
 - b) technical staff while they gain access to and work on the outside of the vehicle adjacent to a running line
 - c) people working on the outside of rail vehicles in depots, sidings or station platforms against movement of the vehicle without warning or train movements on an adjacent siding or line.

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- 2.8.6 Controls – railway workforce (Communication between train drivers and signallers)**
- 2.8.6.1 Operating rules must provide controls to protect the train driver when contact with the signaller is necessary, when there is no alternative to a train driver leaving the train to do so.
- 2.8.7 Controls – railway workforce (Train drivers changing cabs)**
- 2.8.7.1 Operating rules must enable the train driver to obtain protection from the signaller controlling the line concerned, when there is no alternative to a train driver walking along a running line to change driving cabs.
- 2.8.8 Controls – railway workforce (Manual operation of level crossing gates)**
- 2.8.8.1 Operators of manual level crossing gates must be provided with instructions specific to the crossing concerned, including the type of interface between the level crossing and the signalling system.
- 2.8.9 Controls – railway workforce (Retrieving objects from a platform line at a station)**
- 2.8.9.1 Operating rules must enable platform staff to be protected by the signalling system controlling the affected line, when objects are to be retrieved.
- 2.8.9.2 An object that could present a hazard to a train is an obstruction within the scope of section 2.4 of this document, requiring immediate action to prevent the approach of trains.
- 2.8.10 Controls – Members of the public (Stations)**
- 2.8.10.1 Operating rules must outline the actions to be taken by station and train operating staff, to prevent people using stations from being injured by moving trains or during boarding and alighting.
- 2.8.11 Controls – Members of the public (Level crossings)**
- 2.8.11.1 Operating rules must prescribe the actions to be taken by train drivers at level crossings where the controls for mitigating risks to users and to train operations include:
- a) the use of the train's warning horn
 - b) reduction in speed of the train
 - c) observation of the state of the crossing and associated lineside indicators.
- 2.8.11.2 The requirement to apply such controls to a specific level crossing must be published to train drivers of trains on the route concerned.

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2.9 Protection of workers from electrification hazards

Principle: *The workforce must be protected from the particular hazards associated with electrified railways.*

2.9.1 Context

- 2.9.1.1 This principle addresses the hazards to the railway workforce from electric traction current supply systems using overhead lines or conductor rails. It is not concerned with the technical details of the systems.
- 2.9.1.2 The scope of the work covered by this section is identical to that of section 2.8 of this operational concept document.
- 2.9.1.3 On electrified lines, the particular hazards from electrical equipment require additional controls to safeguard railway workers; the additional controls are common to all electrification systems.
- 2.9.1.4 The additional controls involve:
- a) removal of the hazard to the workforce from electrification by securely disconnecting the electrical equipment from its electricity supply (an isolation), or
 - b) if the electrical equipment is to remain live during work, ensuring workers are aware of the hazards and, if necessary, restricting the work they can do and equipment they can use, to mitigate the hazards.
- 2.9.1.5 Members of the public using stations are outside the scope of this principle, as they will not be in close proximity to hazardous electrical equipment when using stations for a legitimate purpose.

2.9.2 Controls

- 2.9.2.1 Differences between electrification systems, their technical and physical characteristics and impact on workforce safety, must be addressed in system-specific instructions.
- 2.9.2.2 Operating rules provided to anyone who works on or near electrified lines must include:
- a) a description of the electrification system operating where they work, definition of terms and explanation of signs used to identify electrical equipment and the components of the system
 - b) a description of the procedure for switching off electrical equipment in an emergency and rescuing people who have come into contact with electrical equipment
 - c) protocols for messages passed between people working on or near electrified lines and people controlling the electric current supply.
- 2.9.2.3 Operating rules for work on the infrastructure of electrified lines, including the electrification equipment, must:
- a) define the responsibilities for planning, establishing and maintaining a safe system of work, including control of the electric current supply and obtaining an isolation
 - b) define the procedure for obtaining an isolation of electrical equipment and securing the isolated section against accidental charging with electricity

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- c) specify any distance from electrical equipment required to assess whether work can be carried out safely without an isolation
 - d) identify and describe the safety equipment required to protect workers from electric shock, the type of work which they can do safely and limitations on the tools, plant and equipment which they can use without obtaining an isolation.

