



Chapter 2: Industry staff competence & human Failure

ORR strategy for reducing risks linked to competence and human failings:

Staff competence underpins all railway operations and asset management. It is fundamental to the successful implementation of risk controls and mitigations. Weaknesses in competence management, as well as human errors and violations, increase the potential for incidents, creating both individual risk and the potential for fatal events.

The industry has matured greatly in its competence management systems over the last two decades. But incident data reveals that there are still many failings associated with non-compliance with procedure and rules. This shows that there is more that industry can do, both to:

- ‘engineer out’ human error by better design and technological innovation and
- Improve existing competence management systems – informed by better understanding of root-causation of failings, enabled by a just culture, and underpinned by structured reviews of prevention and mitigation - taking account of human factors and promoting improved non-technical skills.

ORR will work to influence the industry to ensure:

- all parts of the industry have arrangements to deal with and sustain the skills and competence needed to deliver risk management now and in the future;
- each duty holder has a competence management system, which aligns with good practice in other comparable organisations. These should be proportionate to the risk, targeted to the needs of the organisation and relevant to its medium and long-term development; and
- all parts of the industry have long-term resource and skills plans in place to improve staff competency management.

We note the specific challenges relating to competence management in the heritage sector: the specific risks posed by part-time, multi-tasking, and a predominantly volunteer workforce. We acknowledge the improvements made in recent years and will promote continuation of these efforts.

Incidents in the Charter sector highlight the risks imported to mainline operations when organisations with less well-developed managements systems have access to the network. ORR’s enforcement actions illustrate the benchmark of management maturity and competence levels that we will insist on.

There must be concerted cross-industry effort to meet the challenges of an ever busier network and wider deployment of new technologies such as the Digital Railway.

We will work with Network Rail centrally to ensure that best practice is promoted across the devolved routes. In particular ORR will press to ensure that the transformative potential of Business Critical Rules (BCR) and Role-Based Competence (RBC) is embraced fully.

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Background

1. People are an integral part of the safety management system. They carry out a number of roles: executing operational procedures, monitoring that those processes are not adversely affected by external factors and ensuring the recovery of a system following an event. Processes, however suitable and appropriate, are only as good as the people who carry them out. The consistency and calibre of the input by people is dependent on the quality of procedures, training and competence. However, people unintentionally make errors or, on occasions, deliberately and knowingly deviate from their training and procedures.

2. This chapter describes the risks that flow from competence shortcomings – in both technical and non-technical skills – and from human fallibility. It sets out the importance of safe systems of work in mitigating inevitable human failings and acknowledges that the fast pace of change in the industry means that the risk profile alters – as passenger numbers increase and new technology is introduced. The rail sector will have to be increasingly agile in response to these challenges in order to maintain optimum control of risks.

3. Competence can be described as the combination of training, skills, experience and knowledge that a person has and their ability to apply them to perform a task safely. Other factors, such as attitude and physical ability, can also affect someone's competence. An employer should take account of the competence of relevant staff when conducting risk assessments. This will help decide what level of information, instruction, training and supervision should be provided.

4. This chapter is concerned with the risks that arise from inadequate training and competence, and from human fallibility; since such risks are predictable, they require measures to be in place to control the risk arising from these specific factors.

5. ORR's guidance document 'Developing and maintaining staff competence'¹ defines competence as the ability to undertake responsibilities and to perform activities to a recognised standard on a regular basis. Competence is a combination of practical and thinking skills, experience and knowledge, and may include a willingness to undertake work activities in accordance with agreed standards, rules and procedures. Staff capability and competence are vital to the delivery of a safe and efficient railway, and human failures are frequently implicated in accidents.

