



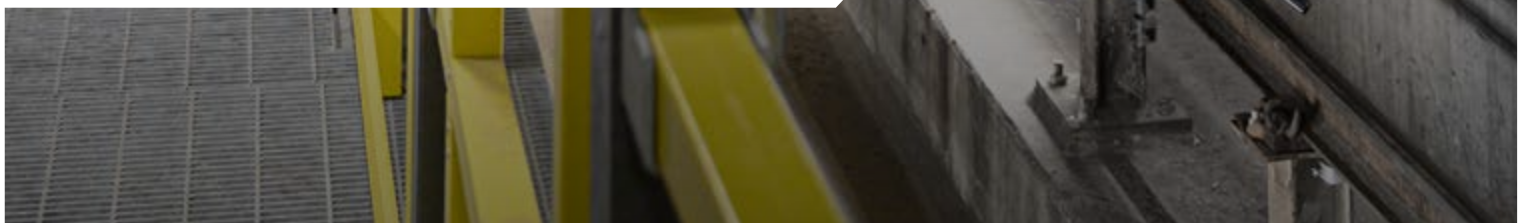
OFFICE OF RAIL AND ROAD



ANNUAL REPORT OF HEALTH AND SAFETY PERFORMANCE ON BRITAIN'S RAILWAYS

2018-19

JULY 2019



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SECTION 1 – CHIEF INSPECTOR’S REVIEW

1. This year was my 10th as HM Chief Inspector of Railways. I am pleased to note that those 10 years have seen a steady improvement in safety on the railway network, and to confirm that our railway remains one of the safest in the world. This bears testimony to the great efforts made across the industry in the past decade.
2. There were some significant achievements in the past 12 months, notably the fewest ever fatalities at level crossings. There has also been good progress in the management of track condition and electrical safety.
3. However, although risk remains at historically low levels, the rate of improvement has slowed. Tragically, two railway workers were killed in 2018-19 and a further two have already been killed in the current reporting year 2019-20. This means that 2015-16 remains the only year we have achieved ORR’s vision of zero industry-caused fatalities. Despite continued overall improvement in workforce safety levels, the ongoing high number of near misses relating to track workers (one of the fatalities was a track worker) demonstrates the need to keep working towards the goal of zero fatalities every year.
4. On the mainline railway harm to passengers rose. Thirteen people died compared to six the previous year. This sharp increase was partly driven by a rise in fatalities at the platform-train interface, which accounted for seven of the 13. Other passenger fatalities in 2018-19 involved one fall on stairs in a station; a passenger fatally injured after leaning out of the window of a moving train; two assaults onboard trains; one cardiac arrest on an escalator; and one victim of another’s suicide.
5. Overall, normalised passenger and public harm (i.e. allowing for the rise in passenger journeys) for train journeys increased from 51.5 Fatalities and Weighted Injuries (FWI) in 2017-18 to 59.6 FWI in 2018-19. The reasons for the rise are still being investigated by the industry but early indications are that there was a rise in the



number of passengers fainting on board trains during the unusually hot summer. Excluding suicides there were also 25 public fatalities, of which 22 were as a result of trespassing. In comparison, there were 42 public fatalities in 2017-18.

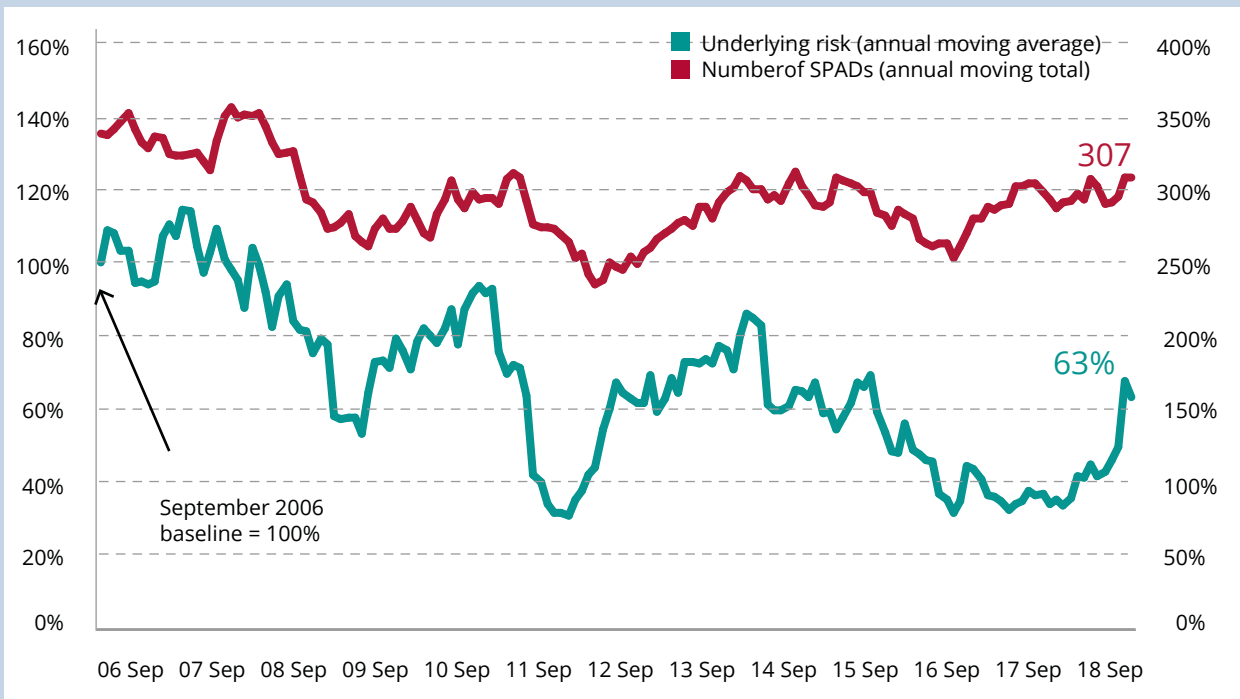
6. In last year’s Annual Health and Safety report, I focused on three main challenges for the industry, which remain equally relevant today:

- **Responding to increased pressure on the system arising from disruption across the network, more trains and ageing assets.** The challenge has come strongly to the fore in the past year and, as a consequence, has driven a lot of our work. The May 2018 timetable failure caused potential overcrowding incidents on platforms and we intervened to secure improvements in how some operators

were managing the consequences. More widely, there has been a worrying rise in the underlying risk from Signals Passed at Danger (SPADs) since autumn 2018, driven by an increase in the number of SPADs given a “potentially severe” ranking, from 10 in 2017-18 to 16 in 2018-19. The numbers are low and it is too early to know whether the rise is significant, but it is clearly an area where we, and the wider industry, must remain vigilant. RSSB has produced work which suggests that because there are more trains on the network and punctuality levels are declining, drivers are seeing more red signals, which in turn increases the opportunity for SPADs. Equally there is no definitive explanation of the underlying cause for a significant percentage of SPADs. So, driver management, focused on SPAD prevention, will be a priority for ORR’s inspections in 2019-20. We continue

to endorse the industry SPAD strategy published by RSSB, and encourage train operators to apply it carefully. We have also been encouraging the responsible introduction of vigilance devices, learning from the tram sector which is starting to use them following the Sandilands tragedy and RAIB’s recommendations. All parties, including the trades unions, have agreed to take part in a cross-industry working group, which will address various concerns before the devices can be tested in a pilot.

The chart below shows that, while the overall number of SPADs (the red line) remained broadly flat the level of underlying risk (the green line) is increasing. This is due to an increase in the number of the most serious SPADs.



Source: RSSB

■ **Managing the effective introduction of new technology while taking human interactions into account.** Passengers will enjoy significant benefits from the new trains being introduced across the network. However, over the past year their safe introduction has occupied a great deal of our time as operational, software and hardware issues have resulted in delays for the new

fleets. We have been required to remind industry that meeting the demands of the technical authorisation process is not sufficient on its own to ensure that trains can be safely introduced into operation. As part of our response to this we have brought the industry together to learn lessons from the delayed introductions of new rolling stock and reiterate our

expectations regarding safety by design. We will continue to do so in the coming year and we will use the opportunity to review how the regulatory framework is operated and to secure earlier engagement in the design process of new trains.

- **Supporting our people who are often the last line of defence in preventing a major failure.** I am personally pleased to see that the sector has recognised the need to do more on mental health, as well as making the commitment to improve management of occupational health. However, despite Network Rail's improvement in overall workforce safety, we want to see significant improvement

on the issue of the unacceptably high numbers of track workers in near collision with trains. The incident at Port Talbot in July 2019 further reinforces our concern throughout 2018-19 that Network Rail's progress has been unsatisfactory. The Planning and Delivering Safe Work (PDSW) programme had clear objectives, which we fully supported, but which have not been delivered. In December 2018, the Chief Inspector of Rail Accidents and I made it clear to NR's Route Managing Directors and Board this was not acceptable and we are likely to take enforcement action to ensure no planned work is done with unassisted lookouts within two years.

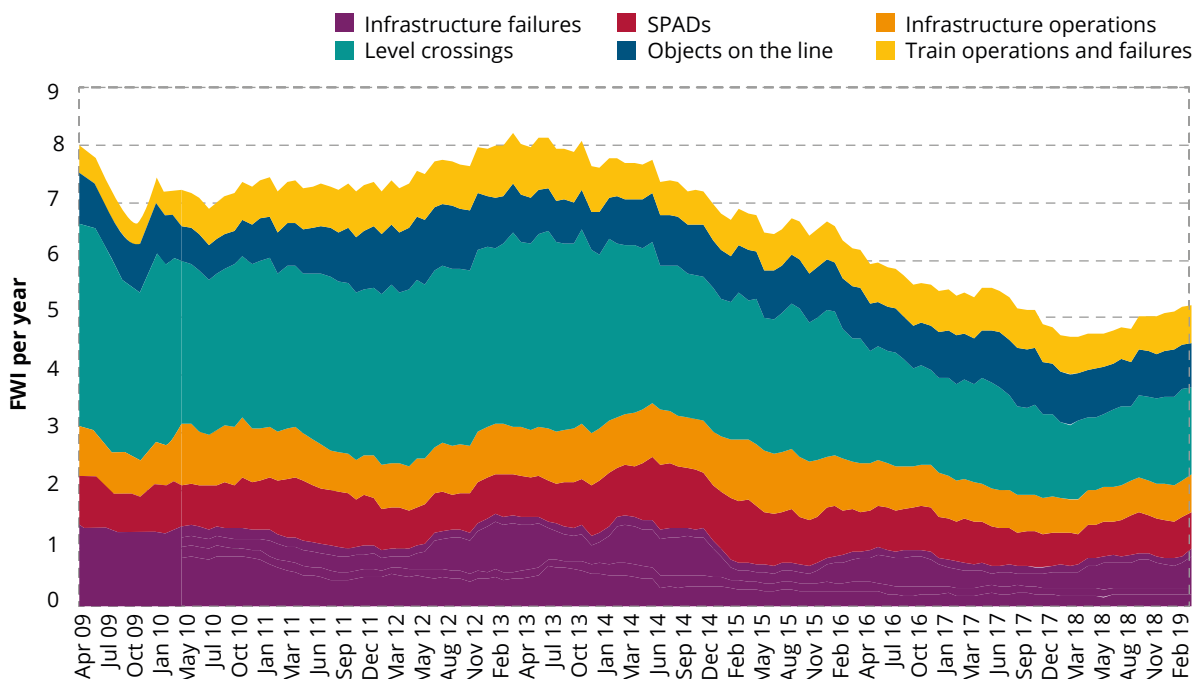
7. Although the industry's Precursor Indicator Model (PIM) of overall risk shows that risk levels today are similar to two years ago (see PIM chart below), in addition to the concern around SPADs (see above) I am also worried about two mainline operating risks which have the potential to cause very serious accidents. They are:

- Objects on the line; and
- Infrastructure operation and signalling errors and irregularities

8. Over the past year I have repeatedly reminded the industry to focus on these areas and we have been working with them to effect changes that should finally bring real improvements in the coming years, emulating the success we enjoyed from focusing on improving risk control around infrastructure failures and level crossings.

9. To help deal with the ongoing problem of objects on the line, Network Rail must manage vegetation better. They

The RSSB Precursor Indicator Model (PIM) for Train Accident Risk to end March 2019



Source: RSSB

showed some progress last year and now the Varley Report has been published - with recommendations on the way forward and with increased funding for CP6 - we expect to see real improvements and will be monitoring closely.

10. To reduce the number of operational incidents/irregularities it is essential to carefully manage the workload of signallers and ensure safety-critical communication protocols are enforced so that misunderstandings are minimised. These issues are linked with some of the track worker near misses. Throughout 2018 we focused on these through our inspections and will continue to do so this year. I have also been pushing the mainline railways to work more effectively together to avoid self-evacuation of trains by passengers, where we are ensuring the lessons from previous incidents are learned along with RAIB recommendations.
11. Risks at the platform-train interface remain the number one cause of harm to passengers on the mainline railway and second on London Underground (LUL). LUL generally manages the risk well, taking account of its constrained infrastructure and high passenger numbers. But on the mainline railway we want to see complete application of RSSB's risk assessment tool for all platforms across the network and proper management and maintenance of yellow lines. We will be carefully monitoring progress in this area this year.
12. Trespass on the railway is a continuing challenge despite public campaigns and significant enforcement action from our inspectors. Levels of harm remained similar this year to the increased levels seen in previous years. This is an area where I think, working with the British Transport Police, duty holders can work more effectively. Further use of technology and selective improvements in station staffing could have a positive impact and we will be pursuing these with duty holders during CP6. In particular, given that 72% of trespass occurs in close proximity to stations, I consider that train operating companies can and must do more.
13. I am heartened that the mainline industry is showing signs of greater commitment to managing workers' health. Good progress is being made where ill health is visible or drives staff absence and costs, such as hand arm vibration syndrome, musculoskeletal disorders and mental health. I would like to see equal focus given to less visible health hazards such as legionella in water systems, and the risk of occupational lung disease from exposures to asbestos, silica dust, diesel and welding fumes, where harm may not be visible for many years. Our inspection activities found weaknesses in some train operators' management of legionella risk at depots and of diesel engine exhaust emissions – in both cases, we took enforcement action. To address these challenges, industry needs to collaborate to build its health management capability, creating better health risk assessment methods with a strong supporting evidence base. Risk modelling and prevention of long latency disease should be as mature as equivalent methods for the prevention of low frequency high consequence rail accidents.
14. As an example of what effective collaboration can achieve, it is pleasing to see the code of practice on fatigue management that National Freight Safety Group has put together. This is a significant achievement.
15. Network Rail's Putting Passengers First change programme will result in significant regional devolution, and this presents a real opportunity to focus safety efforts on the ground. However, the process of introducing the changes must be properly planned, managed and resourced – in particular so that it does not deflect senior management attention from health and safety. We are monitoring Network Rail's change process and will take action if we find that it is not being well managed.
16. In respect of the other key parts of the sector on the London Underground's safety performance remains strong, despite the company going through significant changes as part of the TfL Transformation programme. As with all such change we will monitor the outcomes closely, and we remain concerned by increasing pressure on the system due to delays to Crossrail. Our inspection programme over the next three years has been planned alongside LUL's own assurance activities and is focused on their key risks.
17. In the tram sector, I am pleased we have been able to secure the funding to establish the Light Rail Safety and Standards Board and a programme established to implement, where

reasonably practicable, RAIB's Sandilands recommendations. We will continue to support the sector as it pushes for further funding to support the work of the LRSSB. Progress on the recommendations is covered in more detail later in the report but in actual terms both we and RAIB are pleased with the progress which has been made. However, operators, owners and infrastructure managers still have much more to do to address the issues identified by RAIB's investigation.

18. The heritage sector provides services treasured by many people but continues to cause us concern in terms of achieving a standardised level of safety management consistently. Progress in developing and implementing proportionate safety management systems has slowed in the past couple of years and there have been troubling incidents trackside and issues in the Boardroom which indicate that renewed vigour is required at operator and heritage sector level. In response, we have increased our resources here and in the coming year will be focused on the greater leadership we feel the Heritage Railway Association can play in providing guidance to the sector. We have sponsored research at Birmingham University, whose work we will be using to help direct our longer-term priorities for the sector.
19. Private Open Access Charter Operators also provide a valued service, the sector has generally responded well to the enforcement activity we undertook in 2016 following some serious safety incidents and concerns. However, this year I have spent quite some time with them focusing on the future of old rolling stock and what must be done to ensure they have a future beyond 2023 when their current exemptions from legal requirements for crashworthiness and door locking expire.
20. Here at ORR, we know it is important that we continuously improve. We are proud that our staff are so well regarded within the industry that a number of our inspectors have moved into jobs in the sector. A benefit of that is that they take the ORR approach to safety with them, but it has created vacancies we needed to fill. Fortunately, the professional opportunities we offer and the training we provide has proved attractive and we have recruited a number of high-quality staff. It is especially pleasing that the efforts we have made to boost gender

diversity are bearing fruit with a 50:50 split amongst new recruits.

21. We continue to develop our tools and approach and - with the sector's support - we have recently relaunched our Risk Management Maturity Model (RM3). It has been pleasing to see not only the widespread adoption of RM3 across the sector but the significant contribution sector representatives made to developing the revamped model through our programme board. I would like to thank the industry groups who participated in this as their input has been vital in taking the model forward. Away from RM3, we are looking at ways to use artificial intelligence and data analytics to improve the prioritisation of our work plans. We have also been doing some innovative work on how we communicate risk to the public and how that influences their perception of risk.
22. Finally, I want to touch on what to me will be a key area in the coming years. This is the area of mental health and, alongside that, the industry's efforts to reduce the tragedy of suicide on the railways. The sector's partnership with Samaritans has led to critical interventions, which have saved lives over the past eight years. Samaritans now receives one phone call in the UK every six seconds, so the industry has set up the Million Hours Challenge, with the objective of encouraging staff from across the industry to donate one million hours of volunteering time and raise £2.5 million during CP6.



Ian Prosser, CBE

Director of Railway Safety, ORR
HM Chief Inspector of Railways

PLATFORMS
1 & 2



Trenau i

Bryste Temple Meads
Crewe
Harbwr Portsmouth
Manceinion



Trains to

Bristol Temple Meads
Crewe
Portsmouth Harbour
Manchester



SECTION 2 - HEALTH AND SAFETY ACROSS THE RAILWAY SECTOR: THE REGULATOR'S VIEW

Introduction

23. In this section we provide an overview of our main findings across key risk areas. We go on to set out the evidence supporting our conclusions about risk management effectiveness for each sector, including (where appropriate) the results of our Risk Management Maturity Model (RM3) assessments¹.
24. RM3 is one of our key health and safety assessment tools. It measures an organisation's ability to manage risk maturely and achieve excellence in risk control. It looks at the areas of policy, monitoring, audit and review, planning and implementing, securing cooperation and confidence and organising for control and communication. It uses a five level scale to assess performance and identify areas for improvement:
- **level 1 'ad-hoc'**: processes that are typically undocumented and in a state of dynamic change, tending to be driven in an ad-hoc, uncontrolled and reactive manner by users or events. This provides a chaotic or unstable environment for the processes.
 - **level 2 'managed'**: some processes are repeatable, possibly with consistent results. Process discipline is unlikely to be rigorous but where it exists it may help to ensure that existing processes are maintained during times of stress.
 - **level 3 'standardised'**: there are sets of defined and documented standard processes established and subject to some degree of improvement over time. These standard processes are in place (i.e. they are as-is processes which define the current state of the business process in an organisation) and are used to establish consistency of process performance across the organisation.
 - **level 4 'predictable'**: using process metrics, management can effectively control the as-is process. In particular, management can identify ways to adjust and adapt the process to particular projects without measurable losses of quality or deviations from specifications. Process capability is established from this level.
 - **level 5 'excellence'**: a focus on continual improvement of process performance through both innovative and incremental technological changes/improvements.

RM3 2019

Since publishing the first edition of RM3 in 2011, we have gained considerable experience in using the model to assess the businesses we regulate and holding structured and meaningful discussions to identify strengths and improvements in their health and safety management systems.

We have listened to the feedback from our own inspectors and industry and identified that we needed to update the model, so throughout 2018-19 members of the RM3 governance board have collaborated on a project to revise and update RM3. The project team worked on recalibrating the evidence from earlier editions and expanding the range of evidence in each of the criteria, filling in missing gaps and ensuring

¹ The RM3 assessments used in this year's report were based on the 2017 version of the model, as evidence was collected throughout 2018-19 (prior to the April 2019 publication of the updated model).

evidence builds through maturity levels. We recognise that an organisation’s safety culture is a key enabler to successful health and safety management. We have identified additional evidence of actions, beliefs and behaviours held by staff, at all levels, reflecting the culture of the organization. This culture evidence is now highlighted for every level of maturity in all criteria.