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Part 3 Glossary of terms

In service

A train is in service from the time it starts its journey until the time it completes its journey.

Journey

The route between the depot, siding, platform line or other authorised place where the train enters service and the depot, siding, platform line or other authorised place where the train:

- a) reaches its destination
- b) is required to reverse before continuing to its destination
- c) is required to have vehicles attached or detached
- d) is terminated short of its destination as a result of:
 - i. infrastructure fault
 - ii. line blockage
 - iii. defective on-train equipment
 - iv. any other operational reason.

This definition also applies to short distance shunting movements.

Mainline railway

Mainline railway has the meaning given to it in the Railways and Other Guided Transport Systems (Safety) Regulations (as amended) 2006, but excluding the dedicated high speed railway between London St Pancras International Station and the Channel Tunnel.

On or near the line

The area within which people are at risk of being struck by a moving train. Its limits are defined in operating rules.

Operating instructions

Operating instructions supplement operating rules when applied to specific equipment (for example, a particular type of train or sub-system on a train) which is not used by all transport operators.

Permissible speed

The maximum speed permitted over a section of line, as shown in the Sectional Appendix. Note that the speed at which a train is permitted to travel is governed by either the permissible speed for the line or the permitted maximum speed of the slowest vehicle on the train, whichever is the lower.

Railway undertaking

Railway undertaking has the meaning given to the term 'transport undertaking' in the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended), save that for the purpose of this operational concept document, the term is limited to those railway undertakings who hold a Part B safety certificate issued in respect of the mainline railway.

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Running line

A line other than a siding and shown as such in Table A of the Sectional Appendix. In normal conditions, movements over running lines are made under the authority of a signalling system.

Sectional Appendix (Sectional Appendix to the Working Timetables)

A publication (in hard copy or electronic form), by which the infrastructure manager meets the requirement to provide essential information about its infrastructure, by section or route, for train and infrastructure operating staff.

Shunting movement

Any movement of a train or vehicle, other than a train passing normally along a running line. Shunting is normally over a short distance; if confined to yards, sidings and depots clear of running lines movements may be controlled by handsignals or radio communication between the shunter and the train driver. If the shunting movement goes on to or crosses lines controlled by a signalling system, movement authority must be obtained from the signalling system.

Siding

A line which is not classified as a running line (q.v). In normal conditions, movements from a siding to a running line or vice versa are authorised using a signalling system.

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Appendix A - Fundamental Operating Principles

1. The method of signalling must maintain a space interval between trains that is safe.
2. Before a train is allowed to start or continue moving, it must have an authority to move that clearly indicates the limit of that authority.
3. Trains proceeding over any portion of line must not be obstructed in a way that threatens their safety.
4. Trains must be prevented from proceeding onto a portion of line if it is known or suspected that it would not be safe for them to pass.
5. Trains must not be allowed to begin or continue their journeys until it is clear that it is safe for them to do so.
6. Trains must only be allowed to operate over any portion of line as long as the rolling stock is compatible with the infrastructure on that portion of line.
7. Trains must not continue to operate after they have been found to be unsafe in any respect, until measures have been taken to allow them to continue safely.
8. People must be kept at a safe distance from moving trains.
9. The workforce must be protected from the particular hazards associated with electrified railways.

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Appendix B - Guidance on how the operational concept can be used

This Appendix provides some guidance on how the operational concept can be used, together with some worked examples that illustrate how RSSB has applied this scope test previously. Users should note that following the procedures suggested in this Appendix does not guarantee that industry representatives will necessarily accept a proposal for change. The normal standards change process will continue to apply to all applications.