¹ See: <http://www.rail-reg.gov.uk/server/show/ConWebDoc.8598>

6. Competent people can fail in regular and recurring ways. 'Human failure'² describes slips, lapses in concentration and mistakes that people make unintentionally, but also when people knowingly or deliberately fail to follow rules (called violations, where following the rules either makes no sense to an individual or it seems to make the job harder).
7. As the mainline rail industry moves away from a regime of prescriptive company standards (which, evidence shows, are not consistently and reliably followed) towards a more risk-based approach, the importance of individuals making sound judgements increases. This requires a level of competence management that assures that all those responsible for managing risk are capable of doing so in a coherent way.
8. Historically the rail industry relied on trusting that staff would follow appropriate rules and procedures. This knowledge was rarely tested and the sanction of disciplinary action and dismissal was the main means of 'ensuring' compliance.
9. A series of high-profile incidents in the late 1980s and early 1990s highlighted the importance of having more rigorous competence management regimes and led to the adoption of more mature competence management.
10. The first significant change was introduced following the fatal train collision at Clapham in December 1988. This led to the Institution of Railway Signal Engineers' (IRSE) licensing scheme. Both Network Rail and London Underground still use this regime as part of their competence management system for signal technicians and engineers. It was the sector's first recognition of the need for an active competence management regime and set the standard for subsequent models across the industry.
11. Before the advent of the statutory requirement for train protection in the 1999 Railway Safety Regulations, a desire for better control of the risks from Signals Passed at Danger (SPADs) drove improved competence management systems for drivers and signallers. Competence regimes in both these areas have continued to develop and improve over the intervening twenty years, but daily incidents show that errors still occur and that the industry can achieve even better management of the risks from human error.
12. In the rail industry, 'irregular working', or not following the rules, is one of the most frequently reported category of incident. The underlying causes of these incidents often include lack of competence or human failure, or both.
13. 'Workforce error' is a contributor to risk, even though in many cases no significant harm results because safe systems are designed to require several protective measures to fail together before harm is caused.

Human fallibility

14. People make unintentional errors. 'Human failure'³ describes human errors such as "slips" of communication where the action carried out was not as planned, "lapses", where a step in a procedure is omitted or "mistakes" occur when the plan being followed is incorrect;

² See: <http://www.hse.gov.uk/humanfactors/introduction.htm>

³ See: <http://www.hse.gov.uk/humanfactors/introduction.htm>

for example; a rule is followed that on this occasion should not be or people are set up to fail by assumed "knowledge or information".

15. Sometimes errors occur because an established procedure is inappropriate or incorrect (a rule-based mistake), or there's an over-reliance on personal knowledge, for example, an individual makes a judgement based on uncertain personal knowledge. Errors might also occur as a result of poor safety culture across an organisation (which is covered in more details in the chapter titled: Leadership & culture), such as the 'it's always been done like this' approach. Deliberately and knowingly not following a rule or procedure, such as speeding, is 'violation' behaviour. A number of performance shaping factors can nudge people towards errors and violations: time-pressures, fatigue (which is covered in more details in ORR publication 'Managing Rail Staff Fatigue'⁴), insufficient resource levels, equipment design and personality factors.

16. Human failure gives rise to risk but, by its nature, is recurrent and predictable: hence we can guard against such errors leading to a catastrophic event by ensuring adequate control measures, effectively implemented. A mature duty holder will have effective performance measures that enable better understanding of the root causes of error and failing; this in turn allows more intelligent targeting of preventive and mitigating controls.

17. For this to be most effective a mature duty holder will strive to achieve an open, just culture. This encourages staff to be frank and honest about incidents and close calls, enabling root-causes to be accurately identified and addressed. A healthy culture will also promote individual members of staff to consider and take responsibility for their actions and be aware of the possibility for error.

18. Our focus is on those human failures that can lead to serious train accidents with incidents at level crossings, train derailment and SPADs being significant areas. The Safety Risk Model version 8 (SRMv8) estimates that workforce error, whether from unintentional errors or violations, contributes around 7% of the total risk from collisions between trains and road vehicles at level crossings, for example, mostly associated with irregular working by level crossing keeper or signaller error.

Staff capability

19. Developing staff capability is fundamental to delivering an efficient and safe rail service. Some of the recent difficulties the industry has experienced in delivering major projects and enhancements have been due to skills shortages in vital areas such as signalling and electric traction systems. There is potential to improve the development of transferable skills and to reduce the industry's reliance on temporary labour.

20. Developing capability underpins safe and efficient railway operations in two fundamental ways:

- a) It gives greater assurance that existing staff have appropriate skills and knowledge to deliver current risk control and to contribute to the structured continuous improvement of risk control.

⁴ Managing rail staff fatigue, <http://www.orr.gov.uk/rail/health-and-safety/occupational-health/topic-specific-guidance/working-patterns-fatigue>

- b) It can develop scarce skills whose shortage currently jeopardises delivery of a range of infrastructure enhancement and renewal schemes.

21. The National Skills Academy for Rail (NSAR) has been set up to enhance Britain's railway engineering capability, so that it can design, build and maintain railway infrastructure across all railway sectors. An NSAR project (funded by ORR) to update its skills forecast, assessed whether the industry has identified, coordinated and developed systematic plans to fill competence gaps to meet future needs.