We published the new edition, which we call RM3 2019, at the end of March 2019 and followed this by seven launch events. Stakeholders have welcomed the changes made and, in particular, the new approach to assessing organisational culture. We expect that, in updating the model, users will see that some assessments of maturity determined from previous versions of RM3 will change. This is a positive action by the Governance Board to ensure that RM3 supports greater stretch and improvement. We will need to factor this into our discussions with industry as we apply RM3 2019 from 2019-20. ORR recognises that substantial commitment of the following Governance Board members in the development and promotion of RM3 2019:

- Amey
- Heritage Railway Association (HRA)
- Institution of Occupational Safety and Health (IOSH)
- London and North Eastern Railway (LNER)
- National Freight Safety Group
- Network Rail
- Rail Delivery Group (RDG)
- Rail Safety and Standards Board (RSSB)
- Transport for London (TfL)
- UKTram

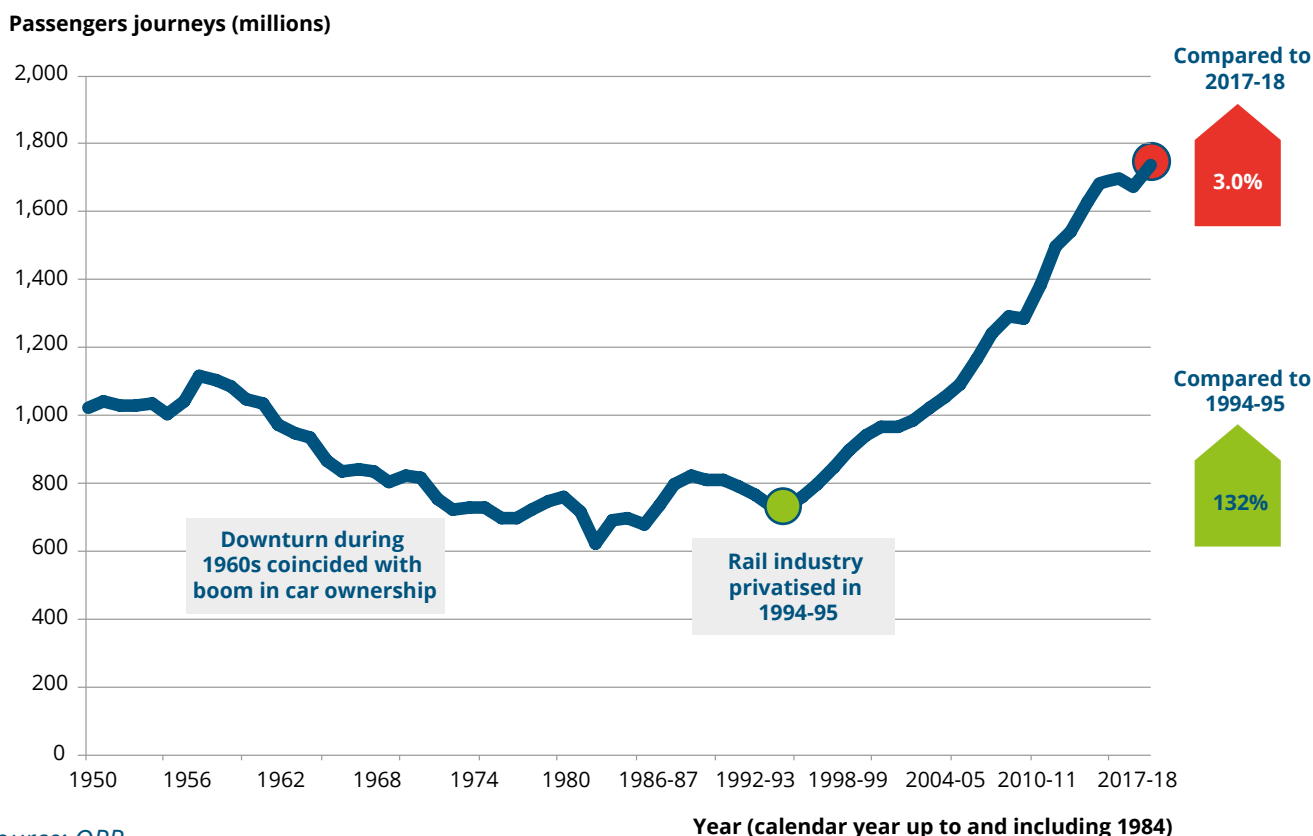
How we assess harm and risk performance

25. The collection of good data from across Britain’s railways is critical in order to;
 - Identify trends and quantify risk,
 - Set the correct risk control priorities;
 - Measure performance.

26. We use industry information about actual harm and modelled risk to measure health and safety performance on Britain’s railways:
 - **Actual harm** caused to individuals, which is measured on the mainline using the fatalities and weighted injury index (FWI).
 - **Modelled risk**, which uses historic mainline data to periodically quantify the frequency and potential average consequence from a particular set of circumstances that could lead to a safety incident. The Safety Risk Model (SRM) periodically takes a snapshot of all significant risks on the mainline and the monthly Precursor Indicator Model (PIM) tracks trends in key catastrophic precursor train accident risk.

27. However, these measures rely on, and are limited by being, outcome-based incident indicators: they measure harm-causing incidents to quantify current catastrophic train accident risk trends, but are not necessarily useful as future predictive or underlying risk indicators. We overcome this through use of our RM3 assessment to ‘triangulate’ our view of industry performance using a broad range of data and intelligence sources, such as:
 - **Performance indicators:** for example, near-miss events, which had the potential to cause harm;
 - **Content indicators**, such as asset management performance; and
 - **Context indicators**, such as measures of safety management culture and duty holders’ risk management values.

28. When analysing passenger harm over time, it is important to consider the annual trends of passenger numbers. There were 1.8 billion passenger journeys on Britain's mainline network in 2018-19, an increase of 3% compared to the previous year. Since privatisation in 1994-95, passenger journeys have generally shown year on year growth and in total have increased by 139%.



Key safety performance data 2018-19

29. This report uses final and some provisional railway data from within ORR and from a range of other sources. Confirmed 2018-19 safety data will be issued in our key safety statistics release in September 2019. It will contain finalised numbers from both mainline and non-mainline sectors.
30. The data in this report may differ from any equivalent figures produced by the industry (e.g. RSSB) due to differences in the way incidents are classified and changes to classifications as more information about the

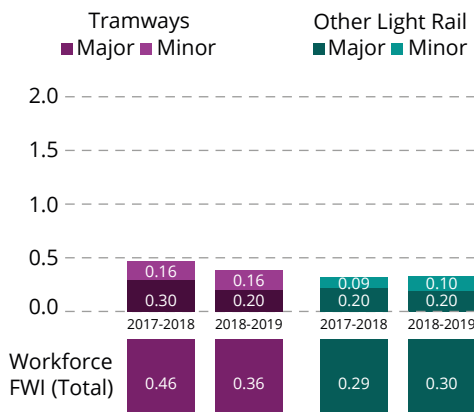
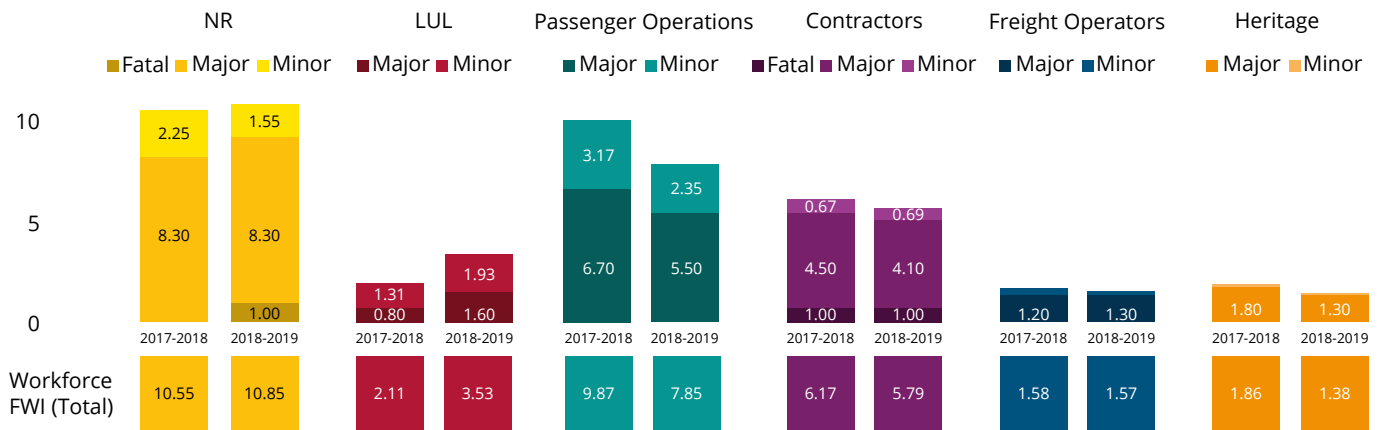
incident comes to light during investigation. For example, in the case of fatalities it may not be immediately possible to determine whether the incident was a deliberate or non-deliberate act and/or whether the individual was intending to travel as a passenger.

²The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)

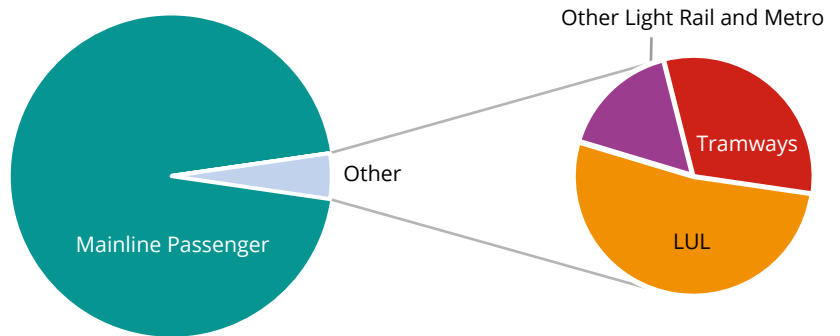
31. Our FWI figures are calculated on the following basis:

- 1 fatal = 1
- 1 major injury to worker = 0.1
- 1 minor injury to worker = 0.01
- Member of public direct to hospital = 0.01

32. This report includes FWI totals and trends for all the separate sectors we regulate. It is important to note that the figures have not been normalised to take account of the respective sizes of operations or the workforce in those sectors. A chart showing the number of track-kilometres operated by each sector (not including heritage railways) is provided to give an illustration of the relative sizes of these sectors.



Infrastructure Size by Route Kilometres



Data and data quality in this report

33. This report is compiled using data obtained from various sources across the industry. The majority of data for mainline operations is held in the Safety Management Intelligence System (SMIS) administered by RSSB. More information about SMIS and data quality³ can be found in the RSSB Safety Performance Reports <https://www.rssb.co.uk/Pages/risk-analysis-and-safety-reporting/Safety-performance-reports.aspx>.

34. For some events it has not been possible for RSSB to differentiate reliably between passengers (people on railway property with intent to travel) and other members of the public. This report combines public injuries occurring on trains or in stations with those to passengers.

³ In 2018 the industry average data quality measure for accuracy was 98.1%. The score for accuracy by mainline operator is: 98.3% for Network Rail, 97.8% for freight operators and 97.4% for passenger train operating companies.



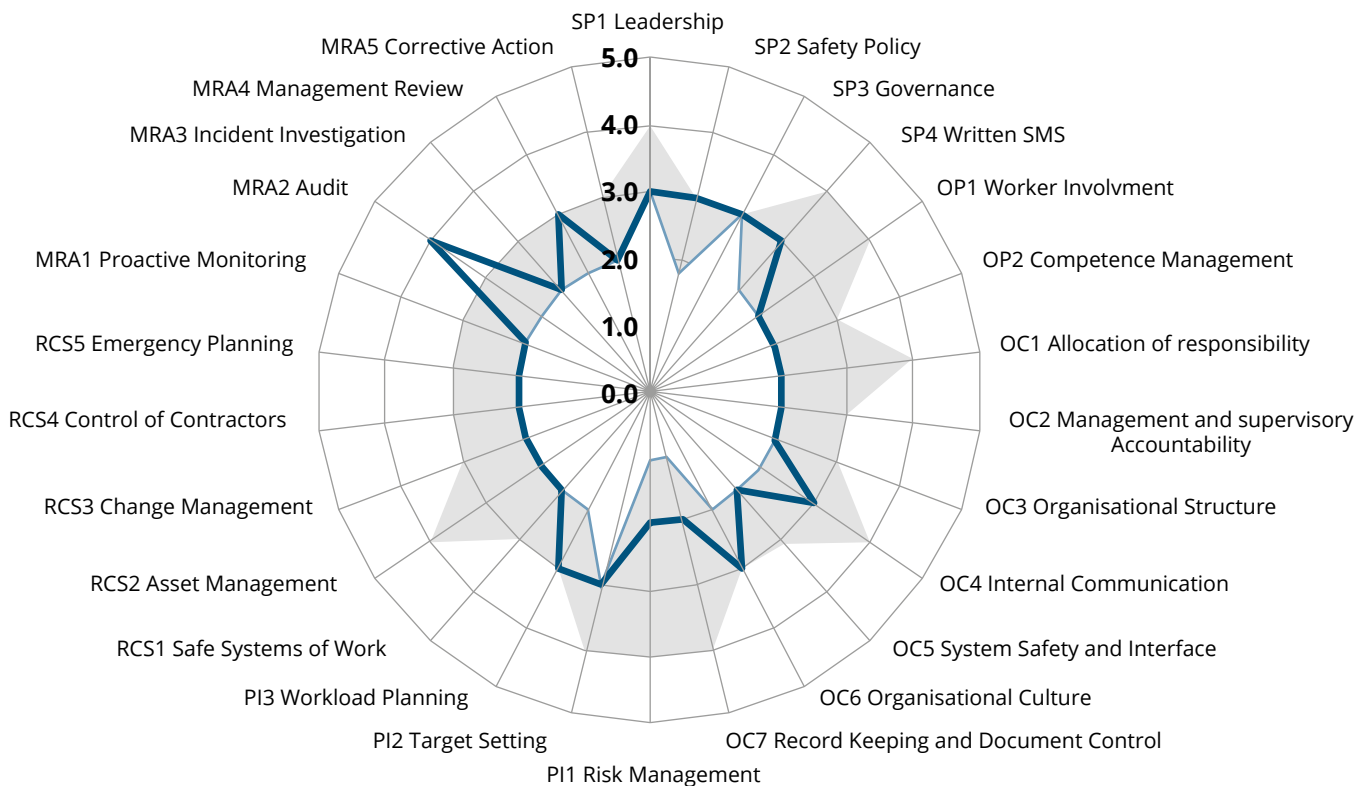
Mainline: Network Rail

Management maturity

Overview: Our assessment of Network Rail's management maturity in 2018-19 suggests that attainment has fallen back from 'standardised' to 'managed' in a significant number of areas. We focussed our work in areas where our intelligence from the whole of Control Period 5 (CP5) suggested that Network Rail could do better. While concentrating on fewer areas but in greater detail gives us stronger evidence for our assessment of them, it does not give the whole picture of Network Rail's achievement in health and safety management. Results should also be seen in the context of 2018-19 being a challenging year of performance pressures and reviews of the business. A positive aspect of our RM3 assessments is that we did not generally find the extreme ranges of ratings across different parts of the business within the various criteria, suggesting Network Rail's controls are being more consistently implemented across its businesses. The challenge now is to raise the quality of that delivery: as our detailed findings on some key disciplines (for example occupational health and drainage) show, progress in some specific key areas is being impaired by variation in uptake and approach across different parts of the business.

35. **Evidence:** Our 2018-19 assessments of Network Rail's management maturity saw a far less significant range of ratings than in previous years. There was still inconsistency but not on the scale of the preceding years of CP5—when we sometimes saw the full range from Ad-Hoc to Excellent in one topic area. This may be due in part to the changes we began to see in the effectiveness at route level of assurance activities - an area where we have been pursuing improved arrangements for several years.
36. Superficially, it appears disappointing that in seven areas of our RM3 model we have arrived at a rating that is reduced from the previous year's. It has to be remembered that we target areas where our intelligence leads us to believe that Network Rail could do better. Further, this year saw many pressures on Network Rail staff that may have affected safety management: they were required to carry out an extra round of business planning submissions for the Periodic Review; there was sustained attention focussed on train performance; and there were significant changes in the senior leadership team and the introduction of a wide-ranging review and re-structuring of the business.
37. Our RM3 findings should also be seen in the context of overall improvements in safety performance during the year. At the end of CP5, the level of train accident risk (as measured by Network Rail's precursor indicator model) was 20% lower (better) than the target set at the start of the control period. Most precursors to catastrophic risk maintained recent excellent trends and those that did not are heavily weather-dependent, such as risk from earthworks failure. Network Rail is achieving delivery of its own programme of risk reduction workstreams to achieve improvements, completing 92% of programme milestones (against a target of 80% for 2018-19).

A composite RM3 assessment of Network Rail risk management maturity in 2018-19



38. **Activities:** Our decisions about what we inspect are informed by intelligence from previous inspections, trends in performance data and what our investigations tell us. In 2018-19 we inspected fewer topic areas but did so in greater detail. Areas covered included track and lineside management, safe stewardship of civil and drainage assets and arrangements for workforce safety. We continued to follow up significant findings from previous inspections of Network Rail assurance activities and progress in delivering electrical safety improvements and better information at user-worked level crossings in long signal sections. Our work looks at both central assurance and standard setting activity and the practical implementation of safety management at route and project level. As well as our inspections and investigations we gather valuable intelligence from regular planned liaison meetings and from monitoring actions in response to RAIB recommendations. All of this activity feeds into our judgements when we assess Network Rail's management maturity.

39. **Conclusions:** As Network Rail decentralises decision making and moves accountability away from the centre – as part of its 'Putting Passengers First' initiative – the regions and routes will need to be even more effective in monitoring, supervising and reviewing risk control activities. It is vital that Network Rail centrally assures itself that its businesses have the capability to take on their new safety responsibilities. It must manage this significant change to its organisational structure so that there is robust scrutiny of preparedness and maturity before each step is taken. We will be devoting significant inspection resource to monitoring how well this change is managed. Our work in 2018-19 shows that we continue to find non-compliance with Network Rail's own processes, standards and procedures that make up its framework for risk control – and that too many preventative and mitigating controls therefore remain vulnerable to variation in human performance. We will be interested to compare our RM3 findings with the routes' own as they embrace it as a tool in CP6.

Workforce safety

Overview: Our RM3 assessments relating to workforce safety were all either 'standardised' or 'managed'. However, the higher assessments generally derived from central activities, such as Leadership and Audit, whereas the lower ratings tended to reflect activities as we found them on the ground. While overall workforce safety performance continues to improve, high risk incidents and near-misses involving the workforce remain too frequent. Network Rail's efforts to secure improved workforce safety in CP5 have been hindered by inefficiencies in its planning system, the slow adoption of technology and the cultural acceptance of arrangements that are far from optimal. Network Rail is still not achieving consistently effective safe systems of work that are less vulnerable to human error so we have focused our inspections on risks to workers whose duties require them to go on or about the line. Network Rail has responded to pressure from ORR, RAIB and its trades unions by developing a plan to address the root causes of near-misses. We have set a clear expectation that this plan must be sufficiently ambitious, targeted and properly implemented. Ensuring that it is will be one of our top priorities in Control Period 6.

40. **Evidence:** In relation to workforce safety, 2018-19 saw an improvement of 12% in the Lost Time Injury Frequency Rate from the previous year. However, the year also saw no improvement in the number of high-risk workforce safety incidents or in the number of near misses with staff and trains. Regrettably, 2018-19 saw two fatalities to workers on Network Rail infrastructure. One occurred at Bearsden station when a contractor fell from a ladder. The other happened at Stoa's Nest Junction, when a contractor placing protection for a possession was struck by a train. A member of staff suffered serious burns in an electrical substation and two other members of staff experienced serious injuries in a rail vehicle collision.
41. The causes ranged from signaller error in line blockages (with no additional protection) to departure from the planned safe system of work. Our inspections highlighted the vulnerability of many procedures to human error. We found that there are many obstacles to planning a safe system of work with the highest degree of protection. Finally, we found that there has been a frustratingly low take up of available technologies which could reduce the potential for human error, by providing supplementary engineering means to protect staff from train movements, or warn them if still required to work on open lines.
42. We investigated a number of incidents related to workforce safety. In January 2019 we issued an Improvement Notice as a result of serious injuries sustained by two members of staff in a rail vehicle collision at Cholmondeston (Cheshire). The enforcement concerned failure to adequately assess and manage the risks from on-track plant movements within a long possession. In December 2018 we prosecuted Network Rail for failure to assess and control the risks to its staff following serious injuries from a road vehicle striking a signaller at East Farleigh Crossing in May 2017.
43. **Activities:** It is positive that Network Rail has carried out its own analysis of the causes of near-misses and is devising a programme to secure improvements. Following the imperfect realisation of the original ambitions of 'Planning and Delivering Safe Work' (PDSW), and our concern that the limited success of PDSW had resulted in timidity about future change, we have been pressing Network Rail to devise a strategy to achieve effective improvements to the safety of its workforce.
44. Following some modest amendments to the company standard for working on or about the line, we decided to inspect across the network to test the adequacy of arrangements for protecting the workforce from the risks and to examine the implementation of the revised standard across the network. We found that even the modest intent of the changes had not been realised consistently well. In particular, we saw that the short-term nature of the planning cycle and poor information available to the

section planner meant there was an inefficient and wasteful duplication of effort: anticipating refusal of the preferred “safe system of work” (SSOW) the planner would often create a default SSOW pack including safety measures lower down the hierarchy of risk control.