The operational concept provides the scope for the content of the Rule Book (GE/RT8000) and other National Operations Publications (NOPs). It can therefore also provide a way of testing whether rules change proposals might be in scope. The operational concept facilitates operational change and thereby supports industry in its efforts to optimise the way the railway operates.

Using the OCD also helps the industry to contextualise ideas for operational change, identifying where changes to rules and/or other NOPs may or may not be needed. It also helps the industry, through TOM Standards Committee, to streamline the process for rules change by distinguishing between those proposed changes that affect the operational concept and its Principles, and those that improve the definition of the rules but not their intent. This enables a holistic approach to change, rather than relying on change by individual proposals in isolation, and leads to a more responsive and quicker process for delivering changes to the way the railway is operated.

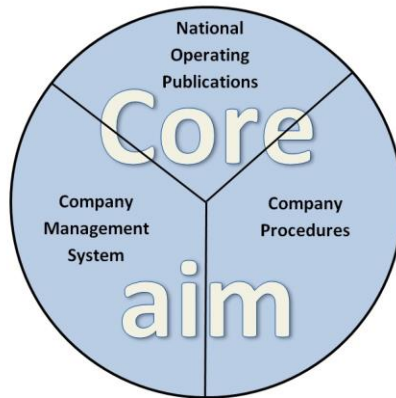


Figure 1: Framework Diagram

The framework diagram in figure 1 constrains the content of NOPs to a defined scope. This enables those that might wish to develop a proposal for change to determine whether there may be an effect on the Rule Book and/or other NOPs.

The flow-chart in figure 2 can be used as a guide for making more detailed assessments as to whether the issues concerned might be in scope of NOPs. If the issues are not in scope then they may be more suited to a local solution, for example within Company Management Systems.

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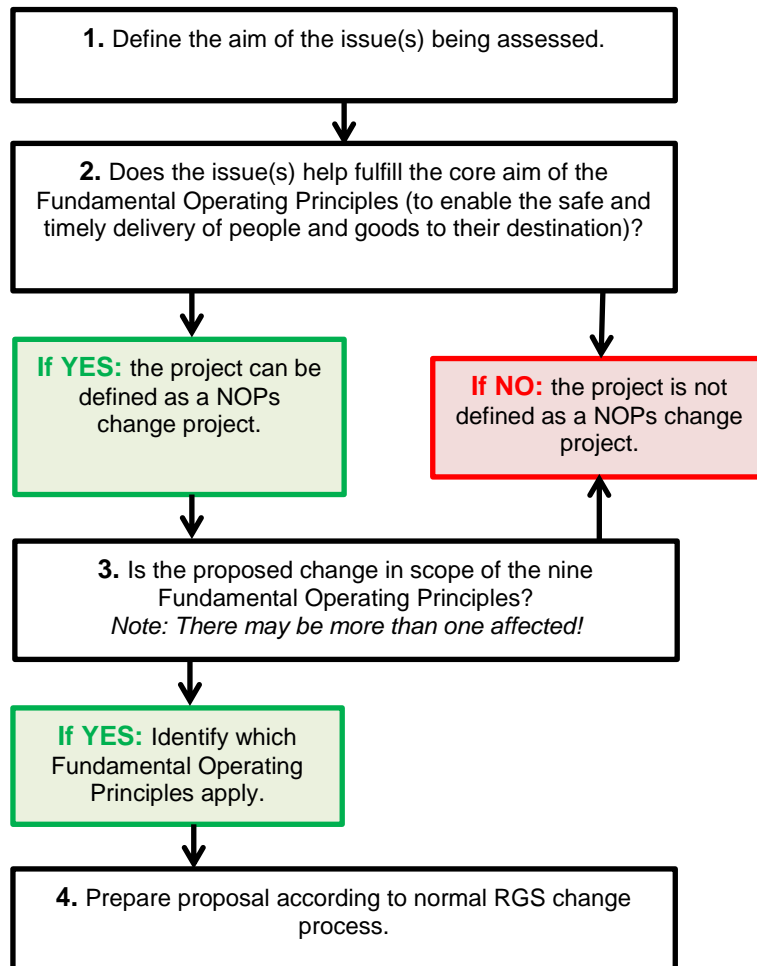


Figure 2: Scope Test Flowchart

Guide to applying the 'Scope Test Flowchart' – described in four phases of activity

This describes the change process outlined above.