22. The mainline railway has ambitions to embrace the 'Digital Railway'. This move to modern, transmission-based train control and information systems requires forward thinking to ensure adequate training for a range of staff who will be affected by the wider deployment of new technologies – from drivers and signallers to rolling stock and signalling equipment maintainers. Achieving successful competence management during this transition will be a challenge. It will require detailed planning and cross-industry co-operation.

Legal context and guidance

23. Competence management is a requirement for a company seeking a Railways and Other Guided Transport Systems Regulations 2006 (ROGS) safety certificate/authorisation. ORR guidance 'Assessment Criteria for mainline railway safety certificate and safety authorisation applications' (December 2014) includes MTU criterion N⁵ calls for a competence management system, and procedures within the Competence Management System (CMS) to identify the posts that carry out safety-related tasks, that people have the necessary knowledge, skills and aptitude appropriate to their task needs, that when allocating staff this is consistent with placing only those with the specific competences in such roles and finally, for monitoring the level of competency in relation to the expected standard.

24. ROGS recognise the particular significance of safety-critical work on the infrastructure and rolling stock which is why such prominence is given to designing an effective CMS. The relevant regulations are 23-26.

25. The Risk Management Maturity Model (RM3) reflects the importance of this element of a SMS by having a significant focus on competence. It enables us to give feedback to duty holders on areas for improvement – or, better still, allows them to measure the effectiveness of CMS for themselves.

26. Further ORR guidance is available in 'Developing and maintaining staff competence'. This sets down the principles of a competence management system that should drive continuous improvement. RSSB has also produced guidance: document RS/100 'Good Practice Guide on Competence Development'. For more general guidance employers can refer to The Health and Safety Executive (HSE) document 'Reducing error and influencing behaviour (HSG48)'.⁶

27. Competence management systems across the rail industry have begun to recognise the benefits of developing staff non-technical skills (NTS). NTS are generic skills which

⁵ See: http://orr.gov.uk/_data/assets/pdf_file/0020/3593/cert_auth_criteria_mainline.pdf

⁶ See: <http://www.hse.gov.uk/pubns/books/hsg48.htm>

underpin and enhance the performance of technical tasks, by helping people anticipate, identify and mitigate errors; examples are the ability to maintain concentration, to anticipate risk, to be assertive, to prioritise competing tasks, and to diagnose and solve problems.

28. Poor non-technical skills often contribute to dangerous and expensive incidents, and experience indicates that developing these skills in rail staff will help the industry further improve safety, effectiveness and wider business efficiency. RSSB has developed a comprehensive package of materials to support these efforts, and ORR believes rail organisations should prioritise the development and refinement of relevant non-technical skills into their wider competence management systems, from recruitment and selection through to on-going professional development.

29. ORR sees evidence that major duty holders and cross-industry organisations, such as the Association of Rail Training Providers, are organising themselves to deliver better training plans. RSSB has a number of guidance publications on training and competence and are actively pursuing a number of research projects, e.g. T948, T869 on NTS training, T1078 on safety critical communications and T1032 on driver monitoring indicators.

Duty holders

Network Rail

30. Our inspections of Network Rail have identified a very mixed picture over the last few years; ranging from the structured licensing Institution of Railway Signal Engineers' (IRSE) scheme for signal maintenance staff to more ad-hoc 'on the job' learning for control room staff. This is reflective of the range of management maturity levels we have identified in Network Rail. Our RM3 findings range from 'ad hoc' to 'excellent' across the spectrum of its safety management system.

31. A recurring theme in the last decade has been the extent to which ORR has found routine, informal non-compliance with Network Rail rules, procedures and standards. Following the derailment at Grayrigg in February 2007, ORR has been pressing Network Rail to fundamentally reform its historical reliance on an extensive written standards regime. Grayrigg was one of a number of incidents revealing the potential for hard-pressed, well-intentioned staff to commit errors or omissions due to confusing instructions and/or a lack of understanding of the significance of their interventions. The importance of non-technical skills (NTS) has been recognised. Network Rail has introduced more NTS training for its staff (and its contractors) to improve the prevailing safety culture and degree of compliance.

32. Network Rail's reform of its standards regime has entailed examining and testing a number of approaches and learning from best practice in other industries. A vital stage in developing the new regime has been the use of bow tie analysis. Through structured workshops of specialists and practitioners this approach identifies:

- the 'threats' that can lead to an unsafe event:
- the barriers to prevent it and
- the mitigations should the event occur.