45. During CP5 we had granted dedicated funding to Network Rail to develop technologies to enhance protection of staff from trains. This project has been successful in developing several means of additional warning and protection. While we liked the simplicity of the approach on LNE route to optimising access opportunities in ‘Safe and Effective Working’ and noted that other routes are exploring similar approaches, our monitoring found that route take-up and deployment has generally been slow. These improvements will remain modest until the planning system is more transparent and effective.
46. Operational irregularities are a contributory factor to some workforce safety incidents, such as errors in setting up possessions and line blockages. This was identified by Network Rail in its own analysis of near-misses. Because of an adverse trend in these events during 2017-18, in 2018-19 we began regular operations liaison meetings with Network Rail. This is the forum where we monitor progress of a range of improvements to signaller competence management, safety critical communications and other related operational matters. We will continue this work into CP6.
47. **Conclusions:** Network Rail has identified initiatives to deliver improved workforce safety. It has analysed the root causes of near misses and tried to address those. However, the number of high-risk workforce safety incidents and near misses with staff and trains is not improving. The next stage of improvement will only be secured by:
 - More widespread adoption of technology and engineering controls to reduce the potential for human error
 - Selecting the right staff for critical roles
 - Maintaining rigorous competency requirements
 - Enhancing supervision, monitoring and assurance
 - Promoting better safety culture
 - Simplifying procedures and paperwork and making roles, responsibilities and accountabilities absolutely clear
 - Helping planners to see what access is available in the medium to long term so planning can be more effective
48. It is ORR’s ambition that all predictable, cyclic maintenance and inspection tasks should be part of a long-term plan that does not include reliance on warning from unassisted lookouts. We will be working with Network Rail throughout CP6 to realise that vision, and to ensure that greater devolution does not promote too much variation in route and regional responses to how to improve workforce safety and does not dilute the effectiveness of the planned programme to reduce near-misses.

Occupational Health

Overview: Occupational Health is an area that illustrates the tension that can exist between Network Rail's central functions and its devolved routes. Our RM3 assessments reflect this with a larger range of findings than most other topic areas. Centrally we have seen really strong leadership from the Network Rail Chief Medical Officer and his team to recover the situation following extensive problems with previous IT systems and Occupational Health and Wellbeing service providers. Additionally, an ambitious strategy to deliver improved health and wellbeing outcomes in CP6 has been developed. Individual centrally-overseen projects, such as asbestos management, progressed through the year to provide routes with the tools they need to manage health and wellbeing successfully. However, in our work across the network, we have found patchy adoption and implementation of some of these processes – in some cases leading to our taking enforcement action.

49. **Evidence:** Network Rail faces a number of challenges in ensuring the health and wellbeing of its staff. The environment within which some work is carried out is hazardous to health - for example, due to the prevalence of asbestos containing material or the silica particles in ballast dust. Many of the tasks and processes are inherently prone to giving rise to risks from manual handling or hand-arm vibration syndrome (HAVS.) Network Rail staff often work in a highly pressured environment and this can affect mental health. Network Rail has supported referral of staff to health service providers to try to better manage mental ill health. Approximately half of such referrals are described as work-related, with stress being the most significant category (38%).
50. Following persistent problems with systems for recording and arranging a range of health service provision and surveillance, 2018-19 saw a welcome recovery of the position. At the end of 2018-19 there was, for example, 92.5% compliance with the HAVS health surveillance programme. This involved the participation of some 9,500 individuals. Network Rail made great efforts through the year to move responsibility and accountability for its asbestos management programme to the routes. Progress has been made in compiling registers and carrying out surveys –even though this is long overdue. It is not yet clear that every route is taking a consistent approach to the next stages of identification of remediation and mitigation.
51. Four of the six Improvement Notices we served on Network Rail in 2018-19 were health related: on asbestos (two notices), manual handling and hand-arm vibration syndrome (HAVS). This level of ORR enforcement action on occupational health in Network Rail shows that the company needs to improve the consistency of its risk controls.
52. **Activities:** We have regular liaison meetings with Network Rail centrally to monitor progress on a range of Occupational Health topics where we have made previous recommendations to secure improvements. Similar discussions take place on each route to see how far the local situation matches what has been described to us centrally. We undertake some inspection work to corroborate reported compliance. Additionally, we carry out frequent 'opportunistic' inspections of arrangements for managing health and wellbeing; whenever we visit a site our inspectors can check that suitable measures are in place to prevent and mitigate Occupational Health risks. Although there is an ambitious vision to improve management of health and wellbeing, our site visits show there is considerable variability in arrangements.
53. Our review of the second five year occupation health programme (2014-2019)⁴ is nearing completion and a full report of the findings is expected to be published in November 2019.
54. **Conclusions:** Recent years have witnessed an overdue but very welcome commitment from Network Rail to improve its management of the health and wellbeing of its staff and to better comply with the law. There has been strong central focus in Network Rail to create the framework for suitable prevention, controls and mitigations. However, there is inconsistent implementation of these measures within routes and projects and the level of enforcement we take on OH topics shows that good practice is not yet consistently present.

⁴ https://orr.gov.uk/_data/assets/pdf_file/0007/12031/occup-health-prog-2014-19.pdf

As Network Rail implements its 'Putting Passengers First' restructuring and devolves more decision making to routes and regions, we will be scrutinising arrangements to ensure there is still appropriate accountability and oversight to drive the delivery of its ambitious Occupational Health and Wellbeing strategy.

Level crossings

55. Overview: Network Rail has achieved considerable success in reducing risk at level crossings during CP4 and CP5. The challenge will be to maintain good safety management in CP6, when there is no dedicated risk reduction funding and where decision making is devolved to the routes and regions. We saw during PR18 that understanding of legal requirements and 'reasonable practicability' was variable across the network. It was the subject of a number of challenges from ORR, resulting in increased funding being identified for level crossing renewals and improvements during CP6. It is frustrating to us that Network Rail's Level Crossing Strategy had not been signed off by its Board by the end of 2018-19. It provides a framework for future improvements to risk control – particularly in relation to adoption of new technologies at passive crossings that currently rely on users to make decisions unaided about when it is safe to cross. We will scrutinise the deployment of such equipment in the future, to ensure that the intent of the strategy is realised.

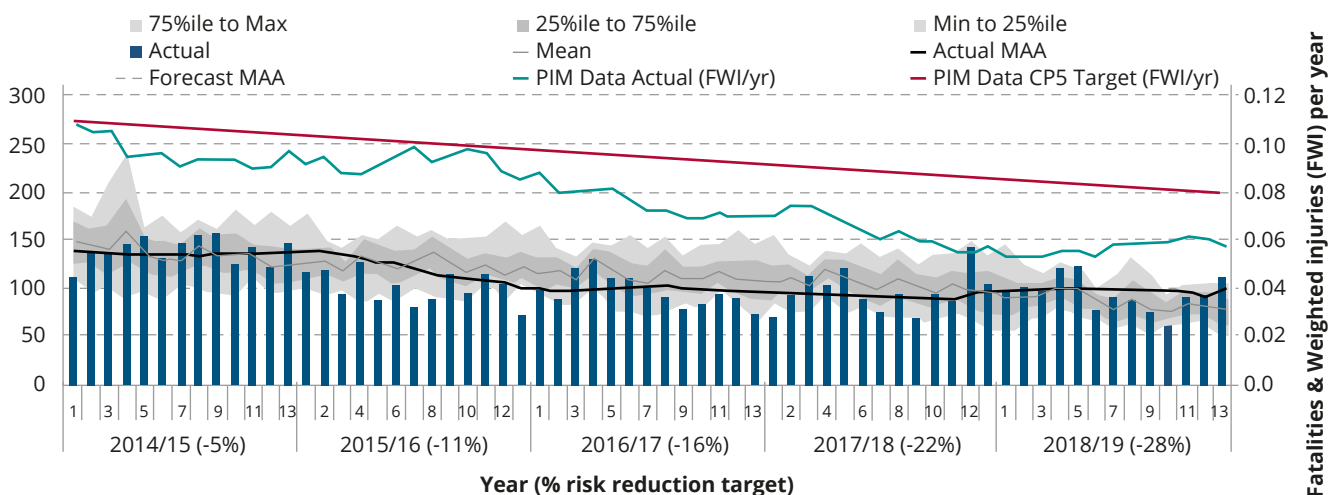
56. Evidence: Level crossing safety is a priority topic for us. It is an area where members of the public interact with the railway and level crossing use gives rise to significant potential for injury and harm. Growth in rail use, road traffic and increased usage of crossings all mean that overall crossing risk could have been expected also to increase. In fact, at the end of 2018-19 the level of risk (as modelled by the All Level Crossing Risk Model, ALCRM) had been reduced by 3.14 FWI over the course of CP5.

57. In 2018-19 there were two pedestrian deaths at crossings, the lowest ever, compared to seven crossing fatalities the previous year. While the numbers of incidents are low, making it difficult to know if this year's improved outcomes will be sustained, it nevertheless represents a positive performance.

58. The chart below shows the general reduction in level crossing risk achieved by Network Rail over the course of CP5 (2014-19).

59. Network Rail set itself a target to reduce level crossing risk by 25% over CP5. In order not to try to measure itself against a constantly moving target we agreed that this would be measured against CP4 exit level. Some of the work begun in CP5 has not yet been completed, so it is hard to be completely accurate about the risk reduction achieved – but Network Rail believe they have achieved their 25% reduction target. Over 370 crossings were closed in CP5. That brings the total to more than 1170 since the start of CP4, as well as nearly 80 downgraded

Network Rail Precursor Indicator Model (PIM) - Level Crossing Chart



Source: Network Rail

- in status (for example formerly public crossings being restricted to user worked crossings).
60. Network Rail is procuring new technology to warn crossing users of the approach of trains at crossings that currently rely on the train driver to sound the horn. This and other overlay warning technologies will be key to improving risk control at large numbers of crossings.
 61. The Strategic Business Plans, submitted by all of Network Rail's Routes during the Periodic Review, revealed that not all routes had a good grasp of what the law requires in terms of 'so far as is reasonably practicable.'
 62. **Activities:** We concentrated on following up our 2017-18 inspections of arrangements at user-worked crossings in long signal sections. This freed up resource to deliver our statutory work of processing level crossing orders and monitoring duty holder response to RAIB recommendations.
 63. We continued to monitor Network Rail's spend on risk reduction throughout the year. As it became obvious that crossing closures were becoming more difficult to secure, we agreed to let Network Rail include other initiatives to be funded. These included progressing closures using the Transport and Works Act in Anglia Region to see if this might be a template for future efforts. Network Rail also spent funds to reduce risk by installing traffic enforcement cameras and investing in technologies, such as automatic warning devices at footpath and user worked crossings.
 64. In the absence of an agreed strategy, we are concerned that decisions, in future, will be at the discretion of routes and regions – given the variable understanding of their responsibilities revealed during the PR18 process. So we will be looking closely at what is delivered by the routes and regions, scrutinising decisions to ensure they are suitably prioritised and risk-based. We will also continue to develop our proposed new approach to level crossing orders, which reflects a structured risk assessment to inform option selection.
 65. **Conclusions:** Level crossing safety has been a success story for Network Rail. It has achieved substantial risk reduction at a time when all external conditions would have led, naturally, to increasing risk. This achievement will only be maintained if all parts of the business recognise their continuing legal duty to introduce improvements where reasonably practicable: With no ring-fenced funds and an altered relationship with the central technical authority, we believe an agreed level crossing strategy is needed to help ensure that every opportunity to introduce improvements is embraced.

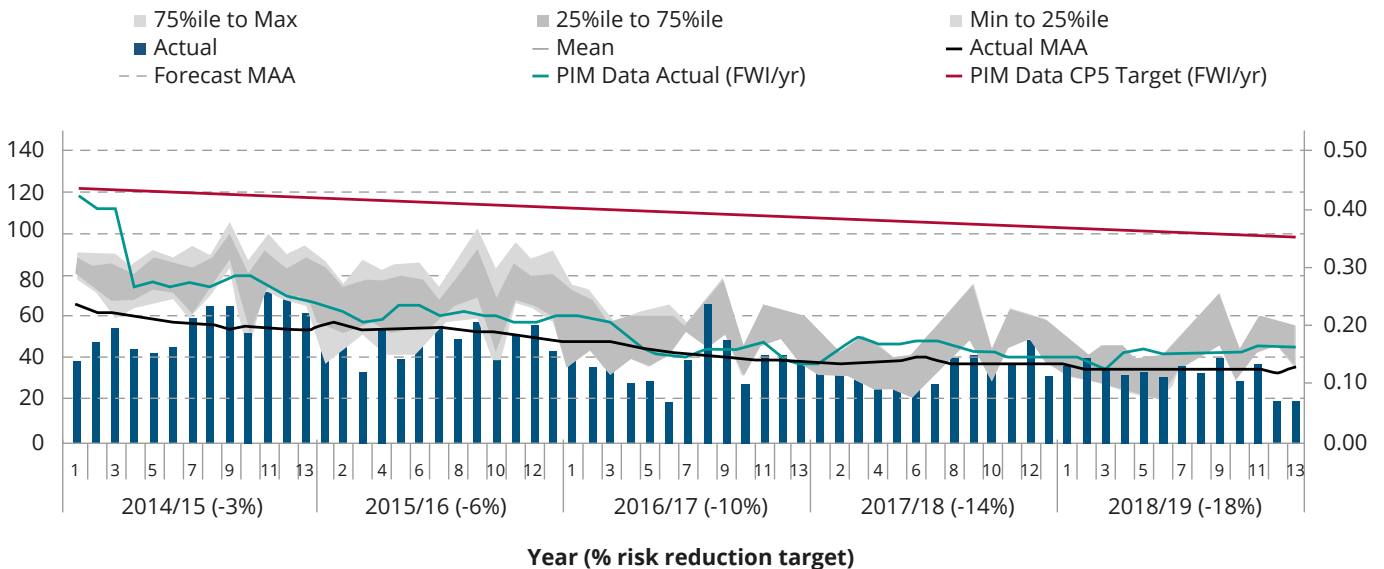


Track and lineside

Overview: Network Rail's management of its track assets has been the subject of focussed ORR effort for many years, following the fatal Grayrigg derailment in 2007 and some adverse track geometry trends and derailments during CP4. The company has responded well to our challenges. This is reflected in its having the most consistently high of our RM3 assessments and in many of the performance indicators associated with track being at historically best ever levels. This trend was maintained in 2018-19. Management of lineside assets is in its infancy as a stand-alone discipline, so, unsurprisingly lineside's assessed maturity levels are not yet as high as for track assets. However, its importance as a discipline is highlighted by the fact that the risks from trains running into fallen trees or animals on the line are higher in the industry precursor indicator model than risks from twist and geometry faults and broken fishplates.

66. **Evidence:** Risk from track assets, as modelled by Network Rail's precursor indicator model, has remained steady throughout 2018-19. For CP5 as a whole there have been significant improvements, e.g. repeat twist faults have improved by 26.4% since CP4 exit. Where there have been slight adverse trends in 2018-19, they mostly relate to track assets being affected by earthwork stability – a heavily weather-dependent precursor. Vegetation management is a key element of autumn preparedness. The number of signalling wrong-side failures due to vegetation obscuring the signal and wheel-rail contamination appeared to be better managed in 2018-19, but that targeted management must be sustained into the future. There was an increase in 2018-19 in the number of events involving passenger trains running into fallen trees – events with potentially serious consequences.

Network Rail Precursor Indicator Model (PIM) - Track Chart



Source: Network Rail

67. Regarding track, many of the substantial improvements of the last decade have been driven by leadership and direction setting from the Professional Head and team. It is not yet clear how that will be sustained in a more devolved matrix. We observed many examples of good practice during our inspections however, we also observed some cautionary instances of non-compliance and variable understanding of relevant standards and instructions. This demonstrates that there is never room for complacency if recent good safety performance is to be maintained at these assets.
68. Lineside, which has only just begun as a discipline, faces a more substantial challenge to ensure that it can set an appropriate framework for the routes and regions to deliver the improvements required in both vegetation and boundary management. In comparison with the track asset it is noticeable that the lineside asset information and performance data is significantly less comprehensive and reliable. This makes understanding the performance of the lineside asset and demonstrating the impact of any improvements difficult. We welcome the Varley Report⁵, published during the year, as a means of promoting better, more professional management of vegetation by Network Rail.
69. **Activities:** For Lineside we inspected continuing efforts to reach compliance with the Network Rail standard for vegetation management and to control risks in the interim; we looked at Network Rail's management of risk from trees falling during extreme weather and we examined how well railway boundaries are managed to prevent animal incursion and child trespass. We found that vegetation management will be improved by enhancing the skills and competency of lineside staff, enabling more sophisticated identification of high-risk trees and better understanding of the requirements of standards. This will bring benefits to day to day stewardship and also enhance extreme weather response. We found that there could be better communication between other parts of the business, particularly those responsible for managing overhead line equipment. This was borne out by a number of incidents we investigated during the year where vegetation had encroached on overhead equipment, leading to lineside fires. We found that boundary faults are responded to promptly, but that some locations have backlogs of work arising and have not always identified appropriate interim mitigation.
70. In Track, we carried out an extensive examination of Network Rail's arrangements for 'special inspections' such as those at longitudinal timbers and cast crossings. We found significant variability and shortfalls in the quality of the special inspections carried out and the recording of findings, but adequate risk control.
71. We followed up on the introduction of Role-Based Competence. We found that Role-Based Competence for Section Managers had stalled before validation; this work continues.
72. We inspected management of flange climb risk at tight radius curves. We found that there were significant tight radius curves not fitted with check rails and have required Network Rail to take further action to mitigate derailment risk and reflect this in guidance to routes.
73. We looked at use of eddy current testing for detecting rolling contact fatigue (RCF). We identified that the ability of NR to reliably deliver Ultrasonic Test Unit runs that are compliant with NRs company standards is under stress, resulting in rails being tested later than planned and short notice re-planning being needed to test lengths of track that were close to going outside of compliance timescales. Network Rail is working to improve this position.
74. **Conclusions:** Network Rail's management of its Track assets has matured significantly since the Grayrigg derailment in 2007. This is reflected in its achievement of performance indicators which are consistently excellent. Our inspection work in 2018-19 showed that despite this high level of performance there are areas for improvement. Management of Lineside assets is not as mature and requires more effort to introduce the necessary competences and processes to bring it into compliance with standards and secure improved control of risks. Both disciplines need to enhance front line assurance activities to provide confidence to a devolved Network Rail that its safety management framework is functioning appropriately.

⁵ Network Rail vegetation management review: valuing nature, a railway for people and wildlife <https://www.gov.uk/government/publications/network-rail-vegetation-management-review-valuing-nature-a-railway-for-people-and-wildlife>



Civils and drainage

Overview: Our RM3 assessments in the Civils and Drainage asset disciplines were a mix of 'standardised' and 'managed'. These asset portfolios present many challenges to Network Rail and our judgements reflect the degree of difficulty. Civils assets typically have very long life-cycles but still require renewal and refurbishment and a lot of this work has been deferred. These assets, particularly earthworks, are susceptible to rapid deterioration in extreme weather. In respect of Drainage, Network Rail inherited assets that had long been neglected, to the extent that in 2018-19 there is still an incomplete drainage asset register.

75. **Evidence:** The risk from events involving structures continued to reduce during 2018-19, as modelled in the on the Network Rail's precursor indicator model. This may be attributed to the targeted effort Network Rail has made to address high-risk sites and reduce the occurrence of the worst consequence failures. Efforts continue, focusing on high risk scour and vehicle incursion sites. The picture for earthworks is more variable. There was a 25% worsening of earthworks failures in 2018-19, mainly due to adverse weather in the first half of the year.
76. Recognising that earthwork failure is not easily preventable, ORR took enforcement in 2010 to ensure that Network Rail focus on mitigating the consequences by identifying its highest risk sites and introducing adverse weather response measures. What is notable is that, although earthworks failures still occur, the incidence of derailment has greatly reduced since then.
77. Drainage assets are not counted as a separate precursor to catastrophic risk. Examination of derailment history over the last decade shows that drainage was a significant root cause in most track, earthwork or structure failures that led to derailment.
78. We found that there is good leadership at the centre to set the framework for optimising prioritisation of interventions at Civils and Drainage assets and in setting a framework for controlling and mitigating risks. For instance, 2018-19 saw further frustrating delays to the Civils Strategic Asset Management Solution (CSAMS). These were largely IT related and outside the immediate control of Network Rail. When we expressed concerns at the continued postponement of the benefits promised by CSAMS, the relevant Professional Heads responded by introducing alternative arrangements to deliver key elements of the system.
79. We found some examples of poor implementation of Network Rail's risk control framework. Improved arrangements must be secured as the company moves to increasingly devolved decision-making, and Network Rail must ensure that it maintains suitable assurance of these arrangements.
80. **Activities:** During 2018 we inspected Drainage asset management. We found that there remains a wide variation in the approach taken across the routes in delivering effective management of drainage assets. Route drainage management systems are at different levels of maturity, producing differing levels of assurance that risks in the parent earthwork and track assets are being managed to as low a level as is reasonably practicable. Each route was at a different stage of maturity and we are following up our concerns with individual routes as appropriate.
81. We looked at the mitigation of consequences of adverse/extreme weather. Inspection work was carried out in two routes – London North Western (LNW) and London North Eastern/ East Midlands (LNE/EM). Action is required on both routes to improve their arrangements in this area, although the Extreme Weather Action Team (EWAT) arrangements in LNE/EM route were notable and the route was felt to provide a template for consistent delivery of the national 'Weather: Managing the Operational Risks' Standard. A series of earthworks failures on LNW provided an opportunity to test the efficacy of the adverse/extreme weather management arrangements in that route. The actions taken by the route were determined to have been considered and proportionate to the risk evident from the weather forecasted.