PHASE 1: The first phase of the scope test is to identify the aim of the issue(s) that might go forward to become a proposed operating rule change. This should be worded in such a way that phase two of this process may be readily assessed.

PHASE 2: The second phase involves identifying whether the issue(s) fall within the scope of the core aim of the Fundamental Operating Principles, which is to enable the safe and timely delivery of people and goods to their destination.

PHASE 3: The third phase (providing that the response to the second phase was 'yes') is for checking against the 9 FOPs to establish whether the proposal is within scope of the context and control described in each of the Principles.

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It is important to make sure that the proposal is checked against all 9 FOPS for completeness, prior to applying phase 4.

If the proposed change does not fall within the scope of any of the 9 FOPs, then the controls are likely to be within the responsibility of the transport operator concerned to provide for their staff (including instructions necessary for operating that company's trains or other equipment).

PHASE 4: The fourth phase is to prepare a proposal in accordance with the agreed process.

Worked examples of how RSSB has applied the scope test previously

Introduction to examples

The four examples shown in this Appendix are intended to provide some guidance for transport operators to help understand how proposals for possible rules change using the operational concept might be within scope of National Operations Publications. If not, it might be a matter more appropriately dealt with by company procedures and instructions.

The following examples illustrate how the OCD can be used. Please note that the cases shown are for illustrative purposes only.

Questions and enquiries concerning the content and use of this operational concept document should be directed to the RSSB Enquiry Desk, from where it will be passed on to the technical specialists concerned for a response.

Example 1: possession arrangements.

Phase 1: What are the issues being assessed?

The project proposes to apply the arrangements set out in the Rule Book for taking possessions around a train in a situation where the possession limits are extended on a planned basis, so that the revised possession limits encompass trains which have been placed ready for work within the possession extension.

The initial proposal is for a trial of the change to be carried out in planned possessions on a section of the mainline railway; if successful, a permanent change to the operating rules would be proposed.

Phase 2: Do the issues support delivery of the core aim of the principles?

The application supports the core aim, by reducing:

- a) the time needed to position engineering trains, so potentially reducing the duration of disruption to other services caused by the work
- b) the distance travelled by engineering trains within possession limits without the safeguards of the signalling system

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- c) the possibilities of communication errors resulting from additional train movements resulting from a restrictive application of existing rules.

It is therefore an operational change.

Phase 3: Which of the principles and control measures within the 9 FOPs are relevant to the proposed operational change?

The change is within the scope of Principle 3: Trains proceeding over any portion of line must not be obstructed in a way that threatens their safety.

The OCD lists the high level control measures required to deliver this principle and the OCD map shows the rules which are relevant.

The project refers to the existing rules covering the subject matter (module T3 and handbooks HB11 and HB12) which enables the map of the relevant rules to be used to confirm the principle and the high level controls.

The controls relevant to this project are defined in paragraph 2.3.3.1: Operating rules for managing infrastructure work must define:

- b) the responsibilities of signallers and people in charge of arrangements for blocking the line and controlling movements of trains towards, into and within the blockage
- c) procedures for blocking the line to prevent trains entering the blockage (unless required for the work).

Note that the rules involved have all been reviewed and reissued under the New Approach. The mapping process has found them to be within scope of the Rule Book.

Phase 4: Does a proposal for operational change to NOPs need to be prepared?