33. Bow tie analysis is one of a number of means of structured review of risks and controls; its use has enabled Network Rail to examine the risks and precursors it controls

that can lead to an unsafe event being realised and then to scrutinise the adequacy of its means of control to prevent or mitigate the undesirable outcome.

34. A significant finding from bow tie workshops is the extent to which Network Rail depends on means of control with a low level of effectiveness due to reliance on human intervention and judgement. This emphasises the crucial importance of identifying the optimum competency management arrangements to ensure: that staff have the right skills; the provision of unambiguous guidance and, scrutiny of staff effectiveness by suitable supervision and monitoring.

35. This bow tie work has culminated in a new framework called 'Business Critical Rules' (BCR). The main features of this approach are: simpler presentation of rules, standards and procedures with a clear link to the risks being controlled; greater clarity about roles and accountabilities and development of linked role-based competency arrangements. BCR will not bring change overnight, but has the potential in the medium to long term to transform the effectiveness of Network Rail's control of risks.

36. The linked role-based competencies are being developed. The Skills Assessment Scheme (SAS) is Network Rail's replacement for its 'Assessment in the Line' (AiTL) competency assurance scheme. It constitutes Network Rail's first steps in moving towards a risk based approach for competence assurance.

37. CP5 funding constraints have curtailed the scope and extended the timescales for introduction of BCR and role-based competence. ORR is monitoring this potentially transformative initiative to assure that it maintains sufficient impetus to deliver the improvements in staff capability and risk control.

London Underground Ltd (LUL)

38. The evidence from our inspections of London Underground Ltd (LUL) competency management arrangements found that, typically, appropriate competency management arrangements are in place. Changes are currently taking place through the LUL Access Transformation Programme (2016) to modernise and update the competency requirements for staff providing protection for those working on the track. ORR will continue to monitor LUL's implementation of these changes.

39. LUL continues to extend its requirement for track qualified staff to be registered on the 'Sentinel' competency system. This continues to represent a major step forward towards creating a national register of railway industry track qualified staff and will in future serve as a deterrent to the practice of 'double shifting' (working during the day on the mainline railway and at night on London Underground).

Train Operating Companies (TOCs)

40. We continue to inspect competency issues in Train Operating Companies (TOCs), particularly among safety critical staff. All duty holders are subject to a range of inspection, including the areas of train crew, dispatcher and maintenance staff competency - disciplines in which alertness and right decision making are essential for safety. Train Drivers must be licensed and certificated – a formal regime overseen by ORR.

41. Compliance with duties under ROGS is assessed and performance is measured against the RM3 model. Whilst ORR has seen improvements in competence, there is more that needs to be done to face the challenges of the busier network and the digital railway era

42. Human error is a significant contributory factor in most operating incidents now occurring on the network. ORR believes that duty holders could do more to minimise the risk of human error resulting in an operating incident. Operators have begun to embrace the use of Non-Technical Skills in their Competency Management Systems but this is still not fully embedded in all Operators systems.

43. As trains become more technically sophisticated duty holders should make use of systems that allow better monitoring of train crew actions in real time as well as incorporating them into the regular competency management systems used to assess safety critical staff.

44. ORR also supports the introduction of any systems that allow better understanding of the causes of distraction and loss of concentration which are present in the overwhelming number of operating incidents. These often remain unexplained even when the independent Investigation body, Railway accident Investigation Branch (RAIB), investigate. Unless the causation of such events is understood it is unlikely that any remedial actions will be fully effective in preventing a recurrence.

45. The ever busier network has seen significantly increased pressure on staff, especially in the area of safe train dispatch at busy stations; where the right decisions to dispatch trains have to be made in a few seconds. ORR is working with the industry to ensure adequate systems are in place to assist dispatch staff to make the correct decisions. This is just one example of the constant changes on the network and TOCs must respond to these changes by keeping arrangements under regular review and identifying reasonably practicable improvements.

46. Another challenge will be ensuring timely and appropriate changes to competence management systems to take account of the wider move to transmission-based train control systems, such as the European Traffic Management System (ERTMS) on the mainline.

47. There has been a number of rolling stock maintenance failures associated with third party provision. It is important that railway duty-holders have robust means of assuring themselves of the competence of any contractors employed by them.

Charter Operations

48. During 2015/16 there were several well-publicised incidents involving charter train operations. Competence management was at the heart of these shortcomings – and led to significant ORR enforcement on the topic. Our efforts have been focussed on bringing charter train operators' safety management systems, governance and leadership up to the standard of other TOCs on the mainline.