82. We found that routes were managing the identification and remediation of high-risk scour sites well. We found evidence of some improvement in compliance with the requirements for structures examinations compared to 2017-18, although the issue of gaining access was still problematic at some locations. Some routes have had difficulty delivering agreed action plans for key asset management improvements. For example, LNW and Anglia routes have not completed the Operational Property Structural Assessment Programme (OPSAP); and LNW, LNE and Scotland have significant backlogs in the delivery of their programmes for examination of hidden critical elements in buildings. Four routes have yet to identify all hidden tunnel shafts. These problems delay the implementation of safety critical improvements, as well as creating extra work for the routes, Network Rail's Safety, Technical and Engineering Directorate (STE), and ORR.

83. **Conclusions:** Civils and Drainage assets make a significant contribution to potentially catastrophic risk on the network. Safe management of drainage assets must focus on improving the accuracy and completeness of asset knowledge and using this intelligence to inform prioritised remediation and improvement. Safe management of structures and earthworks is more focused on ensuring the consequences of failure are mitigated. This relies on timely inspection and examination regimes and on appropriate contingency arrangements in the event of adverse and extreme weather. A coherent strategy for remote monitoring will assist both these aspects of risk control.



Electrical safety

84. Overview: 2018-19 was a year of excellent consolidation of Network Rail's drive to improve electrical safety and legal compliance. We assessed the leadership in this area as 'standardised' in the RM3 criteria, recognising the significant effort that has been made to transform arrangements. The Electrical Safety Delivery Programme (ESDP) has grown in maturity throughout CP5 and in 2018/19 demonstrated that it is at the forefront of safety leadership within Network Rail. The programme successfully secured funding of £263 million for CP6, despite many competing claims on funds. The Programme succeeded because it could clearly demonstrate the benefits of adopting the improvements it was proposing. This was partly due to its development of a Decision Support Tool to identify investment options that will deliver the greatest performance benefits, as well as better risk control and increased legal compliances. These have been prioritised for CP6 and constitute the most beneficial improvements to railway electrical safety whilst ensuring best value for money spent. 2018-19 also saw the development of new initiatives with the potential to achieve compliance with the law while providing good value for money.

- 85. Evidence:** Electrical assets present a significant hazard to both workforce and members of the public and there were 7 fatalities as a result of electric shock in 2018/19. Contact with electrical systems usually results in death or life-altering injuries. This was illustrated towards the end of 2018-19 when a member of Network Rail staff sustained third degree burns in an electrical substation at Godinton (Kent).
- 86.** Much of the legacy electrical infrastructure in use today on the railway predates the requirements of the Electricity at Work Regulations 1989 and retrospective improvements can be hard to achieve within the physical constraints of the built network. The same is true of new electrification schemes, which should provide the opportunity to install compliant assets, but this has not always been possible. This is because they are overlaid onto existing track and structures which are not always susceptible to optimal, compliant solutions.
- 87. Activities:** ORR's approach has been to focus on those areas where legal compliance and risk control overlap and to prioritise mitigations that address both. This philosophy is reflected in Network Rail's ESDP, which identifies those investment options that will bring the greatest safety benefits, performance dividends and enhanced legal compliance in combination. In 2018-19, we supplemented our inspection focus on the ESDP with a number of investigations and site inspections.
- 88.** We have scrutinised continuing elements of ESDP throughout the year. These include:
- The roll out of the use of the Negative Short Circuit Devices has continued across the third rail network. The use of these devices has improved the control of electrical risk in this area and has also expedited the taking of possessions. There is a more extensive roll out planned for CP6;
 - Work on isolation demarcation methods have been trialled. The learning from these trials has been fed back before a final roll out of the system. This is linked to 'Safer Approach to Isolations'. This work is progressing slowly in some aspects. This partly reflects the need to engage effectively with a range of staff representatives in order to learn from their insights and persuade them of the benefits of proposed approaches; and
 - There was significant progress in developing and proving the concept of remote securing of isolations and circuit-mains earths to prevent accidental re-energisation on AC networks
- 89.** New electrification schemes overlaid on existing railway has continued to be rolled out. There continues to be extensive discussion between ORR and NR project teams to determine what constitutes reasonably practicable risk control measures whilst demonstrating compliance with the Electricity at Work Regulations. Over 2018-19 Network Rail has engaged in research and trials of some alternative approaches to relying on minimum clearance distances to achieve risk control. Our role has been to challenge and support Network Rail as appropriate. Some of these developments are promising e.g. use of surge arrestors at a bridge in Cardiff.



90. We continue to see a gap between the level of understanding and setting of objectives at the centre of Network Rail on the one hand, and the choices made and delivery of objectives at the Project and Route level. The following examples of ORR's work in 2018-19 emphasise the need for greater consistency:

- Route inspections have been carried out during the course of the year. We found that some areas were not compliant with the application of Network Rail's lifesaving rule 'test before touch'. We conveyed our disappointment to Network Rail at the continued inconsistency in the understanding and implementation of these vital interim controls. As a result of our challenge, heightened assurance work is ongoing within Network Rail to better embed this important rule into working practices;
- As a result of inspections and investigations we have worked through the year to ensure Supplementary Isolation Procedures (SIPs)

have been able to adapt to circumstances whilst retaining sufficient robustness to enhance control of the risk of accidental re-energisation; and

- We encouraged Network Rail to bring greater clarity to its prioritisation of vegetation management around OLE. This arose from our investigation of a number of fires attributable to vegetation encroachment on return conductors.

91. **Conclusions:** Network Rail has shown leadership combined with pragmatism in the development of its ESDP. That effort must continue during CP6 and we will follow progress closely. We intend to ensure that devolved routes and regions adopt the requisite structured approach to improving electrical safety and achieving close compliance with legal requirements.

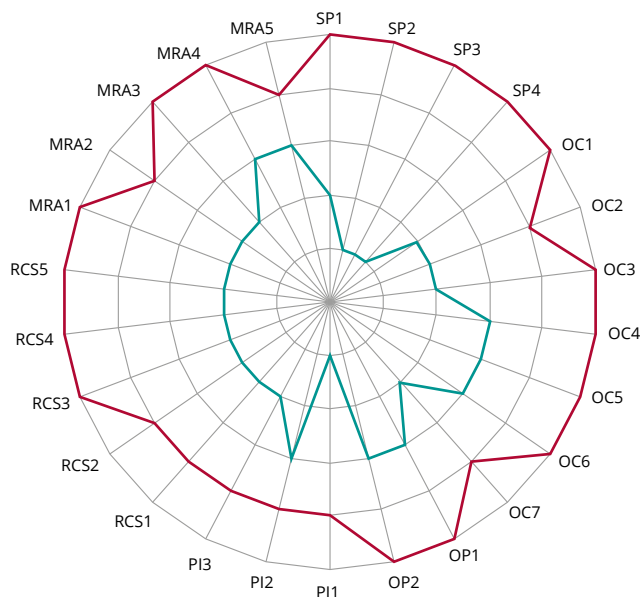
Mainline: Train Operating Companies

Management maturity

Overview: While caution should be exercised in reaching a common conclusion for the sector, based on evaluation of a range of different organisation, we have found a slight improvement in management maturity among train operating companies in general.

92. **Evidence:** The figure below shows a composite of the results we have obtained from our inspections this year, indicating the maximum and minimum maturity levels determined by inspectors for each criterion, across all duty holders.

A sampled and composite RM3 assessment of train operators risk management maturity in 2018-19 with maximum scores (in red) compared to minimum scores (in green)



93. **Activities:** We carried out detailed inspections on a range of topics, including train driver management, management of the introduction of new trains, risk at the passenger/train interface (PTI), and emergency planning. Our RM3 inspections comprise interviews with a cross-section of staff from the most senior to ground-level employees and staff representatives; reviews of procedures, assessments, company audits and other records; and examination of live working practices. Investigations of accidents and incidents, and our other interactions with duty holders provided further information with which to modify the scores, to form an end-of-year view of each company, discussed with them in a review meeting.
94. **Conclusions:** We found that, in general, the train operating companies have a good grip of their control measures for the key risk areas of driver management, rolling stock maintenance and crowding at stations; though we have found weaknesses in relation to change management processes for the introduction of new train fleets and arising from incidents at the PTI. We can say that it is good to note an overall improved picture, and to see minimum evaluations of “standardised” in the critical areas of system safety and interface

arrangements, and competence management. Lower scores in leadership, risk assessment and management, change management and proactive monitoring are more worrying, and train operators to whom this applies should give this aspect of their management systems close attention. We remain impressed with the level of engagement with the RM3 model across the sector, and note that many train operators apply it widely, gathering significant evidence of their own performance as a basis for making improvements.



New trains

Overview: Some new train fleets are reaching too late a stage in their development before safety problems are identified. This means that resolving issues is unduly challenging. The associated risks are (i) delaying introduction to service, or (ii) the need for additional operational control measures that could have been avoided with better application of the principles of safety by design.

95. **Evidence:** Many operators are taking delivery of new trains, with 25 fleets being introduced between 2017 and 2022, and our authorisation processes ensure that these meet basic design safety standards such as for structural integrity and wheelsets. However, we have seen that existing EU Technical Specifications for Interoperability are not keeping pace with technological developments and where a designer's risk assessment processes are not sophisticated enough to identify gaps, trains have been produced which meet the standards but have outstanding safety issues. Examples include:
- Large stepping distances from platform to train;
 - Cables between carriages which make it possible for trespassers to climb on to the roof and the 25,000V overhead wires;
 - Curved windscreens causing reflections which limit the driver's vision; and
 - Software inhibiting application of the service brake.
96. The above issues have often come to light late in the process and close to the date when the trains are expected to come into service, bringing increased pressure on all parties.
97. It is also becoming apparent that there is an industry wide shortage of experience in some areas of new and innovative technology, particularly software. This appears to be present both during the design/testing phase and after entering service.
98. **Activities:** ORR has a role in authorising new vehicles and we aim to engage with designers, manufacturers and operators as early as possible in the process to ensure that hazards are designed out at an early stage. However, our role has no legal basis until an application for authorisation is made at the end of the manufacturing process. Vehicles have been handed to operators with outstanding faults and design deficiencies. Our inspectors and engineers have worked closely together to identify and address many of these issues, and are still engaged with others. We held a workshop in November 2018 for operators, owners and manufacturers to communicate our concerns and discuss solutions. We have encountered a reluctance to accept that more needed to be done. Consequently, we have had to threaten serving enforcement notices to obtain improvements. The industry has initiated a National Task Force to discuss the issues and 11 recommendations have been made.
99. **Conclusions:** We will continue to promote early engagement between designers, manufacturers and operators to share experience of how trains will operate when in passenger service. This engagement will take into account the conditions and restrictions with which operators are familiar but the designer is not. We expect designers, manufacturers and operators to improve their performance significantly in this area if they are to avoid formal enforcement action.
100. Consideration needs to be given to updating existing Technical Specifications for Interoperability (TSIs) and supplementing them with National Technical Rules (NTRs) where required. In line with the expectation of the EU Commission the number of National rules has been reduced over recent years but the UK's exit from the EU may provide an opportunity to implement a new vehicle procurement system.
101. A 'lessons learned' exercise needs to be carried out to review the current standards regime and the future rolling stock program needs to be managed in a strategic way so that it remains within the capacity of supply chain to deliver it effectively.



Drop light windows

Overview: While doors that require passengers to open a window to reach an external door handle are not a feature of newer fleets (and this issue is gradually being resolved as train fleets are renewed), passengers have been killed in recent years leaning out of accessible opening train windows. We are seeking improvements to rolling stock remaining in service with drop light windows to reduce the opportunity for passengers to lean out when it is not safe to do so.

102. Evidence: A passenger was killed in 2016 when leaning out of the window of a Gatwick Express service at Balham. The operator, Govia Thameslink Railway, recently pleaded guilty to charges brought by ORR in connection with the accident. In December 2018, another passenger was killed in similar circumstances on a Great Western Railway train near Bath: we are currently investigating that incident.

103. Activities: We have engaged with the industry to establish the nature and scale of the problem, and to identify the remedies that might be available. While many of the affected vehicles will be replaced by new fleets during 2019, a number will continue to be in service

beyond this year. The industry considered this risk after the Balham accident, and there are sound engineering reasons why obvious remedies, such as fitting bars, are not feasible on many vehicles. However, we have written to all mainline passenger train operators setting a new standard for what we consider to be reasonable measures in controlling this risk. We expect operators of affected trains in service beyond 2019 to apply physical control measures, such as window bars, or locked windows and internal door handles, where this is not grossly disproportionate to the time the fleet is to remain in service. For trains without physical controls up to and beyond the end of 2019, we expect additional staff to be present on services where there is a risk that people might lean out when it is unsafe. We also expect operators to implement better labelling.

104. Conclusions: We expect the industry's response to our intervention to reduce the risk, but this issue will require active management so long as trains with opening windows remain in service.

Signals passed at danger (SPADs)

Overview: There has been a recent rise in the risk from SPADs, causing ORR to scrutinise the industry's management of the causes.

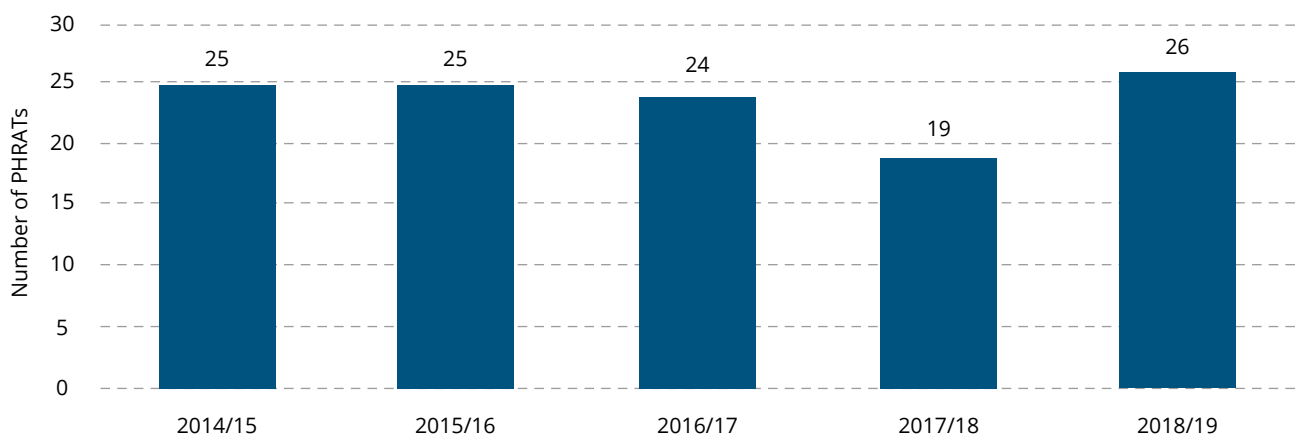
105. **Evidence:** The risk from SPADs has been at historically low levels in recent years, with sustained industry focus on the management of driver competence and fitness following the accidents at Southall and Ladbroke Grove in the late 1990s. However, there was a sharp rise in the estimated risk during the last year, particularly over the winter months, driven by an increase in the number of SPADs attributed a potentially severe ranking, from 10 in 2017-18 to 16 in 2018-19. The numbers are small and it is too early to see if this is a significant trend, but this is clearly not an area where ORR or the industry can be complacent. Equally, the rise might be explained by the greater number of red signals encountered by train drivers due to the network becoming busier, and the prevalence of delays. RSSB have developed the Red Aspect Approaches To Signals (RAATS) tool which uses data from Network Rail to help operators determine how often a signal is approached when red. We hope this will help inform an understanding of the cause of the rise in SPAD risk.
106. **Activities:** Train driver management, with a focus on prevention of SPADs, is a core inspection item for ORR. Earlier this year ORR held a cross-industry workshop to consider the opportunities and challenges associated with technologies designed to monitor the attention and alertness of train drivers, including levels of fatigue. The presentations on the day and associated discussion created a compelling case for the GB rail sector to consider further using such technologies, as related research from the road transport sector and the falling costs of technology mean deployment is likely to be reasonably practicable.
107. RSSB have established a cross industry Driver Attention and Alertness Working Group, including subject matter experts and representation from the trade unions. It is proposed that the group be remitted to develop the scope for a study that will engage with the supply chain, with a view to evaluating the systems available through field trials within controlled environments on the GB mainline railway.
108. **Conclusion:** We have prioritised the management of drivers and SPAD risk in our inspection plans for train operators in 2019-20, and are investigating a number of the serious SPADs. We continue to endorse the industry SPAD strategy published by RSSB, and would encourage operators to apply it carefully.

Workforce health and safety

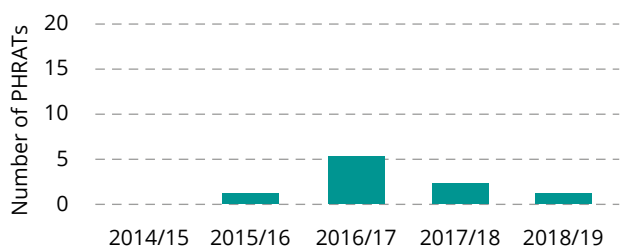
Overview: We have served a series of improvement notices on train operators during 2018-19 relating to their management of a diverse range of occupational health and safety matters – including one issue with a potential public health impact.

109. **Evidence and activities:** Four linked cases of Legionnaires' disease were identified by Public Health England in north Bristol. One of the potential sources was the wash facility at a train maintenance depot. Inspection visits identified deficiencies in the management of legionella risk, and the operator closed the train-wash voluntarily. Because of the severity of the risk, we served a notice formally prohibiting further use until the plant was brought up to the correct standard. ORR is forming a small team to visit other train-wash facilities around the country to check that standards are suitable.
110. During an inspection of a train maintenance depot, we found significant weaknesses in the assessment and control of risk from diesel engine exhaust emissions (DEEE). DEEE is a suspected carcinogen, and we have commensurately high expectations for how exposure of the workforce is controlled. The introduction of a new fleet to the depot meant that exhausts no longer lined up with the extractors. There was limited evidence of the equipment being maintained, and some of the extractors were not working. Staff reported symptoms of exposure. We served an improvement notice requiring the operator to assess the risks thoroughly and to make improvements. Subsequently, the operator has responded positively and taken recent action in order to achieve compliance. We have recently begun interventions at other maintenance depots and a major station in response to concerns raised by staff through their trade union representatives, and we will continue to take this issue seriously.
111. At another depot we found inadequate welfare facilities, including no showers despite dirty work; no separate facilities for male and female staff; no electricity – and therefore no lighting – to a staff rest room and lockers; insufficient tables and chairs in the rest room; and no drying room for wet clothing following outdoor work. We served an improvement notice requiring proper provision in a short timescale, which was achieved. This standard of welfare is thankfully rare.
112. We investigated an accident in November 2018 in which a member of staff at another depot sustained burns to his face and hand when the can of spray paint he was using to mark track defects exploded. He was working next to a live third rail. There was no safe system of work or agreed method for marking track faults to avoid the risk. We served a notice requiring improvements to the way the work was undertaken.
113. **Conclusion:** The end of our Occupational Health programme does not mean that management of occupational health and safety by passenger train operators will not remain an area of sustained focus for ORR and the industry. The range of issues on which we have felt the need to take enforcement action is illustrative of the need for further improved industry leadership and vigour.