The project as stated does not propose any change of substance to the existing rules but wishes to widen the scope of their application, beyond current practice. The existing rules do not prohibit what is proposed but operations experts and practitioners have different views about its legitimacy. As a result, the rules are interpreted restrictively and opportunities to improve the efficiency of infrastructure work and mitigate potential hazards arising from it may be lost. The practical effect of implementing the project would be to change the current methods of delivering the high level controls. A change to operating rules would be required to ensure clarity and consistency of interpretation.

Although the change to the rules would be quantitatively small and potentially beneficial, it will prompt a change to existing practice and transport operators will need to ensure that the workforce understands its significance for their work. Railway undertakings' staff (engineering train crews) are affected as well as those of the infrastructure manager (signallers, PICOPs, Engineering Supervisors).

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Example 2: Warning of movement of on-track plant (OTP)

Phase 1: What are the issues being assessed?

The project proposes that OTP operators make only one short blast on the horn to warn people working on the track of an impending OTP movement, irrespective of whether the machine is to move in the forward or reverse direction.

The present rule requires the OTP operator, before making any rail movement, to give one blast on the horn for a forward movement and two blasts when about to reverse. Many items of OTP, such as 360° excavators, have a revolving superstructure. Whilst the chassis and the machine operator's controls will have a forward and reverse direction, there is no clear indication to workers nearby of the intended direction of the machine, especially when more than one machine is working. Changing the warning to one blast clarifies that a movement of OTP is about to take place and people on the ground need to check to see if the movement will affect them, rather than relying on a sound that may not readily distinguish the direction of the movement.

Phase 2: Do the issues support delivery of the core aim of the principles?

The project supports the core aim (the safe and timely delivery of people and goods to their destination) indirectly: the subject is within scope of Principle 8, which governs the safety of people working on the infrastructure rather than train operations *per se* but the work itself is essential to ensuring the safe movement of trains.

It is therefore an operational change.

Phase 3: Which of the principles and control measures within the 9 FOPs are relevant to the proposed operational change?

The change is within the scope of Principle 8: People must be kept at a safe distance from moving trains.

The project refers to the existing rules covering the subject matter (handbook HB15) which enables the map of the relevant rules to be used to confirm the Principle affected and identify the specific high level controls.

The high level controls affected are in paragraph 2.8.3.3 of the OCD: Operating rules must prescribe the conditions to be applied to the movements of engineering trains or on-track plant and machinery in an area which is protected for the safety of the workforce.

Note that the rule involved has been reviewed and reissued under the New Approach. The mapping process has found it to be within the scope of the Rule Book.

Phase 4: Does a proposal for operational change to NOPs need to be prepared?

The project, if implemented, would change how the high level controls are delivered, wherever a possession involving OTP takes place. A change to operating rules would be required.

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The project proposes a limited change to operating rules (HB15 s7.2) affecting people who work in possessions or operate OTP. Possession arrangements are under the control of the infrastructure manager but OTP and its operators may be provided by contractors. However, the railway undertakings would not need to be consulted on the change as the rule does not affect their staff.

The infrastructure manager would have to be satisfied that the change would not adversely affect the risk of injury to its staff (or its contractors' staff) from being struck by a moving vehicle.

Example 3: testing brakes during winter weather conditions

Phase 1: What are the issues being assessed?

The project proposes less prescriptive rules for testing brakes during winter weather conditions, as some trains are equipped with systems designed to achieve this without reducing the speed of the train, which is a requirement of the present rules.

Phase 2: Do the issues support delivery of the core aim of the principles?

The project supports the core aim of the safe and timely delivery of people to their destination: if implemented, it will permit the drivers of trains equipped for this purpose to test the efficiency of the braking system during winter weather without a reduction in the speed of the train, as prescribed in the Rule Book, avoiding the consequent delay.

Phase 3: Which of the principles and control measures within the 9 FOPs are relevant to the proposed operational change?

The change affects Principle 5: Trains must not be allowed to begin or continue their journeys until it is clear that it is safe for them to do so.