49. We will maintain this scrutiny to ensure that risks are managed suitably and sufficiently. We welcome and encourage the efforts of industry to secure improvement in this area – for example the formation of a Charter Train Group, facilitated by RSSB.

Heritage railways

50. Heritage railways are usually preserved railway lines, some are tourist lines and some are working museums. They cover over 570 miles of track and 450 stations. Heritage railways operate in excess of 1.3 million passenger train miles which consist of 16 million passenger journeys, travelling 126 million passenger miles with continuous growth year on year. The risks are therefore not insignificant – but the nature of operations differs from the mainline and the characteristics of its workforce pose a range of challenges where competence management is concerned.

51. The sector directly employs approximately 20,000 volunteers. The heritage railway operates a mix of aging steam and diesel hauled trains which present different and unique challenges. There are also heritage tramways operating historic tramcars.

52. The heritage sector traditionally relies on the commitment and enthusiasm of often older volunteers who share their knowledge by word-of mouth. Although technical information is available workers still use old-fashioned technology which is not found in today's railway industry; additionally, skills relevant to heritage railways are being lost.

53. The heritage sector has responded positively to a series of ORR inspections that found weaknesses in competence management and other aspects of safety management systems and governance.

54. ORR continues to encourage the Heritage Railway Association (HRA) to take a greater leadership role over the sector, particularly on the maintenance and compliance with HRA's core guidance and standards for the industry. Additionally, ORR has an active input into many of the HRA's committees, for example, the operating and safety committee which produced 13 new and revised guidance notes during 2015. Other committees within the HRA are also developing guidance notes in appropriate specialist subject areas.

55. We will seek opportunities to collaborate further with HRA, for example, promoting the use of our RM3 assessments of safety management systems to identify weaknesses and target improvements. We will work to ensure all heritage operators have strong and effective safety management systems, staff competence and board governance arrangements in place.

Rolling Stock Maintenance

56. Rolling Stock Maintenance inspections have found that in general Train / Freight Operating Companies (T/FOCs) and Plant Maintainers have in place effective competence management systems for their maintenance and engineering staff, based on recognised competence systems.

57. Rolling stock maintenance benefits from a formal, certificated regime for Entities in Charge of Maintenance (ECMs). Under ROGS regulation 18A no vehicle may enter into service unless it has a registered ECM assigned to it.

58. Each ECM has to ensure, through a system of maintenance, that each vehicle for which it is responsible is safe to run on the mainline. This requirement has brought greater consistency to the reliability of maintenance systems and the competency underpinning them.

59. However, the pace of change in the industry brings areas of challenge, including:

- Management of Engineering Change: As trains become more sophisticated, for example the use of on board signalling equipment and computerised diagnostics, this will alter the competence requirements of staff; there also needs to be regular review of any skills which may have become obsolete as equipment changes and are therefore no longer required.
- Management of supply chains: A significant amount of safety related defects are attributed to issues in the supply of poor quality equipment; Where modular replacement of equipment is employed end users rely on either the manufacturer or supplier giving an assurance that the equipment is fit for purpose.
- Management of competence for engineering decision makers. For example where an engineering change procedure embraces maintenance policy or plan changes as well as physical engineering change
- Engineering resource: Having sufficient competent engineering resource to undertake and validate the range of routine and non-routine activities.
- How TOCs validate the competence of their managers and trainers / assessors.

60. Each of these areas is rapidly changing and competencies need to change with them. ORR will actively monitor the industry's response to these challenges.

Technology

61. The railway has a long tradition of finding engineering solutions to overcome human factors vulnerability – from Victorian mechanical interlocking to the latest transmission based in-cab signalling.

62. ORR believes there are still many opportunities where technological innovation could improve control of risks. There have been continued, repeated instances of certain operating irregularities that reveal just how unreliable certain controls and mitigations are:

- Runaway trolleys caused by poor brake maintenance and/or poor staff application of rules governing use on gradients; vehicle collisions within possessions caused by poor understanding of instructions and local geography. Solutions to these issues require cross-industry co-operation to seek remedies that decrease reliance on procedure and increase engineering controls.
- Line blockage errors by signallers and by staff on the ground leading to unsafe train movements around workers; close calls at telephone crossings where lack of basic train position information (particularly in long sections) makes it very difficult for signallers to give accurate advice to crossing users. New signalling schemes should incorporate faster, safer, easier means to protect staff working on or near the line and accurate current information as to train position.