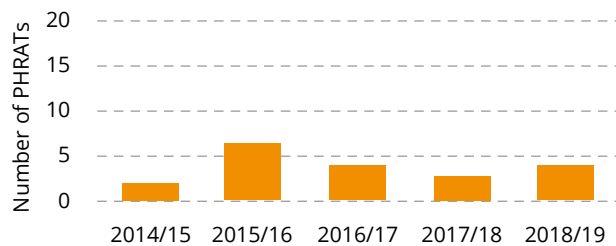
Potentially higher-risk train accidents



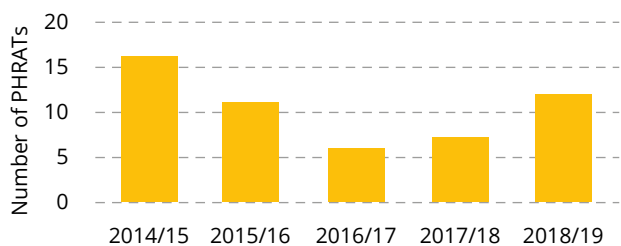
Buffer stop collisions



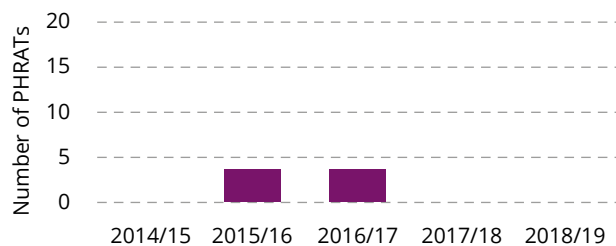
Collisions between trains (excluding roll backs)



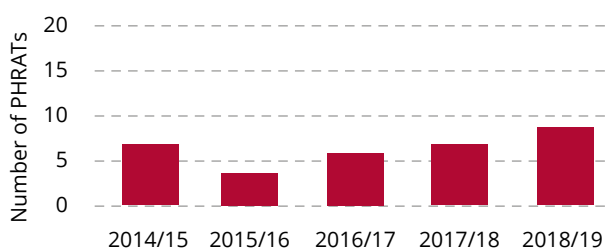
Derailments
(excluding collisions with Road Vehicle on level crossing)



Collisions with Road Vehicle not at level crossings
(without derailment)



Collisions with Road Vehicle not at level crossings



Source: RSSB

114. Potentially higher-risk train accidents (PHRTAs) are those with the most potential to result in serious consequences. The number of incidents last year was higher than in 2017-18, but was of a similar magnitude to the previous three years. While the number of incidents remains small, it is important to consider the individual incidents and to understand and address their causes.

115. In the nine collisions at level crossings, there were no injuries to passengers or train crew. In all cases, the immediate cause was an error by the road vehicle driver, some involving deliberate risk-taking and some inadvertent (five were at half-barrier crossings, confirming that this design of crossing is vulnerable to accidents).

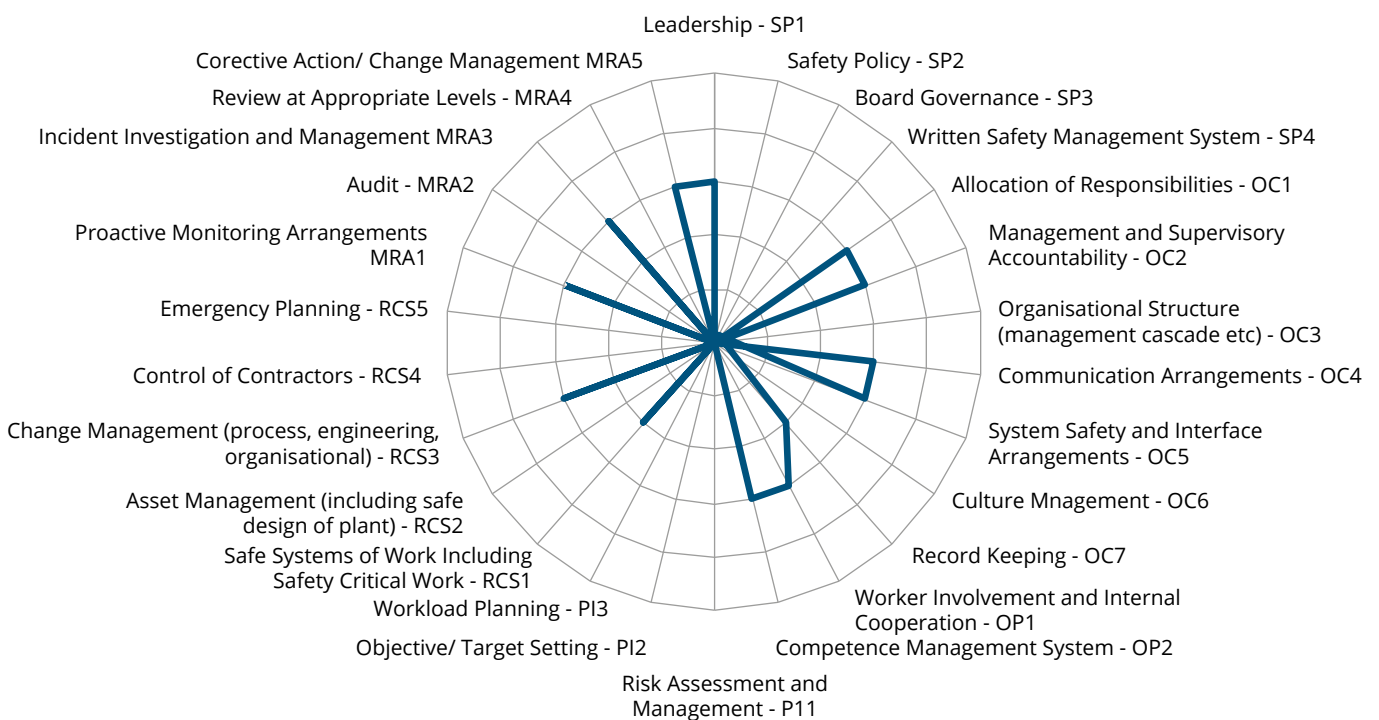
116. Of twelve derailments, eleven were of non-passenger trains, mostly entering or leaving sidings at low speed. These still have potential to cause a more serious accident, for example if the derailed train fouls adjacent lines open to other traffic. ORR initiated the formation in 2014 of a cross-industry group to reduce the number of freight derailments, and this has worked effectively on higher-risk issues with our active encouragement. The risk at the entry to and exit from yards is known, and the industry is working to address this.

Mainline: Freight operating companies

Management maturity

Overview: Freight Operating Companies (FOCs) continue to operate in an increasingly competitive and challenging environment. In 2018-19 there was a 3% increase in the amount of freight moved to 17.4 billion net tonne kilometres. Domestic intermodal and construction traffic are now the two greatest commodities moved by rail.

117. **Evidence:** The RM3 data gained during inspections demonstrates the overall management maturity in the freight sector is operating at either a “managed” or “standardised” level.



118. This assessment is based on ORR's proactive inspection work and assessment of incidents that occurred during 2018-19. It highlights the benefits of RM3 in identifying areas for discussion both internally and with external stakeholders about how to improve health and safety management.
119. **Activities:** Our proactive inspection work during 2018-19 focussed on FOCs' arrangements for the management of train driver competence, change management and workplace health and safety.
120. **Conclusions:** We are encouraged by FOCs' engagement with RM3, including the contribution of the National Freight Safety Group to development of the RM3 2019 model, together with proposals by both individual FOCs and the sector as a whole to use RM3 to drive improvements in health and safety risk control.
- The freight sector, through the National Freight Safety Group, has developed a set of principles for the management of fatigue of staff.
122. We made recommendations to a number of duty holders concerning the need to improve arrangements to document driver route knowledge information.
123. **Conclusions:** We found that duty holders had suitable arrangements in place for the management of train drivers, however, our inspections highlighted the importance of having effective arrangements in place to enable train drivers to develop and maintain route knowledge.

Driver Management

Overview: Management of train drivers remains a core inspection item for ORR. The nature of freight operations means that duty holders need to ensure that staff fatigue and route knowledge is managed effectively.

121. **Evidence and Activities:** We carried out inspections of duty holders' arrangements for the development and ongoing management of train driver competence. Our work identified the following issues of note:
- All duty holders had established systems in place for the management of train driver competence and activities. RM3 assessments identified performance ranging from "managed" to "predictable" in this area.
 - It was promising to note that FOCs are beginning to move beyond the use of historic fatigue monitoring methods (i.e. the "Hidden" limits) in rostering in order to manage the risks associated with fatigue in safety critical staff, although there is still much work to be done in this area. There is also evidence of duty holders using technology to improve their management of train drivers.
124. **Evidence:** In September 2018 a shunter sustained serious injuries after being stuck by a train at a marshalling yard. Following the incident, ORR immediately launched an investigation, deploying inspectors to site. Our investigation into this incident is ongoing.
125. **Activities:** We carried out a series of announced and unannounced inspections at FOC maintenance and operational sites. Our inspections identified both good practice and areas for improvement in occupational health and safety risk control. For example, inspectors found examples of robust risk control for hazardous substances used in rolling stock maintenance as well as examples of poor underfoot conditions and general housekeeping.
126. **Conclusions:** The evidence gathered here reflects the importance of duty holders implementing effective arrangements for the ongoing monitoring of risk control measures.

Workplace Health and Safety

Overview: We have carried out inspections of operational premises to assess individual duty holders' arrangements for the management of occupational health and safety risks. This is an area where we expect duty holders to have robust arrangements in place to control the risks to the workforce, contractors and railway users.



Trespass at Freight Depots/Sidings

Overview: Incidents of trespass can have tragic consequences. The law requires duty holders to take reasonably practicable measures to reduce prevent trespass. Where duty holders fail to meet this standard, we will take enforcement action.

127. **Evidence:** In March 2019 a freight operator in the North of England was sentenced following an incident in 2014 where a child suffered life-changing injuries after receiving an electric shock from 25,000-volt overhead line equipment, having entered a railway depot through an unfenced boundary. The duty holder was found guilty and fined £2.7 million. A number of other incidents remain under investigation.
128. **Activities:** We have continued to examine duty holder's arrangements to prevent unauthorised access during site visits and have engaged with both FOCs and Freight Customers on this issue.
129. **Conclusions:** These incidents highlight both the serious consequences that can result from individuals gaining unauthorised access to railway sites and the requirement on all railway duty holders to take reasonably practicable steps to prevent unauthorised access to infrastructure under their control.

Cross-sector collaboration

Overview: Freight sector working groups are becoming increasingly effective and are contributing to the delivery of sector-wide improvement in health and safety risk control.

130. **Evidence:** The Integrated Plan for Freight Safety, which is endorsed at the most senior level across the freight sector, has now been in existence for over two years. The National Freight Safety Group, which is responsible for the delivery of the plan, should be regarded as a leading example of how competing duty holders can collaborate successfully on safety matters.
131. The cross industry group on freight derailment has moved its focus from analysis and research to the implementation of practical control measures designed to reduce the risks associated with freight train derailment. This has already resulted in the implementation of a number of controls by duty holders, including the adoption of revised container loading guidance for heavy loads by FOCs and the regular distribution by Network Rail of wheel impact load detector data.
132. The derailment of an intermodal freight service on leaving a freight terminal in the Birmingham area in September 2018 resulted in considerable damage to both the terminal and adjacent Network Rail infrastructure, leading to

the Birmingham to Leicester railway line being closed to traffic for several days. The incident highlighted the importance of ensuring that infrastructure at boundaries between different infrastructure managers is maintained to an appropriate standard.

133. **Activities:** We have continued to engage with industry working groups, Network Rail's Freight and National Passenger Operator route and we are developing our links with Freight End Users.
134. **Conclusions:** The work of the sector groups has already led to improvements in risk control, demonstrating the benefits of collaboration on safety matters amongst competing organisations. The support for this work from the highest level is essential to its success and it is important that this collaborative work continue, in order to bring about further improvements in safety management.

Heritage railways

Overview: The non-mainline heritage sector continues to make an important contribution to Britain's railways and relies on the enthusiasm of dedicated volunteers to continue operating safely. However, health and safety performance has slowed, and the trend, distribution and type of incidents indicates that renewed vigour is required. Evidence from our inspection and investigation activity indicates that many operator's safety management systems require work to bring them up to an appropriate standard that is capable of demonstrably controlling risk in a systematic way. Strong safety management systems will ensure that as the sector grows, the public can continue to enjoy the "1950's experience" with 21st century levels of safety.

135. The Heritage Railway Association continues to play an important role in the sector, and we are encouraging them to take a greater leadership role, particularly in developing, maintaining, and achieving compliance in its core guidance and standards for the industry; and ensuring cross operator cooperation and sharing of information. High quality board governance and leadership within individual operator's operations is also fundamental in ensuring a positive safety culture and continued sustainability into the 21st century; this combined with the requisite level of competence are areas that requires specific sector attention.
136. Looking forward, we have increased our supervisory capability of the heritage sector and have sponsored research focusing on the role of leadership and governance. We are promoting and using RM3 as part of our intervention programme as a tool to help operators identify weaknesses and target actions to drive forwards improvements in their safety management systems.
137. **Evidence:** The non-mainline heritage sector (the 'heritage sector') has around 220 railways travelling over 562 miles of track of different gauges, operating at a maximum speed of 25mph over lengths varying from 0.25 to 38 miles. Many operate at significantly lower speeds consistent with infrastructure and rolling stock capability. One railway holds a non-mainline safety certificate to allow limited operations on the national railway whilst others have similar plans. The sector is growing and we continue to see new heritage operations beginning to emerge with ambitions to commence operating trains in the future.
138. **Workforce safety:** There were no workforce fatalities in the heritage sector in 2018-19, and combined with fall in the number of reported major injuries, drove an overall improvement in the FWI, down to 1.38. The main cause of major injuries was slips, trips and falls.
139. **Passenger & public safety:** As was the case last year, there were no passenger fatalities in connection with heritage operations. The number of RIDDOR reported passenger / public injuries across the sector remains low and small changes in numbers can lead to dramatic shifts in performance. Although the total number of reported injuries fell in 2018/19, the passenger / public FWI doubled to 0.42 as a result of three major injuries: two related to people falling on a platform, and one incident alighting a train.



140. Dangerous occurrences: The total number of reported RIDDOR dangerous occurrences across the heritage sector rose by 30% during 2018/19. The rise is primarily due to a spike in the number of incidents in quarter 1 of 2018/19 when over half of the total 57 events were reported. Slow speed derailments and standard gauge SPADs account for around half of all reported incidents; and whilst SPAD numbers remain unchanged on 2017/18, derailments doubled, the majority on narrow gauge railways. The number of level crossing related incidents involving trains has also increased on previous years.

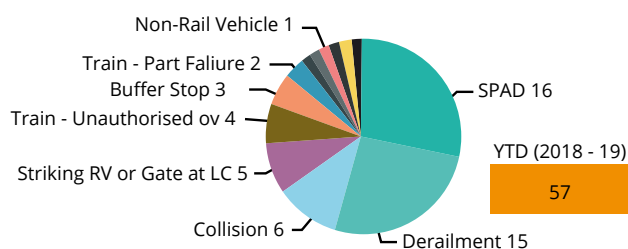
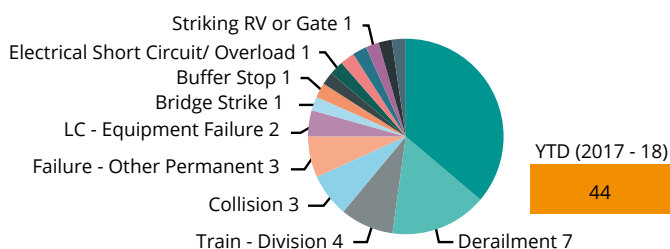
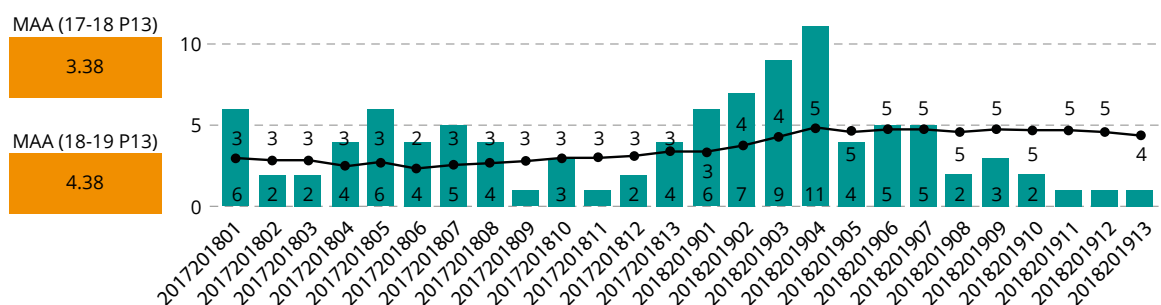
141. Safety Management Systems: While we recognise that heritage railways vary in both organisational size and scale of operation, and generally rely on volunteers to run the railways, we require all operators to have safety management systems that are proportionate to the risk they are managing. Heritage operators show enthusiasm to learn and manage their operations safely and to respond appropriately to ORR inspector advice. Although risk is generally controlled on a day-to-day level, safety management systems remain immature in many operators. We began introducing RM3 into our inspections during the year and, although based on a limited sample, early indications from our own assessment is that the operators visited are operating at an 'ad-hoc' or 'managed' level, with some indications of a higher 'standardised' level in a few areas. We will build on this evidence in 2019-20 with

the introduction of RM3 2019 and believe it is a useful tool that can help operators improve their management maturity and reliability of implementation of their risk control measures.

142. Leadership & governance: A repeating theme from our inspections during the year has been the impact that leadership and governance within individual operators can have on safety performance – both positive and negative. Widely reported at the time within railway press was the impact these factors were having on the management of safety at one larger heritage railway operation. Our intervention found corporate governance and widespread safety management failings leading to poor risk control. The railway's response, including the installation of robust new management arrangements, a period of voluntary non-operation to create space for organisational and engineering change, and reduced axle loadings allowed the railway to re-open for the 2019 season.

143. Rolling stock condition: In May 2018 we prosecuted South Devon Railway under section 3 of the Health and Safety at work etc. Act 1974 in connection with a missing floor in a toilet cubicle on a mark 1 carriage that put a three year-old child at risk. Our investigation found that the carriage was in a severely corroded state affecting its structural integrity. This incident had significant ramifications across the industry: a number of operators withdrew mark 1 rolling stock from service

Number of Dangerous Occurrences to end March 2019



Source: ORR

following examination, with others beginning a programme of heavy maintenance and refurbishment. In response to our challenge over the apparent lack of clear risk control arrangements to manage corrosion in historic rolling stock, the HRA ran a carriage seminar that identified the need for clear guidance to supplement current maintenance manuals, and put in place arrangements to deliver.

144. Activities: We increased our supervisory capability during the year to allow us to shift focus from reactive inspection and investigation towards more proactive monitoring of the non-mainline heritage sector. This included appointing a new HM Principal Inspector of Railways to lead a small team of inspectors testing the effectiveness of operator's safety management systems. Using our risk assessment risk ranking process, we identified our key risk priority areas that will form the foundation of our future inspection activity.

145. Inspections: We carried out proactive inspection visits with 10 railway operations; and made contact with many more as a result of a variety of incidents that required follow-up activity. We renewed North York Moors Railway's safety certificate to allow them to continue limited operations on the national railway; and reviewed several new level crossing proposals in accordance with policy. Our proactive inspections focused on:

- Leadership & governance
- Inspection and maintenance of infrastructure; and traction and rolling stock
- Competence management systems generally, with particular focus on operating staff
- Workshop safety
- Level crossings



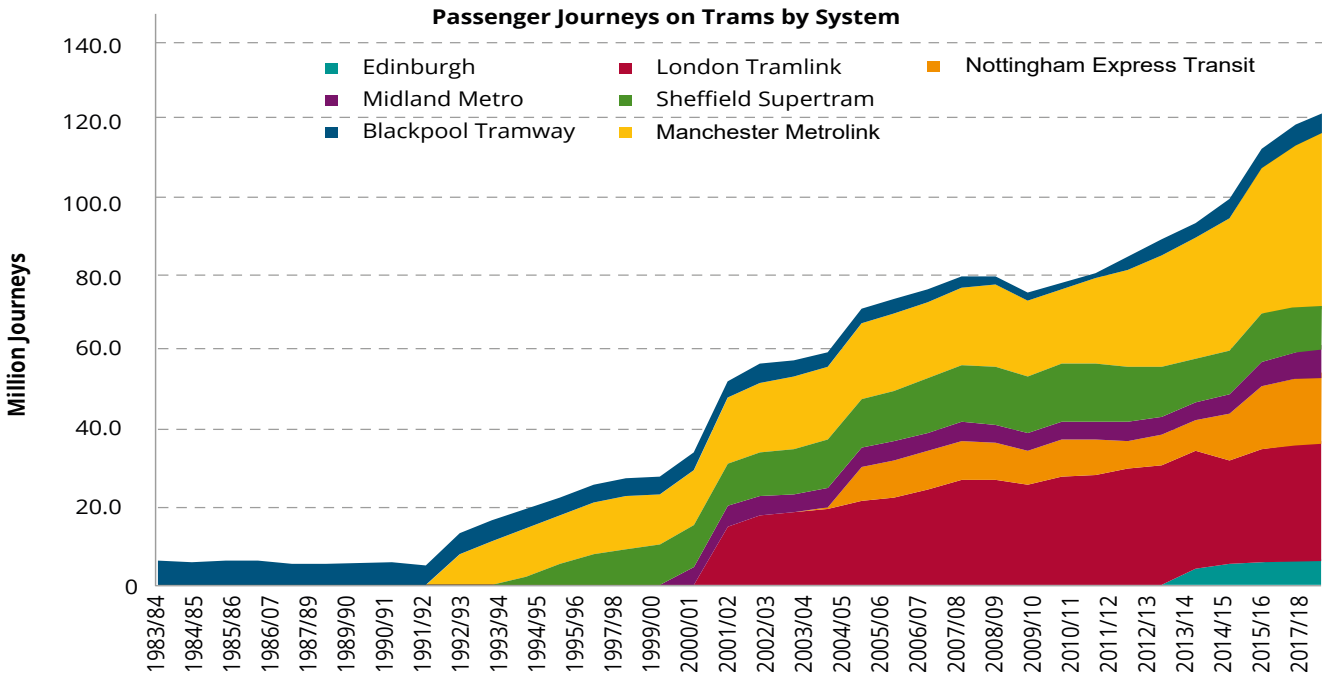
146. Incidents during the year fell into six key themes: rolling stock runaways; collisions; steam engine maintenance; operating irregularities; slow speed derailments, and poor train control. Each instance provided an opportunity to test the effectiveness of the safety management system, with particular focus on governance and leadership, competence, records and rolling stock maintenance.
147. **RM3:** As part of our approach to supporting the heritage sector to strengthen their management systems, we are promoting RM3 2019 as a tool to help both operators and ORR assess their capability, and identify areas for development. With HRA's support, we will hold a number of seminars in the autumn, initially focusing on a small number of RM3 criteria, identified with HRA.
148. Recognising the important role that volunteers play at all levels in securing safety within heritage railways, ORR is taking specific action to help the sector maintain and improve its management of risk:
149. We attended a variety of local railway and HRA events and committees to support training and briefing sessions, develop competence, and highlight key areas of concern. We also continue to encourage and support HRA in its leadership role, engaging with the Operating and Safety Committee and providing input into its core operating principles and guidance development activities.
150. Sponsoring research at Birmingham University; focusing on the role of governance and leadership in the sustainability of the heritage sector. We expect the findings to inform our longer term priorities for the sector, and provide practical guidance to assist building capability in this area. We believe there is potential for this work to complement RM3 2019.
151. **Asbestos:** To allow second hand railway vehicles (including heritage vehicles) containing asbestos to continue to be sold, leased, and loaned, we re-authorised a general exemption to REACH⁶ enforcement regulations in December 2018, retaining the same detailed conditions that those operating under the exemption must meet.
152. **Looking forwards:** A number of challenges on the mainline sector are equally relevant to the heritage sector. This includes ensuring that the risks associated with vehicle condition are demonstrably identified and managed (including vehicle repair or withdrawal); and that operators have in place robust arrangements so that passengers do not, so far as reasonably practicable, expose themselves to risk at doors and windows that can be opened when a train is moving. As the mainline responds to these challenges, there is the potential for solutions to become available that the heritage sector can exploit.
153. **Conclusions:** The heritage sector is a diverse collection of different types of railway with very different scales of operation. It remains a growing sector but significant challenges remain if it wants to remain sustainable into the 21st century, relating to the age of rolling stock and assets, and reliance on an enthusiastic, but largely voluntary workforce performing safety critical tasks professionally.
154. Safety performance in the sector has slowed, and the distribution and type of incidents indicates that renewed vigour is required to ensure that appropriate and proportionate risk control measures are in place as part of a strong and effective safety management system. High quality leadership and governance arrangements are fundamental to the future sustainability and safety of the sector; and is an area that the sector requires to strengthen. We believe the HRA is well placed to increase its capability in this area and provide greater leadership and guidance in the future.