The high level control is defined in OCD paragraph 2.5.2.4: The sufficiency of the operation of the braking system must be assured in winter weather conditions by company instructions specific to the train.

The project refers to the rules covering the subject matter (module TW1 s18) which enables the map of the relevant rules to be used to confirm the Principle affected and identify the specific high level controls.

Phase 4: Does a proposal for operational change to NOPs need to be prepared?

The rules require a running brake test to reduce the speed of the train to prove the effectiveness of the test; the new system does not need a reduction in speed to confirm that the test has been successful.

The mapping tables for the OCD and module TW1 indicate that s18 is over-prescriptive: a general requirement referring drivers to company instructions should be sufficient to deliver the control.

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The rule change required in this example was to remove the prescription in TW1 s18. This change was made and came into force in December 2011, resolving the problem of over-prescription. No further change is needed, but note that module TW1 is a legacy module which, at the time this proposal was received by RSSB, had not yet been reissued under the New Approach.

Example 4: testing of power-operated train doors

Phase 1: What are the issues being assessed?

The project seeks to permit trains to enter service from a depot as empty coaching stock (ECS) before a door test has been carried out.

Phase 2: Do the issues support delivery of the core aim of the principles?

The project supports the core aim (the safe and timely delivery of people and goods to their destination), which includes ensuring that a passenger train does not enter service with a defect which could affect passenger safety. It is not proposed to eliminate a door test but to provide railway undertakings with the option to carry it out before passengers are permitted to board the train (which may be after a journey as ECS).

Phase 3: Which of the principles and control measures within the 9 FOPs are relevant to the proposed operational change?

The change is within the scope of Principle 7: Trains must not continue to operate after they have been found to be unsafe in any respect, until measures have been taken to allow them to continue safely.

The project refers to the specific rules (module TW2, s1.3), which enables the high level controls to be identified from the rules mapping tables. The relevant OCD paragraph is:

Operating rules, supported by maintenance and train preparation instructions for each type or class of vehicle, must (as set out in 2.7.2.5 a)) prescribe the requirements to be met, in respect of on-train equipment, before trains or vehicles are permitted to enter service.

Note that the rule involved was a legacy rule which, at the time this proposal was received, had not yet been reissued under the New Approach. The mapping process had found it to be within the scope of the Rule Book (but see comments under Phase 4).

Phase 4: Does a proposal for operational change to NOPs need to be prepared?

A change to operating rules is required to align the railway undertakings's procedures and the Rule Book. The railway undertakings's operating procedures provide for some trains to be operated as ECS from its depot to a station, where a door test will be carried out before passengers are allowed to board it. The rules require a test before the train enters service and do not differentiate between service as a passenger train and ECS.

This example shows that the boundary between the scope of the Rule Book and railway undertaking's procedures is not always simple to define, though both are within the scope of

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the OCD. A requirement for door tests before a train enters service as a passenger train could be sufficient to deliver the OCD control as an operating rule; the decision about precisely when the test is carried out would then be a matter for the railway undertaking, subject to the outcome of its assessment of the impact on risks to other users of the railway arising from its selected procedure. Both the rule and procedure would remain within the scope of the OCD.

The rule change required would affect all railway undertakings operating multiple unit trains with power-operated doors and would therefore require widespread consultation, supported by an assessment of the risks to the operations of other railway undertakings on the network which would be affected by an undetected door defect materialising during an ECS journey.

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Part 4 References

The Catalogue of Railway Group Standards gives the current issue number and status of documents published by RSSB. This information is also available from www.rgsonline.co.uk.

RGSC 01	Railway Group Standards Code
RGSC 02	The Standards Manual

Documents referenced in the text

Level crossings: a guide for managers, designers and operators. (ORR)

Other relevant documents

Railway Group Standards

GE/RT8000	Rule Book
GO/RT3056	Working Manual for Rail Staff: Freight Train Operations
GO/RT3053	Working Manual for Rail Staff: Handling and Carriage of Dangerous Goods