These are just a few examples of the potential for engineering safety into assets. We will press industry to seek continuous improvement. For more information on this approach (which is covered in more details in the chapter titled: Health & Safety by Design).

ORR activity

63. As well as carrying out inspections of various aspects of competence management ORR has been actively encouraging all sectors of the industry to be proactive in ensuring a competent and skilled workforce, and in recent years has influenced:

- a) the creation of an initial skills-demand forecast;
- b) the setting up of NSAR, which now embraces around 340 member organisations including: Transport for London, Crossrail, Network Rail, HS2 and train and freight operators;
- c) industry understanding of what ORR expects through the publication of 'Railway Safety Publication 1' on 'Developing and maintaining staff competence';⁷ and
- d) the promotion, with other stakeholders, such as RSSB, of improved integration of NTS development in the industry.

64. ORR will work to influence the industry to embrace all reasonably practicable improvements to its competence management systems to make them fit for the current demands placed on the network. In particular:

- a) Greater use of models enabling systematic examination of risk and control measures so that duty holders can identify and understand the vulnerability of controls relying on human intervention – leading to processes to improve training, competence and supervision. Network Rail's use of bow tie analysis is one example of this good practice.
- b) Better use of performance measures to identify root-causes of errors and violations so they can be taken into account when assessing risks;
- c) Further promotion and adoption of non-technical skills; these are fundamental to securing improvement whilst so much of railway activity relies on compliant behaviour for risk control;
- d) Securing a just culture to promote open and honest investigation of root causes of human failure.
- e) Recognition that a certain incidence of human error is unavoidable and duty holders must plan for this in risk assessments;
- f) Adoption of good practice from other sectors. Network Rail did this before deciding on its approach to Business Critical Rules and Role-Based Competency; it learned from off-shore, chemical and aviation sectors;
- g) There is much scope to learn from construction industry best practice. When ORR inspects railway construction sites we see repeated, basic non-compliances directly affecting workers' safety and health. The wider construction industry has striven to

⁷ See: http://orr.gov.uk/_data/assets/pdf_file/0016/4264/sf-dev-staff.pdf

become more mature in its competence management. The Construction Industry Training Board (CITB) has sought to build on its card-based competency regime by recognising the importance of a range of factors. These are known as SKATE:

- Skills
- Knowledge
- Attitude/Attributes
- Training
- Experience

65. ORR will encourage duty holders to consider all reasonably practicable technical solutions; especially at the design stage, embracing good CDM practice. This will lessen the reliance on human intervention over time.

66. ORR will work with all duty holders to encourage them to adopt structured continuous improvement of competence management systems making them more robust.

67. ORR will encourage the industry to recognise and respond to the changing picture of risk arising from an ever more crowded network and the move to the Digital Railway.

68. For the Heritage and Charter operations sectors ORR will ensure that the improvements underway in competence management are sustained.

69. For Network Rail ORR will push to achieve the potential of Business Critical Rules and Role-Based Competency.

70. ORR will encourage the industry to co-operate to identify skills shortages and collaborate to grow the capability of the industry as a whole.

71. ORR will achieve this by continued inspection activity, by use of RM3 feedback, by regular liaison meetings with duty holders and by influencing other important players such as DfT and RSSB.

72. Glossary of terms	
Acronym	Definition
AiTL	Assessment in the Line
BCR	Business Critical Rules
CDM	Construction (Design and Management) Regulations 2015
CITB	Construction Industry Training Board
CMS	Competence Management System
CP5	Control Period 5 (2009-14)
DfT	Department for Transport
DU	Delivery Unit
ECM	Entity in Charge of Maintenance
ERTMS	European Rail Traffic Management System (ETCS plus GSM-R)
ETCS	European Train Control System
GSM-R	Global System for Mobile Communications - Railway
HS2	High Speed 2
HRA	Heritage Rail Association
HSE	Health and Safety Executive
HS2	High Speed 2
IRSE	Institution of Railway Signal Engineers
LUL	London Underground Ltd
NSAR	National Skills Academy for Rail
NTS	Non-Technical Skills
ORR	Office of Rail and Road
PIM	Precursor Indicator Model
RBC	Role Based Competence
RM3	Risk Management Maturity Model
RSSB	Rail Safety and Standards Board
ROGs	Railways and Other Guided Transport Systems Regulations 2006
SAS	Skills Assessment Scheme
SKATE	Skills, Knowledge, Attitude/Attributes, Training, Experience
SMS	Safety Management System
SPAD	Signal Passed At Danger
SRM	Safety Risk Model



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