⁶ Registration, Evaluation, Authorisation & restriction of Chemicals Enforcement Regulations 2008

Tramways

Overview: Great Britain’s tram sector continues to grow, with increasing numbers of passengers using its existing services and Britain’s first new tram-train system coming into operation during October. Health and safety performance across the tramway sector remained consistent during 2018-19, with improving trends in the numbers of dangerous occurrences, injuries, and reported fatalities. While there were no worker or passenger fatalities during the year, there was one member of the public fatally struck by a tram at a footpath crossing.

- 155. The sector has made strong progress in addressing the requirements of RAIB’s 15 Sandilands recommendations, most notably in creating the new Light Rail Safety and Standards Board (LRSSB) and pushing forwards the development of the new risk model to help improve its understanding of risk. However operators, owners, and infrastructure managers have much work still to do to demonstrably address the issues raised by RAIB’s Sandilands Investigation Report, and we believe the sector can make substantial progress during 2019-20.
- 156. As part of addressing the two recommendations addressed to ORR, we published our strategy for regulation of health and safety risks for tramways and have increased our supervisory capability.
- 157. We continue to work alongside BTP investigating the circumstances of the Sandilands tram crash to determine if there were any breaches in health and safety legislation.
- 158. **Evidence:** There are seven tram systems in Great Britain: Blackpool Tramway; Edinburgh Trams; Manchester Metrolink; London Tramlink; Nottingham Express Transit; Sheffield Supertram and West Midland Metro. Outside London there are also two light rail systems: the Tyne and Wear Metro system and the Glasgow Underground.
- 159. **Performance:** Confidence in the tram sector remains high, reflected in several owning authorities developing plans to expand their network. For example West Midland Metro’s city centre extension which will introduce battery operated trams running catenary free through the centre of Birmingham, and Edinburgh’s recently announced plans to extend its current line by 2.8 miles. Passenger numbers increased by over 2% to 122 million across GB’s tram operators in 2018-19 and passenger satisfaction and performance remains high. However, planned expansion and change, new trams and services, and increasing passenger demand potentially increases the stress placed on the operating environment, infrastructure and people; and together increase the pressure on the system.



Source: ORR and DfT

160. Workforce safety: Once again the tram sector reported no workforce fatalities in connection with their operation during 2018-19 and the number of reported workforce major injuries remains relatively consistent at 2 per year. The RIDDOR reported workforce injury trends and FWI continue to fall, down to 0.36, from a high of 0.50 in 2016-17.

161. Passenger & public safety: As with the previous year, there were no passenger fatalities in 2018/19 and the number of both reported major and minor injuries fell on previous years. Based upon RIDDOR reports, the passenger and public FWI for 2018/19 continued to fall, down to 1.3 which is the lowest level on record. A member of the public was fatally struck by a tram on a footpath crossing in a segregated section of the Edinburgh tramway system, and four other fatalities were identified as deliberate acts.

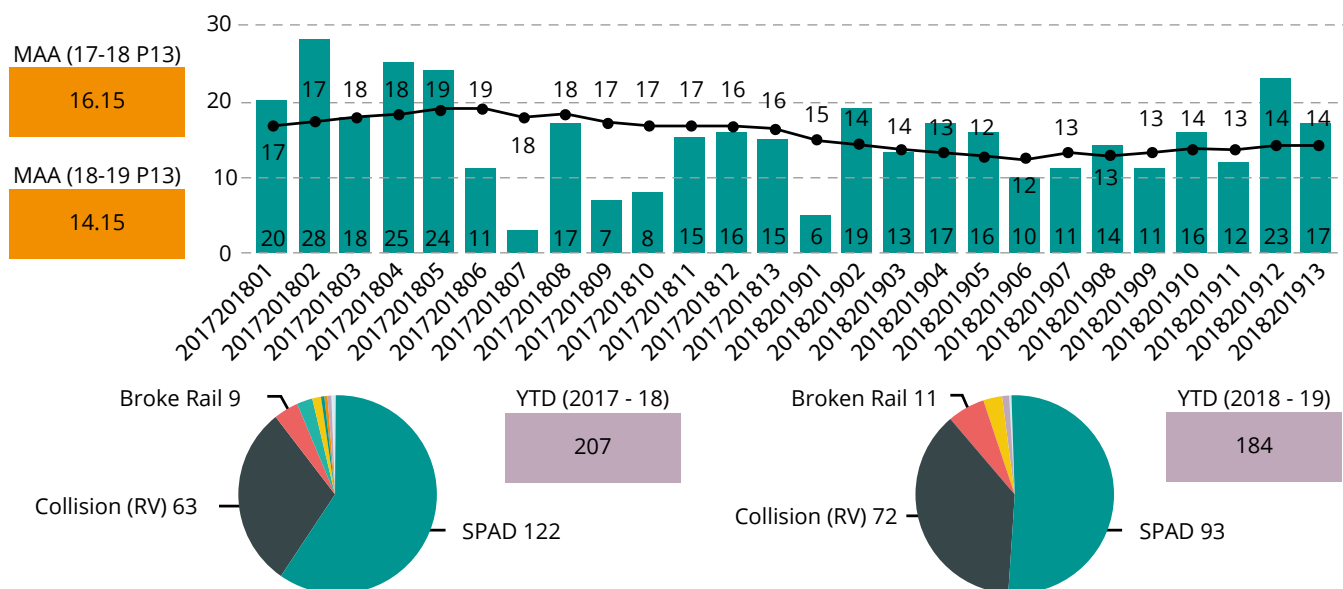
162. Dangerous occurrences: The number of reported RIDDOR dangerous occurrences across all tramways fell to 184 in 2018-19, the lowest number since 2013-14. The overall reduction has been driven by a fall in the number of reported signals passed at stop (SPAS), although these still account for around half of all dangerous occurrences reported. Tram collisions with road vehicles increased by 14% to 72, but remain on a long-term reduction since 2015-16's high of 101. Work to address a number of the RAIB

Sandilands recommendations has the potential to further reduce SPAS risk.

163. Sandilands: The tramway sector's response to the RAIB Sandilands recommendations remains positive and a number of material safety improvements are already in place. However there remains much to do, and each tramway operator, owner, and infrastructure manager must push forward actions to maintain the pace, and make substantial progress during 2019-20. The establishment of the new safety and standards body – the Light Rail Safety and Standards Board – is a significant step in the sector's push to improve risk management, and enables it to improve cooperation, share data, and develop new standards and guidance. Development of the safety risk model and accident and incident database also continues apace, and will help the sector better understand tramway risk by the end of 2019-20.

164. Safety management: The sector continue to show steady signs of improving their health and safety management systems, with particular focus on improving human reliability and supporting the performance of their people. The sector has responded well to the matters raised in the RAIB Sandilands recommendations targeted specifically to the London Tramlink tramway system, taking action to put in place, or develop existing arrangements to improve safety. Across a range of RM3 criteria the

Number of Dangerous Occurrences to end March 2019



Source: ORR RIDDOR

tram operator's safety management of risks associated with fatigue, vehicle maintenance, safety culture and investigation were judged to be operating at "managed" or "standardised" level. We did not consider any of the operators to be non-compliant with legislative requirements in the areas inspected.

- 165. Activities:** In December 2018 we reported to RAIB on the 15 recommendations they made in their Sandilands Investigation Report, and published our response on our website⁷ which included setting out our role, approach and wider ORR activity on tram safety. We provided an update in April 2019 to reflect further progress made by both the sector and ORR.
- 166.** As part of implementing the two recommendations addressed to ORR, we supported the sector in developing plans for the now established LRSSB, completed our review of the regulatory framework and, after extensive consultation, published our strategy for regulation of health and safety risks for tramways. Intended to complement our other strategic health and safety chapters, the tramway strategy sets out our vision, summarises the key characteristics of tramway systems; how the differences with traditional rail systems impacts on risk management; and describes our priorities at sector and individual duty holder level.
- 167.** We reviewed how we could best use RIDDOR data to provide greater granularity on safety performance in the tramway sector pending the introduction of the sectors own reporting system and risk model during 2019-20 and are using RIDDOR data reports at system and operator level to inform our inspection priorities for the future.
- 168.** Our plans for 2018-19 included a resourced and structured programme to carry out more proactive supervision of the tram sector. Our intervention programme targeted the effectiveness of duty holders' arrangements to manage safety risk arising from change, including how they were taking account of RAIB's Sandilands recommendations that were directed only at London Tramlink. We promoted the use of RM3 as a tool to assist in gaining a clearer understanding of the capability of duty holders' safety management systems, and identified six criteria on which we would focus.
- 169. Tram / Train:** the "Citylink" tram-train vehicles entered into passenger service in October 2018 operating between Sheffield Cathedral and Rotherham Parkgate. Designed to operate on both tramways and the mainline network, these vehicles were extensively tested on the mainline infrastructure prior to coming into passenger service. We approved Stagecoach's non-mainline safety certificate to allow mainline operation to commence, and our targeted intervention activities did not find any areas of poor risk management.
- 170. New vehicles:** We engaged with a number of owning authorities which are procuring new vehicles to ensure that every opportunity is taken to design out, or reduce risk where reasonably practicable, and where relevant taking account of the principles set out in RAIB's recommendations. We provided advice on a number of matters related to safety verification, including scrutinising the approach used for West Midland Metro's battery powered trams; the advantages of applying the Common Safety Method on Risk Evaluation and Assessment (CSM-RA) principles; Rail Vehicle Accessibility Regulations (RVAR); and a number of interface related matters.
- 171. Investigations:** Our health and safety investigation into the circumstances of the Sandilands tram crash is nearing completion. We are investigating the pedestrian fatality at a public footpath crossing on the Edinburgh Tramway system, and verifying how the system is responding to the RAIB USA on tramcar audibility devices. The team made initial inquiries into 26 incidents on UK tramways, most related to tram collisions with pedestrians on the highway or at tram stop crossings. With one exception, we concluded that the tramways were operating appropriately in accordance with their safety management system. A number of tramcar / road vehicle collisions resulted in prosecutions of motorists for road traffic violations.
- 172. Conclusions:** The tram sector continues to respond professionally to the challenges laid down by RAIB's 2016 report into the tram overturning at Sandilands. The creation of the LRSSB is an important step forwards as a key enabler to improve cooperation, and bring a firm structure to sharing information, understanding risk, and developing standards

⁷<https://orr.gov.uk/rail/health-and-safety/investigation-and-enforcement/overturning-of-a-tram-at-sandilands-junction-croydon>

and guidance. Together with the risk model, due during 2019/20, it should allow individual operators, owners, and infrastructure managers to pick up the pace in delivering the outstanding RAIB Sandilands recommendations, recognising that they are responsible for implementation. We believe individual operators, owners, and infrastructure managers are capable of, and should make, significant progress towards implementing the remaining recommendations during 2019-20.

173. Our inspection findings indicate that the sector continues to have safety management systems capable of managing risk, and is taking action to improve reliability of these systems in key areas. Whilst the number of safety incidents continues to fall, incidents such as the Sandilands accident illustrate that the sector must continue to drive forwards their understanding of risk, to inform the reasonable practicability of safety improvements to increase the reliability of risk control measures. These may offer opportunities to reduce the number of dangerous occurrences, particularly SPAS, road vehicle collisions, and incidents around the tram interface with pedestrians and public.



Transport for London, including London Underground and other metro services

Overview: Health and safety performance on Transport for London's (TfL) managed infrastructure has again remained stable and consistent during 2018-19. London Underground Limited (LUL) and London Overground (LO) passenger volumes were marginally lower (less than 1%) than those in 2017/18 whereas the Docklands Light Railway (DLR) saw a slight increase in passenger volumes of 1.8%. TfL Rail passenger volumes increased by 20% which is largely due to transfer of the Heathrow Connect in to the franchise. Once more there have been no workforce fatalities arising from TfL railway operations (i.e. LUL, DLR, LO, and TfL Rail). A high level of safety has been maintained throughout the 2018-19 period of the TfL transformation programme. Health and safety performance by London Overground franchisee ARL (Arriva Rail London Ltd) has remained stable with control room improvements now implemented following response to RAIB recommendations derived from its investigation of the unauthorised detainment at Peckham Rye. The Docklands Light Railway (DLR) and its franchisee Keolis Amey Docklands Ltd (KAD) continued to deliver a stable health and safety performance with a low incidence of workforce and customer harm. TfL Rail franchisee, MTR Corporation, once again produced a good year's health and safety performance and in May 2018 took over operation of the Heathrow Connect service between Paddington in central London and Heathrow Airport to the west. Our strong engagement with the Crossrail project has continued and ORR has delivered its ROGS exemption and authorisation commitments to the project to time. Despite the announcement that the projected opening date for Crossrail (December 2018) was being put back ORR's involvement in the regulatory aspects of the Crossrail project has continued to be delivered on or ahead of time. Our relationships with the Crossrail project team and the other key duty holders; ATC, RFLI & MTR Corporation continues to be open, forthright and positive in outcome – to ensure that regulatory requirements are clearly understood and the timescales that are involved.

174. In 2018-19 we served one improvement notice on a contractor in relation to depot security and trespass issues at LUL's Morden depot.

London Underground Ltd (LUL)

Overview: Throughout the TfL Transformation Programme London Underground has continued to deliver a good level of safety for its workforce and the travelling public. Nonetheless embedding the changes within the reconfigured organisation remains a challenge and in particular ensuring key health and safety issues, notably adherence to established processes, are not inadvertently missed or bypassed.

Evidence:

All Workforce Harm:

175. London Underground again recorded no workforce fatalities in connection with its operations. It has recorded its lowest ever FWI for workforce major injuries (0.70, down from 0.90 in 2017-18) although minor injuries and shock and trauma again both showed minor increases. Overall LUL has sustained its lowest workforce FWI since

Infrastructure Worker Harm:

176. Similarly, in connection with infrastructure no workforce fatalities occurred.

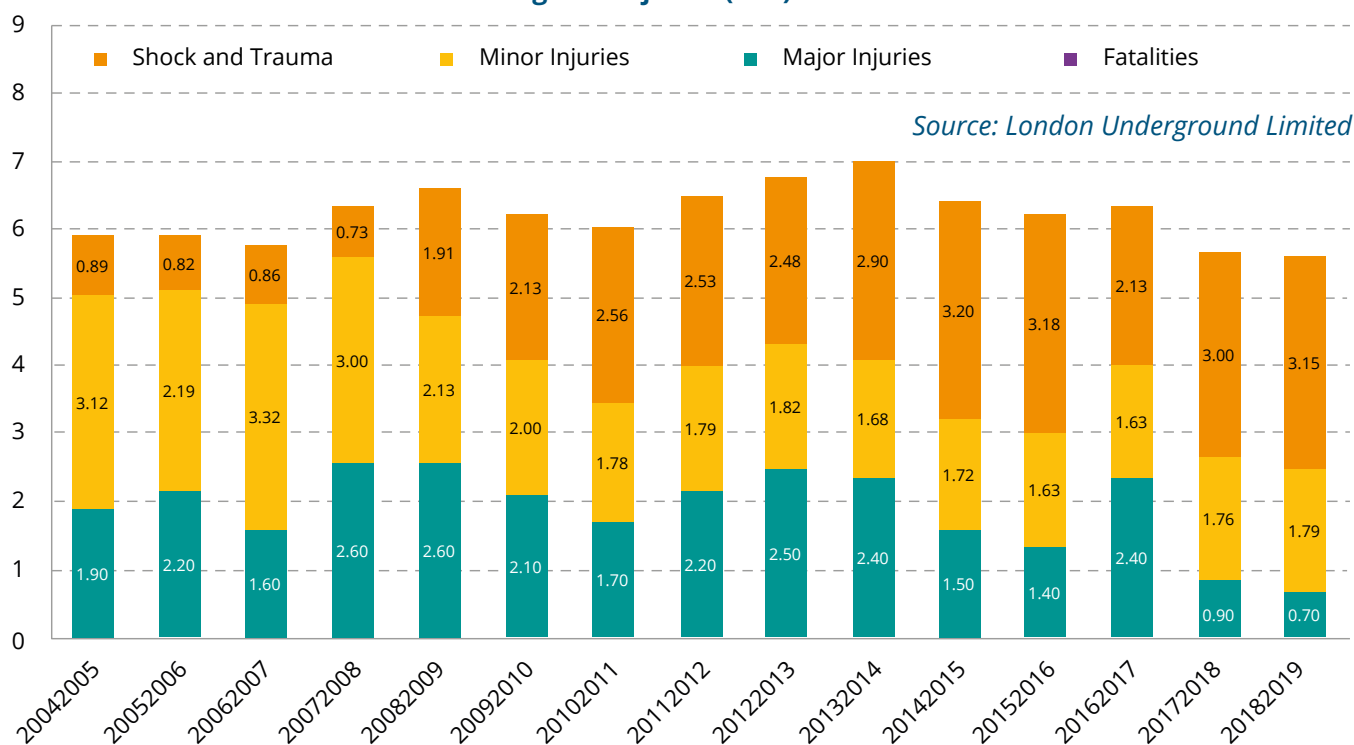
177. LUL recorded its lowest ever number of workforce major injuries (two) with a resultant FWI for workforce major injuries in connection with infrastructure of 0.20; together with the lowest incidence of minor injuries.

178. There was an increase in shock and trauma injuries (0.43).

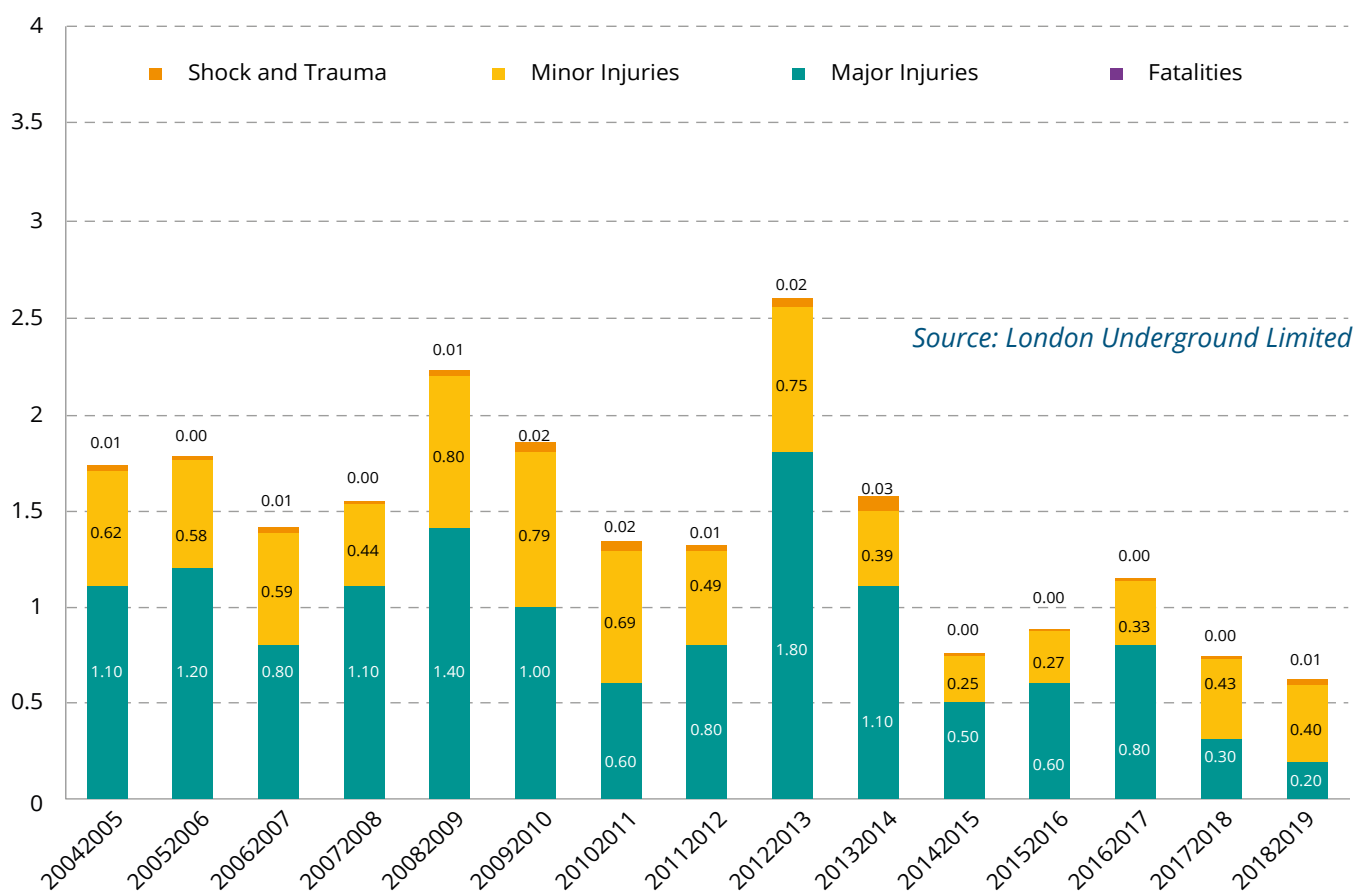
Passenger Injuries

179. With regard to passengers there were two fatalities (one less than 2017-18).

All Workforce Harm in Fatalities and Weighted Injuries (FWI) to end March 2019



Infrastructure Worker Harm in Fatalities and Weighted Injuries (FWI) to end March 2019



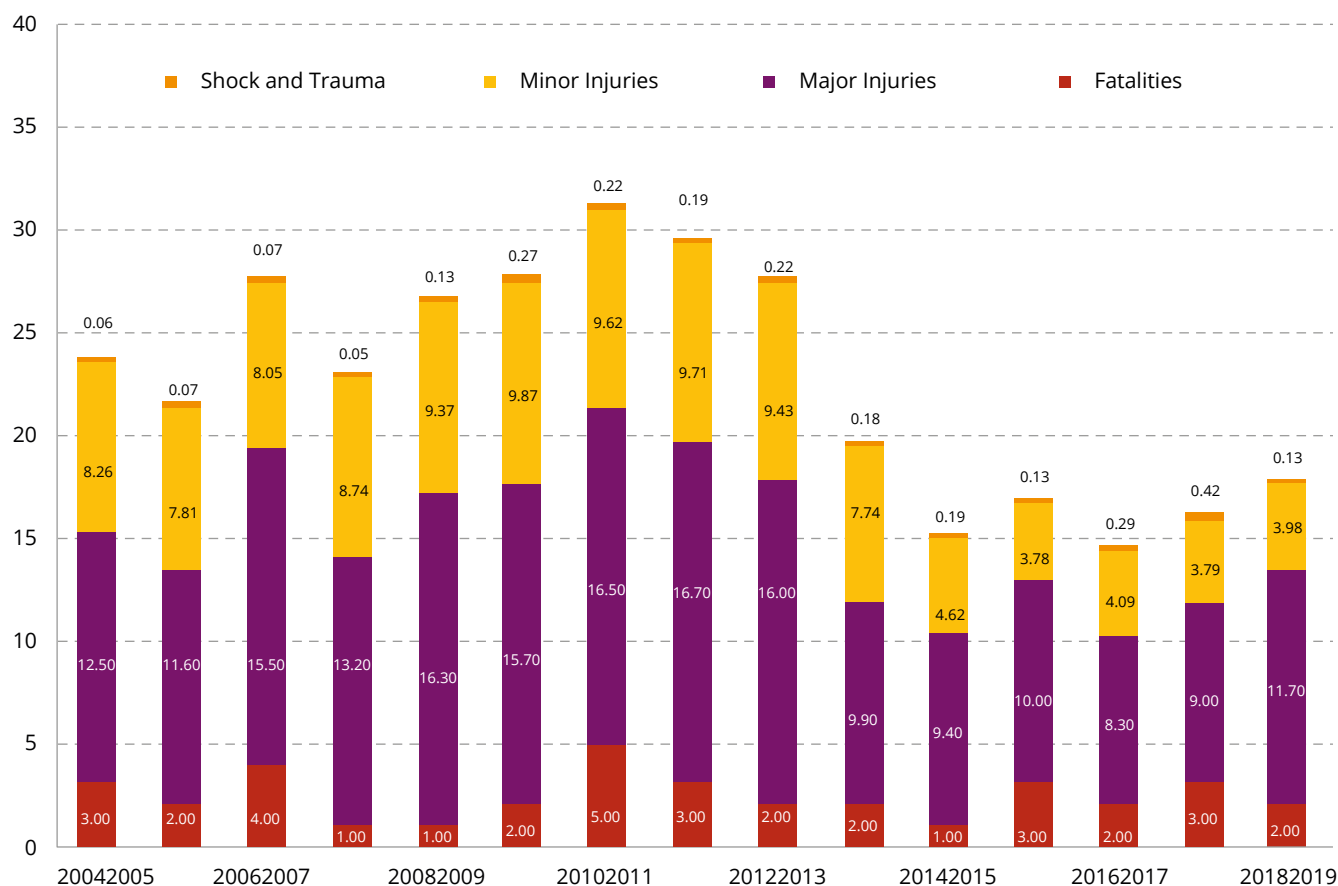
180. The passenger FWI for major injuries was 11.7, a marginal increase on the 2017-18 figure.

181. There was also a very small increase in passenger minor injuries and FWI was slightly higher than the previous year at 3.98.

182. Taken together, this has resulted in an increase in Passenger FWI but should be seen in the light of the increase in passenger numbers and the involvement of alcohol in passenger-related incidents.



Passenger Harm in Fatalities and Weighted Injuries (FWI) to end March 2019



Source: London Underground Limited

183. Activities: ORR set up a 5 year programme of interventions with London Underground to run from 2014-19 and we have reported previously on LUL's steady improvement in RM3 assessment during this period. However, during 2018-19 LUL along with other TfL duty holders were involved in the TfL transformation programme. A primary outcome of this was a fundamental reconfiguration of the structure of LUL resulting in several leadership changes. We consequently chose to terminate the 5 year programme after 4 years and treat 2018-19 as a single year of interventions for the purposes of monitoring the transition. This would also allow a new baseline to be set for 2019-20 with the introduction of a 3 year plan taking LUL up to the next 5 yearly reassessment of its SMS under ROGS. While RM3 discussions have taken place between LUL and ORR we have opted not to publish the isolated one year results because they have only limited relevance to the old organisation structure which has been dismantled or the new one that has been created.

184. Our inspections carried out under our intervention programmes found that overall LUL's health and safety procedures continued to ensure it managed its operational risks well. In 2017-18, we focused on:

- Engagement with Leadership at the head of reconfigured directorates within LUL (and in some cases TfL more widely in the reconfigured organisation)
- Construction activities associated with preparation of infrastructure as part of the 4 Lines Modernisation programme
- LUL's implementation of its improved risk assessment processes.

185. Our inspection of 4 Lines Modernisation sites again raised some concerns relating to compliance with obligations under the Construction (Design and Management) Regulations 2015, in particular in relation to tidiness and order of sites; a particularly significant issue given the restricted nature of the working areas in proximity to the railway. We noted contractors and LUL's action to resolve these issues.

186. Our intervention to follow-up on LUL implementation of its revised assessment processes.
187. We were pleased to note that LUL's own review of the revised process identified areas for improvement and communication of the revised approach. We will continue to monitor LUL's implementation of its revised processes.
188. Our intervention to engage with LUL's new directorate top managers in assets and infrastructure monitored the establishment of the new directorate and found a strong, positive approach to safety from leaders.
189. More widely in the course of the year we have found a small number of instances of uncertainty about where safety responsibilities rested in the reconfigured organisation. None of these represented a significant diminution in safety but together they confirm there is still work to do to ensure the revised organisational structure sustains LUL's long-standing positive health and safety record.
190. We comprehensively investigated the 2017-18 New Year's Eve fatality at East Acton Station involving a member of the public under the influence of substances, who fell from the platform edge onto the track and was tragically stuck by a train and died. LUL staff had made considerable efforts to dissuade the individual from boarding a train, but to no avail. The subsequent sequence of events in the efforts made to alert stations down the line of her presence on a train, involved use of non-recorded means of communication and poor adherence to good practice communication protocols (receive, record, repeat back). As a consequence, LUL is now reviewing its approach to safety critical communication with a view to making all exchanges involving communication of safety relevant information subject to safety critical communication protocols. We strongly support this development.



TfL Rail (MTR Corporation)

Overview: Our intervention and the subsequent liaison meetings have shown that MTR Corporation continues to demonstrate a positive and planned approach to health and safety issues as their operations expand.

191. **Evidence & Activities:** An intervention was conducted on governance and leadership arrangements within MTR to examine and verify the adequacy of its health & safety governance arrangements for the staged introduction of Crossrail. This included interviews with senior managers (including the Managing Director), review of the safety validation strategy for eventual operation in the central operating section, and attendance at a programme board meeting & Safety Quality and Environment Executive meetings. Additional evidence was available from routine ORR/MTR liaison meetings held between the Inspector and MTR Director of Safety. On the evidence gathered we concluded MTR has robust and suitably resourced governance, leadership and change management arrangements in place which should ensure the safe progression through the delayed staged opening of Crossrail.
192. The proposed amendment to MTR Mainline Safety Certificate and Authorisation in support of Stage 3 of the Crossrail Staged Opening Plan (for central operating section running), was issued on time in summer 2018 based on original opening plans. While the Certificate and Authorisation changes remain valid, the delay to the Crossrail project means that their coming into effect has now been delayed.

London Overground - Arriva Rail London Ltd (ARL)

Overview: ARL has made steady improvement to its management of health and safety during 2018-19 particularly in the light of staff changes in respect of its internal health and safety management arrangements. This coupled with the implementation of changes arising from the RAIB investigation of the unauthorised detrainment of passengers at Peckham Rye station and the preparation for introduction of the new 710 train presented ARL with a complex health and safety environment in 2018-19.

193. **Evidence & Activities:** Our activities in 2018-19 focused on emergency preparedness arrangements. We are pleased to note that ARL have been involved in three tabletop exercises involving itself, TfL, London Underground and Network Rail which indicates that appropriate control measures including training and resources, are now in place to deal with emergencies. We also noted changes to ARL documentation which clearly indicate that potential emergencies arising from tasks are identified as part of risk assessments. Finally we were pleased to note that for ARL's Barking detrainment on 29 March 2019, the system changes implemented as a result of the Peckham Rye incident meant that all passengers (including one with mobility issues) were detraigned safely under fully controlled conditions. We concluded that this demonstrated that the necessary control measures including training and resources are in place to deal with emergencies.

Dockland Light Railway / Keolis Amey Docklands (KAD) Ltd

Overview: DLR/KAD health and safety performance was again characterised by the absence of significant incidents involving either staff or customers. Despite significant changes in health and safety management within KAD it has delivered another positive year in terms of customer and workforce health and safety.

194. **Evidence & Activities:** Our engagement this year has focused on risk to passengers at the platform train interface, in particular passengers standing at the platform edge who drop mobile phones onto the track. We found that KAD does have reasonably practicable approaches to this problem and continues to monitor closely the incidence of such occurrences.
195. We have also monitored closely the progress of the Royal Mint Street over-railway development and we are pleased to report that excellent cooperation between Health and Safety Executive Inspectors and ORR Inspectors raised questions about the safety of lifting operations on the site which had potential to compromise the railway, were quickly resolved.

Automated Airport People Movers

196. During 2018-19 we have engaged with Gatwick, Stansted and Heathrow airports all of which operate guided Automated Airport People Movers and are pleased to report the positive response of all three duty holders to our establishment of a forum in which all can share common issues. The additional positive engagement of KAD (for DLR) and Glasgow SPT (which is moving towards automated operation) with this forum has further reinforced the value of the exchanges.

The safety of the Channel Tunnel

197. Health and safety regulation of the Channel Tunnel is carried out by the bi-national (UK and French) Channel Tunnel Intergovernmental Commission (IGC). To assist in this role we continue to provide leadership, expert advice and secretariat support to the IGC and Channel Tunnel Safety Authority (CTSA), applying the key principles of our health and safety vision and strategy for the railway in Britain equally to the Channel Tunnel. Our inspectors are appointed to lead and deliver, alongside their French counterparts, the CTSA inspection plan, which aims to provide assurance that Eurotunnel's and train operators' management systems are capable of managing the specific risks associated with Channel Tunnel operations.
198. During the year, the IGC and CTSA have continued to regulate the users of the Channel Tunnel in a way that facilitates the safe operation and growth of cross-Channel railway traffic. Key areas of activity undertaken included the ongoing monitoring of Eurotunnel's approach to safety related issues in respect of its new ElecLink project. Last year the IGC issued a Direction under the Channel Tunnel Concession Agreement prohibiting the installation of the cable in the tunnel dependent on restoration of the consent which was suspended in October 2017. The IGC is working closely with Eurotunnel on both lifting the Direction and reinstating the consent and ORR is investing significant resource to scrutinise this work.
199. Other activities included the IGC authorisation of the use of GSM-R voice equipment on Eurotunnel's shuttle locomotive fleet and the issuing of a letter of 'no-objection' to Eurotunnel's proposal to reintroduce four pagodas to each of its Arbel and WBN shuttle wagons to reduce the risk of over height objects coming into contact with catenary in the Channel Tunnel. In August 2018 an Improvement Notice was served on Eurotunnel requiring it to provide safe systems of work in respect of employees escorting customer vehicles from the terminal platforms onto shuttles. This action arose following a serious accident at Folkestone terminal in 2017. Eurotunnel demonstrated compliance with this Notice in January 2019.

200. In July last year, the IGC held its annual performance meeting for all operators that use the Fixed Link to review Eurotunnel's performance system and the data collected during 2017. The scope of this meeting was expanded to include for the first time a review of Channel Tunnel related safety and environmental key performance indicators.
201. Our inspectors also provided the IGC and CTSA with support in the bi-national assessment of an application for the renewal of Eurotunnel's five year safety authorisation (authorised by the IGC in March 2019) and an application from GB Railfreight for the renewal of its Channel Tunnel Part B safety certificate (authorised in August 2018).
202. Further specific information about IGC activities can be found in its own annual safety reports published on its website at <http://www.channeltunneligc.co.uk/IGC-reports,27.html?lang=en>⁸

Train driving licences

203. In 2018/19 we worked collaboratively with train operators to meet the 29 October 2018 deadline for all mainline train drivers to be licensed under the Train Driving Licences and Certificates Regulations 2010 (TDLCR). This was a significant milestone, reflecting considerable effort by the train operators and ORR, resulting in more than 19,885 licences being issued between TDLCR being introduced and the October 2018 deadline. Within the year we managed a sharp peak in applications with 6,065 being processed between 1 April 2018 and 31 March 2019.
204. In the latter part of the year we consulted on a new suite of TDLCR guidance aimed at the different groups of people with duties under the regulations. The consultation covered a guide for train operators, a guide to the medical and occupational psychological fitness requirements, a guide to the training and examination requirements, a key facts leaflet for train drivers, and expanded guidance on the process.

Our safety policy work

Preparing for UK's exit from the EU

205. We have provided extensive support to Government and the industry to prepare for UK's exit from the European Union. In particular:
- We provided extensive advice to the Department for Transport on its "no deal" exit regulations relating to safety and train driver licensing, ensuring the legal framework will remain workable should the UK leave the EU without a deal. We also published guidance on these regulations to help industry to continue complying.
 - We worked closely with international passenger and freight operators and with the French railway safety authority (EPSF) to ensure that UK-based international train services and their drivers are able to hold the necessary certificates and licences they need to operate after exit.
 - We negotiated and entered a "memorandum of understanding" with EPSF to provide for our and their safety inspectors to continue working together to supervise the safety of international train services between the UK and continental Europe.

Other developments in the regulatory framework

206. We have continued to develop, improve and promote the regulatory framework for railway safety. In particular:
- We completed the transfer of our previous role in the certification of entities in charge of maintenance (ECM) to the UK's accredited ECM certification bodies.
 - We also published new or updated guidance to help industry comply with the law on a wide range of topics, including safety certification and safety management systems, risk assessment, and the introduction of new level crossings.

⁸ The IGC annual safety report for 2018 will be published in October 2019

Our work in Europe

207. We have continued to participate in the activities of the EU Agency for Railways and in EU decision-making on the future of the legal framework for railway safety. In particular:
- We were influential in the development of a framework co-operation agreement between NSAs and ERA that should support NSAs continuing to have a say in ERA certification and authorisation decisions that affect our territory. If relevant to the UK, we expect to sign such an agreement by June 2020.
 - We lobbied against Commission proposals to extend the scope of certification of entities in charge of maintenance to all rail vehicles. While we were not able to prevent scope extension, we did secure exceptions from certification requirements for train operators and infrastructure managers who already have certified safety management systems – avoiding undue duplication of effort for this part of the industry. We will take forward the necessary work to ensure the new regulation is understood and complied with by the mainline railway.

Permissioning

ECM Certificates

208. ECM certificates are issued by certification bodies to organisations in charge of maintaining freight wagons that are used on the mainline railway. These include freight train operators which maintain their own wagons as well as third party companies which maintain freight wagons under contract to the owner/operator.

209. We stopped acting as an ECM certification body on 31 March 2018 and since then have been supporting the industry certification bodies in taking over responsibility for issuing ECM Certificates. We issued two ECM Certificates during 2018-19 both of which were applied for in the previous work year. Industry Certification Bodies issued 11 ECM certificates 2018-19, the majority of which were renewals of existing certificates that had reached the end of their validity.

Safety Certificates and Authorisations

210. Safety Certificates are issued to companies which use trains on the mainline. These include passenger and freight train operators as well as some infrastructure managers and construction companies which need to move equipment and supplies around the mainline network.
211. Safety Authorisations are issued to companies that manage mainline infrastructure such as track, stations and level crossings.
212. The number of safety certificates and safety authorisations issued in 2018-19 are shown in the table below:

Exemptions

213. There were two exemptions processed and issued during 2018-19 from the Railway Safety Regulations 1999. These related to:
- Regulation 5 – Use of hinged doors on passenger carrying vehicles: one exemption issued;
 - Regulation 4 – Operating Mark I rolling stock: one exemption issued.

Certificate/Authorisation type	New	Updated / Amended	Renewed	Total
Mainline Part A Safety Certificate	3	5	9	17
Mainline Part B Safety Certificate	3	7	9	19
Mainline Safety Authorisation	4	2	6	12
Non-mainline Safety Certificate	1	1	2	4
Non-mainline Safety Authorisation	1	0	1	2

214. There was also one exemption processed and issued during 2018-19 from the requirement in the Railways and Other Guided Transport Systems (Safety) Regulations 2006 to hold a safety certificate or safety authorisation. This was to enable the testing and commissioning of Crossrail infrastructure in the Central Operating Section.

Comparison with railways in the European Union

Passenger risk in the European Union railways

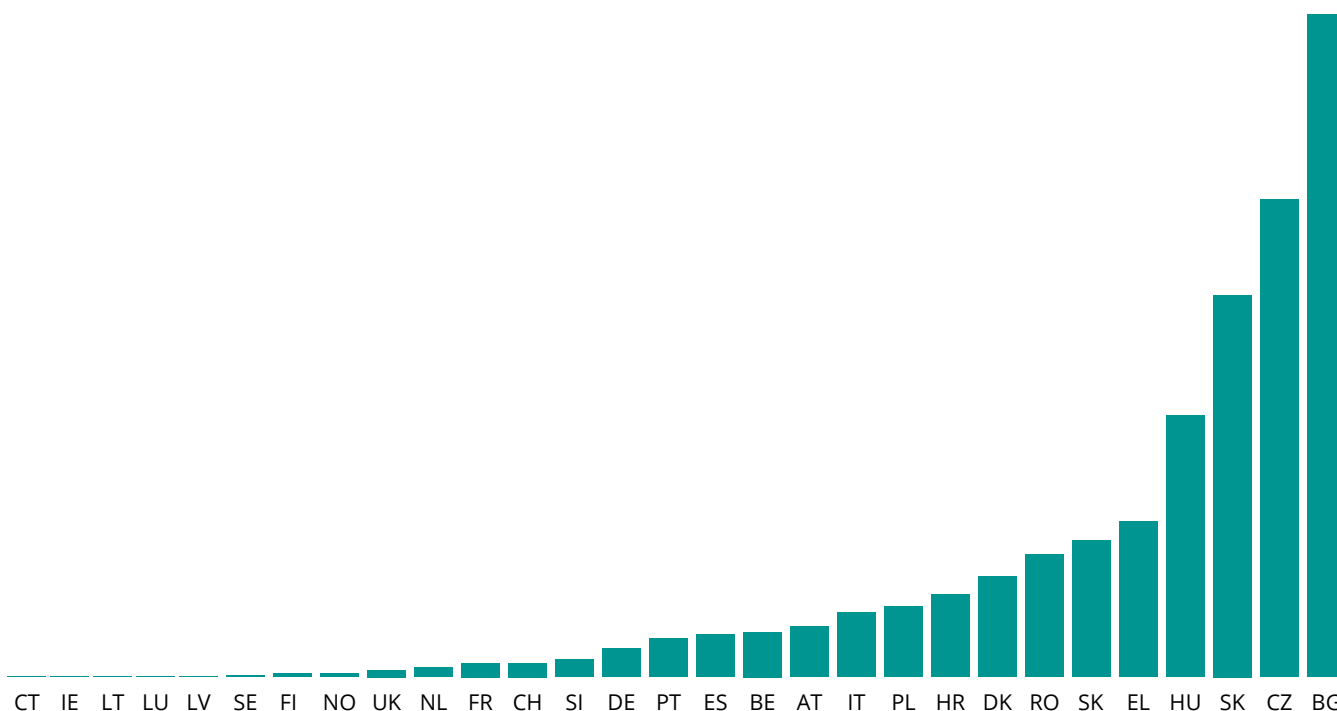
215. The European Union Agency for Railways Common Safety Indicators dataset has been extracted from the ERAIL database, which contains data on accidents between 2006 and 2017.

216. The data presented below covers the risk to workforce and passengers which is calculated from the last four years of available data. Averaging the data over four years helps to illustrate safety performance over a longer period of time and reduces the effect of any large-scale one-off events.

217. The values for risk are calculated from the number of persons killed or seriously injured⁹ over the relevant time period, and normalised by train kilometres (workforce) or passenger train kilometres (passengers).

218. UK is ninth in terms of passenger safety risk but performs considerably better than the EU average and very favourably in comparison to other Member States with large railway networks.

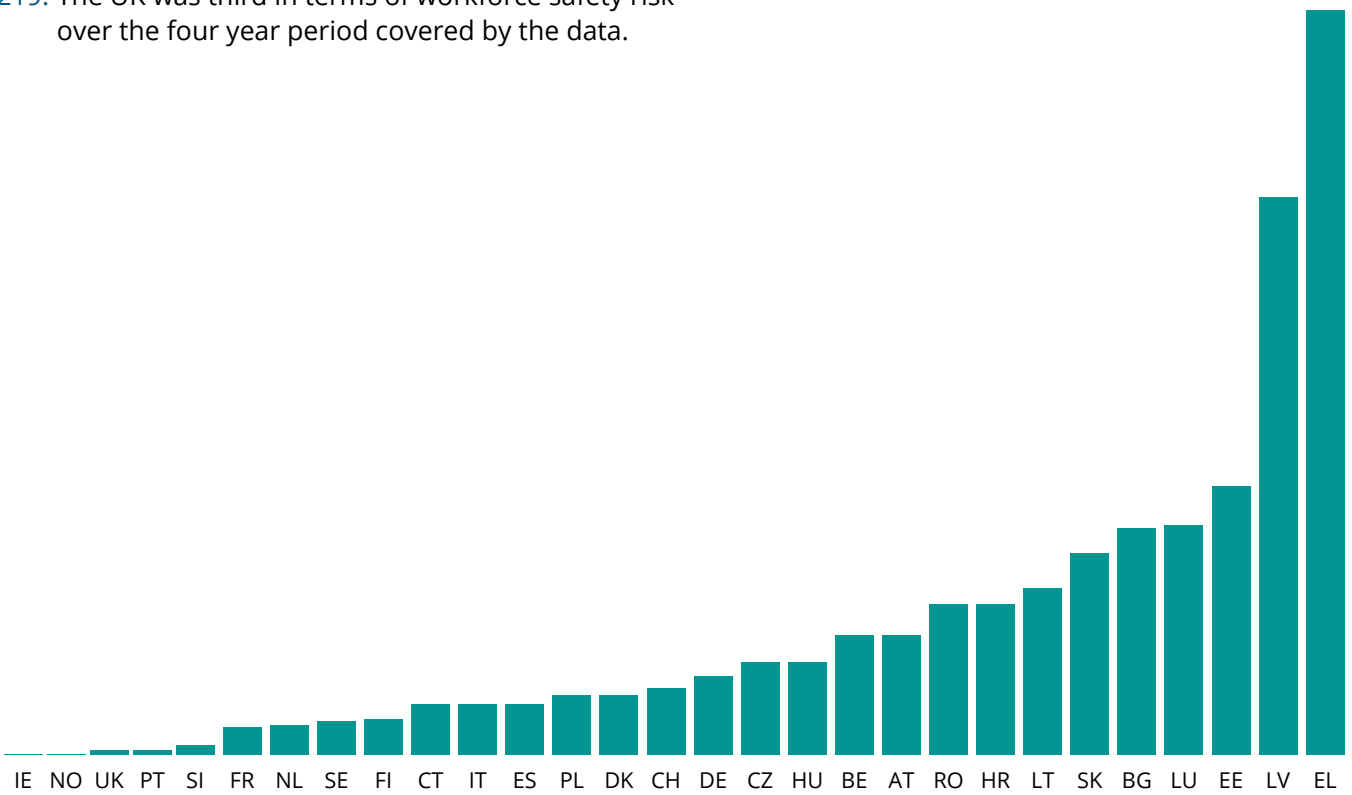
Passenger risk (2014-2017 four year average)



⁹ Definitions used by the European Union Agency for Railways may differ from those we use internally in the UK.

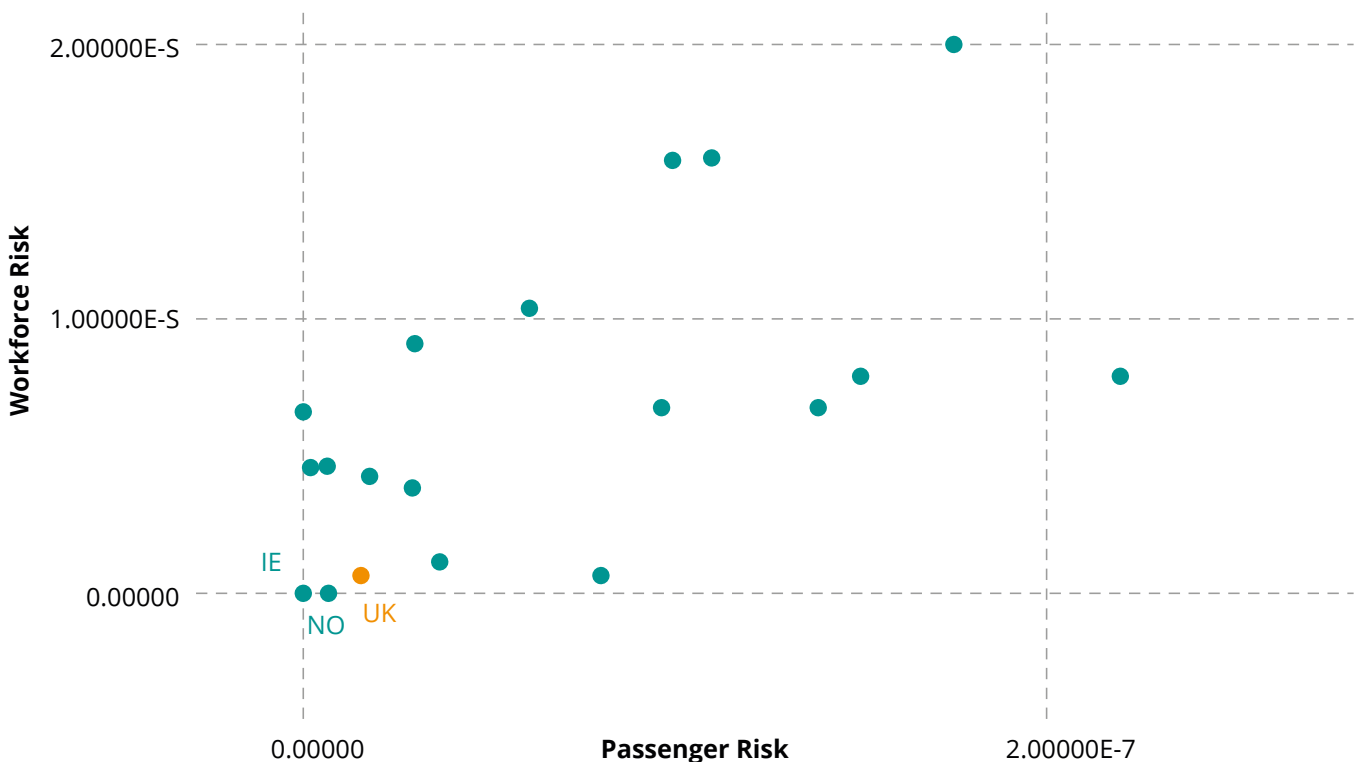
Workforce risk (2014-2017 four year average)

219. The UK was third in terms of workforce safety risk over the four year period covered by the data.



Combined passenger and workforce risk (2014-17 four year averages)

220. UK is third best performing (behind only Ireland and Norway, who have reported only one serious injury and no fatalities between them over a four-year period) in terms of combined passenger and workforce risk over the last four years.





SECTION 3 – ROLES OF KEY INDUSTRY BODIES

Rail Accident Investigation Branch

221. The Rail Accident Investigation Branch (RAIB) is the independent investigation body for accidents and incidents on UK mainline, metro, tram and heritage railways. RAIB is not a prosecuting body and does not apportion blame or liability.
222. Over time, ORR has established a good working relationship with RAIB, helping us share our understanding of incidents, the key learning from them and areas where we share concerns. During 2018-19 we continued work to refresh the 2006 Memorandum of Understanding between ORR, RAIB and the British Transport Police (BTP) to ensure that it reflects the effective coordination and cooperation between the parties. As the National Safety Authority (NSA), it is ORR's responsibility to pass recommendations to the industry bodies we think are best placed to address them.

Sandilands investigation

223. The investigation into the overturning of a tram at Sandilands junction on the Croydon Tramlink network on 9 November 2016 was one of the most significant undertaken by RAIB since it was established.
224. The investigation report was published on 7 December 2017 and made 15 recommendations upon the tram industry and ORR. In line with our legal obligations, we reported progress against these recommendations within 12 months of the report's publication (on 4 December 2018) and continued to monitor industry progress in implementing them and to complete actions to address the two recommendations placed upon ORR. To date, both of the recommendations placed on ORR have been reported as implemented, as have

seven of the 13 recommendations addressed to London Trams/Tram Operations Ltd which owns and operates the Croydon network. The seven recommendations directed to all tram owners, operators and infrastructure managers in the UK are being progressed and we note the positive collaboration that has taken place to address those that require cross-industry action.

Reporting to RAIB

225. ORR has a statutory obligation to report to RAIB on the action being taken by a duty holder to address each recommendation within 12 months of publication.
226. In 2017-18 we received 17 reports, which included a total of 51 recommendations.
227. During the year we reported to RAIB on 97 recommendations; 39 were reported as being implemented; 23 as implementation ongoing; 20 as progressing; and 15 as being an insufficient response.
228. In their 2018 Annual Report, RAIB identified eight instances where they were concerned that a duty holder response did not sufficiently address the recommendation.
229. There are two outstanding recommendations on ORR, both of which are related to changing our level crossing guidance to reflect any changes to signage requirements following legislative changes by DfT. Following DfT's decision not to pursue reform of level crossings legislation, we nevertheless intend to improve our guidance and processes around the existing regulations in 2019-20, which will satisfy these two outstanding recommendations.

Safety Digests

230. As well as full investigation reports, RAIB also publish Safety Digests. Safety Digests are a useful alternative to full RAIB reports as they are produced more quickly after an incident and are focused on identifying safety learning rather than making recommendations. Safety Digests cover many of the same topics as RAIB's full reports, such as the five areas of concern they have focused on. In 2018-19 RAIB issued 15 Safety Digests.

RAIB identification of important issues raised in 2018

231. In their 2018 Annual Report, RAIB identified four areas of concern they had identified from their investigations. These areas of concern align with the issues identified in this report and the key challenges facing the industry around supporting our people, pressure on the system and technology.

Design and operation of user worked level crossings

232. ORR shares RAIB's concerns about user worked crossings and is working to facilitate safety improvements, particularly at those crossings where the user relies on telephoning the signaller to obtain permission to cross. Further, during PR18 we challenged Network Rail because we believed that there was more it could reasonably practicably do to improve level crossing safety during CP6. As a result, in addition to increased funds for renewals, Network Rail has dedicated £25 million in CP6 to providing active warning systems at its highest priority passive crossings, including some user-worked ones.

233. ORR is working with the DfT to update the Private Crossings (Signs and Barriers) Regulations 1996. These signs explain how to use a user worked crossing safely, including when to use telephones. The update includes a significant revision of the signage, improving the wording and graphical images; increasing their usability.

234. We have enforced to secure improvements in the information Network Rail's signallers have regarding train position in long signal sections. This enables more accurate and timely granting of permission to users seeking to cross. We complemented this by using ORR's inspectors to examine Network Rail's management of risk at such crossings across the network. The resulting recommendations have been accepted by Network Rail and we have been monitoring progress throughout 2018-19.

Managing the risk at the platform-train interface (including trap & drag)

235. We share RAIB's concerns regarding this important issue, but note the platform-train interface presents a number of hazards in addition to trap and drag, including risk associated with train dispatch and stepping distances.

236. We support measures being taken by industry to utilise technology to help drivers identify hazardous incidents, particularly during Driver Controlled Operations [of doors] (DCO), as well as better use of mirrors and monitors.

237. We also encourage industry to consider measures to reduce risk at the PTI, such as yellow lines and tactile edges.

Protection of track workers from moving trains

238. We recognise the issues identified by RAIB and agree there are too many near misses.

239. In 2018/19 we inspected Network Rail's management of track worker safety. Our efforts are focused on improved planning of maintenance activities to reduce access to the live railway and to improve provision of automatic warning and protection, in order to reduce reliance on individuals doing the right things.



SECTION 4 - OUR ENFORCEMENT ACTIVITIES

240. In most cases, we secure improvements in health and safety for passengers, the workforce and public through evidence-based advice and encouragement to duty holders to improve and adapt their risk management. But, occasionally, we use our formal powers to ensure compliance with the law or to deal with immediate risk. Mostly, we use enforcement notices to stop an activity involving serious risk, or to rectify serious gaps in duty holders' risk control. Our enforcement policy statement¹⁰ sets out how we ensure rigour and consistency in our enforcement decisions by using our enforcement management model.

Improvement notices in 2018-19

241. We served 18 Improvement Notices in 2018-19, compared to 13 in 2017-18. The reasons for our notices, included:

- Insufficient risk assessment of manual handling of steel sleepers
- Absence of a system to identify, assess and maintain culverts
- Lack of suitable washing facilities, clothing storage, changing facilities or area to eat meals
- Absence of a system to identify the presence of asbestos in company assets
- Failure to provide a system of work that ensures the safety of staff escorting road vehicles on platforms
- Absence of a suitable and sufficient assessment of the risk of shunting vehicles without the use of a traction engine
- Failure to take proper action to ensure employees exposure to vibration is eliminated at source

- Failure to comply with a level crossing order
- Inadequate information, instruction and supervision to workers undertaking track patrols in 3rd rail electrified areas
- Inability to demonstrate effective management of the risks of on track plant movements
- Lack of suitable and sufficient assessment of the risks to trespassers

Prohibition notices in 2018-19

242. We issued three prohibition notices in 2018-19. None were issued in 2017-18. The reasons for these notices included:

- Performing lifting operations where there is a risk of equipment failure
- Use of trollies with defective brakes that are at risk of running away
- Failure to take measures needed to reduce or prevent exposure to legionella

Prosecutions in 2018-19

243. In England and Wales we completed six prosecutions against eight defendants during 2018-19 – see table below. This compares to two prosecutions in 2017-18. There were no prosecutions by Crown Office and Procurator Fiscal Service in Scotland during 2018-19.

¹⁰ https://orr.gov.uk/_data/assets/pdf_file/0016/5650/health-and-safety-compliance-and-enforcement-policy-statement-2016.pdf

Summary overview of our concluded 2018-19 prosecutions:

England and Wales		
Defendant	Incident	Fine
NcNealy Brown Limited	A cleaner fell through a suspended ceiling and in to an open waiting room	£65,000
BAM Nuttall Limited		£900,000
South Devon Railway Trust	A child fell through a hole in the floor of an on-board toilet cubicle	£40,000
Kier Infrastructure and Overseas Limited	A pre-cast concrete unit fell on an agency worker	£600,000
London Underground Limited	A track worker was crushed between a Road Rail Vehicle and the platform edge	£100,000
Balfour Beatty Rail Limited		£333,000
Network Rail Infrastructure	A signaller was struck by a level crossing gate when a car failed to stop	£200,000
DB Cargo (UK)	A child suffered life-changing injuries after receiving an electric shock from 25,000-volt overhead line equipment	£2,733,500

ANNEX 1 – GLOSSARY

Abbreviation	Definition
CP5/6	Control period 5 (2014-19) and control period 6 (2019-24): the usually five year period in which ORR reviews and sets track access charges and Network Rail's funding and output levels.
CSM	Common Safety Method(s). A series of European railway regulations that are directly applicable to Mainline Railway operations.
DfT	Department for Transport
FOC	Freight Operating Company.
FWI	<p>Fatality and Weighted Injury index: the common way of measuring harm to people on Britain's mainline railways.</p> <p>The fatalities and weighted injury ratio used is: one fatality = 10 major injuries = 200 class 1 minor injuries (where the injured person is taken directly to hospital) = 1,000 class 2 minor injuries = 200 class 1 shock and trauma injuries = 1,000 class 2 shock and trauma injuries.</p>
HAWS	Hand Arm Vibration Syndrome.
Mainline Railway	<p>A railway is a 'mainline railway' unless:</p> <p>a) we determine that it falls within one or more of these categories:</p> <ul style="list-style-type: none"> • metros and other light rail systems; • networks that are functionally separate from the rest of the mainline railway system and intended only for the operation of local, urban or suburban passenger services, as well as transport undertakings operating solely on these networks; • heritage, museum or tourist railways that operate on their own networks; or <p>b) we determine that heritage vehicles that operate on the mainline railway and comply with national safety rules are deemed not to operate on the mainline railway; or</p> <p>c) it is privately owned infrastructure that exists solely for use by the infrastructure owner for its own freight operations.</p>
NSA	National Safety Authority in the European Union.
OH	Occupational health.
ORR	Office of Rail and Road, as of 1 April 2015: the economic regulator of Britain's mainline railway and health and safety regulator on all Britain's railways. It also monitors England's Strategic highways network. It was previously the Office of Rail Regulation.
PDSW	Planning and Delivering Safe Work – A Network Rail programme.
PIM	Precursor Indicator Model: models accident precursor trends on Britain's mainline railway.

PR18	Periodic Review 2018: The 2018 periodic review of Network Rail (relating to CP6)
PTI	Platform-train interface: the gaps both in terms of width and height between a station platform and a train. It also includes risks from electrocution and falls from platforms without trains being present.
RM3	Railway Management Maturity Model: the tool we use to assess an organisation's ability to achieve excellence in controlling health and safety risks.
RSSB	Rail Safety and Standards Board: a body by and for the mainline industry, involved in understanding and modelling risk (see SRM and PIM), guiding standards, managing research and development and industry collaboration.
SMIS	Safety management information system: the system managed by RSSB that Britain's mainline railways uses to report safety information.
SPAD	Signal Passed at Danger: where a train passes a red signal without permission and runs the risk of compromising safety.
SRM	Safety Risk Model: models the long-term risk trends on Britain's mainline railways and is recalibrated periodically to take account of the harm caused by incidents.
TfL	Transport for London.
TOC	Train Operating Company.



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