



Shunter safety special topic report 2007

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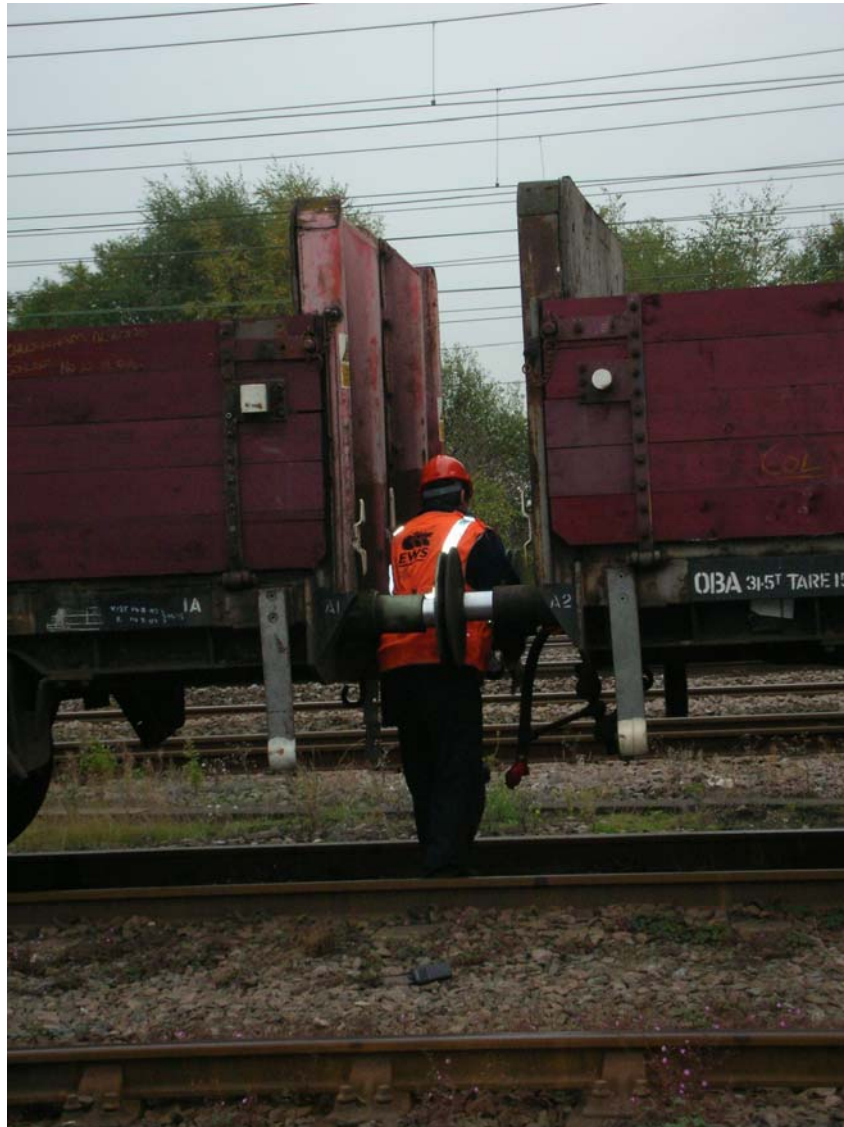
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All photographs were taken by L. Mazin at Up Decoy Yard and Marshgate sidings.

Executive summary

This Rail Safety and Standards Board (RSSB) special topic report looks at the risks faced by shunters and discusses the underlying causes that contribute to the current risk level. The rates of shunter fatalities and RIDDOR-reportable injuries indicate that shunters face a high level of risk compared with other railway occupations.

Some of the main points from the report are as follows:

- Shunter responsibilities in both Train Operating Companies (TOCs) and Freight Operating Companies (FOCs) are changing.
- FOC shunters generally carry out traditional shunting duties 'on the ground', such as controlling propelling moves, operating hand points, carrying out manual coupling, communicating with the driver, and so on. TOC shunters, on the other hand, are increasingly responsible for driving the vehicles as well as controlling the moves.
- There have been four shunter fatalities in the past 10 years. All involved FOC shunters who were carrying out shunting duties 'on the ground'. Three of the fatalities were attributed to getting trapped in between two vehicles whilst carrying out manual coupling. This rate compares to seven shunter fatalities in the previous 10 years.
- On average, each FOC shunter loses 0.7 days each year as a result of injuries sustained whilst working. This compares with 0.2 for TOC shunters.
- There is no evidence of any significant trend in shunter incident rates in the period since January 2002.
- The greatest contribution of lost-time injuries comes from slips, trips or falls whilst '*moving around or between work areas*'. Strains and sprains are the most common types of injury resulting in lost-time.
- Human factors have a critical impact on shunter safety. In particular, management visibility, effective resource planning and a robust risk-based competence management system were identified as some of the essential elements for maintaining shunter safety.
- There have been a number of industry events that have highlighted the risk from shunting. A set of control measures were identified, including plans for effective management of staff, equipment, procedures and morale.

The Operations Focus Group (OFG) is set to coordinate future research into the causes of shunting incidents, including human factors and workforce safety campaigns. The group will also be responsible for the development of any arising recommendations.

1 Introduction

Shunting is one of the highest risk occupations within the rail industry. Since 2005, there have been two shunter fatalities. The importance of focusing industry commitment on this area of risk prevention is clear.

This RSSB special topic report reviews the risks faced by shunters and discusses the underlying causes that contribute to the current risk level. It also details initiatives that have been introduced by the industry to improve and maintain shunting safety performance.

This work follows a joint RSSB-ATOC workshop on *Shunting Safety*, held in London in September 2007. Key issues raised at the event are also outlined herein.

We would appreciate your views on the content of this document, along with any ideas for future special topic reports. Please send your comments to Lisa Mazin, whose contact details may be found on the title page. Or, alternatively, use our new feedback form on the RSSB website.

Aims and objectives

The report presents information on the current shunter risk profile. By providing operators with an informed assessment of the risk, we aim to help them better understand the problem and, as a result, develop solutions that improve the safety of their shunters.

Shunters are essential for the timely and safe presentation of trains from depots or sidings and are therefore a critical workforce for any railway undertaking. They are responsible for protecting the assets and a mistake such as incorrectly setting points or leaving a handbrake off can have serious consequences. However, such incidents – while sharing many of the causal and contributory factors discussed here - are outside the scope of this report, which focuses on the safety of the shunters themselves.

This special topic report is aimed primarily at operators and stakeholders with an interest in, or responsibility for, the safety of shunters.



2 Shunters and the risk from shunting

2.1 Who are *shunters*?

This is a more complicated question than one might think, mainly because there is an increasing move towards dual-functional roles. It is perhaps best answered by first considering how the Rule Book views the situation.

According to the Rule Book, shunting is, 'any movement of a train or vehicle other than a train passing normally along a running line'.

A *shunter* is, therefore, 'the person in control of a specific shunting movement'.

The ORR also sets out the essential principles and guidance related to maintaining safety within the operational railway in its *Railway Safety Publication 3: Safe Movement of Trains*. This document gives an outline of shunting as follows:

'Shunting is the movement of trains or vehicles other than the normal passage of trains on running lines. It may take place on running lines, in yards and sidings or within engineering possessions and may be controlled by fixed signals, hand signals, radio communication, audible signals or by the establishment of shunt authority limits. Shunting movements may be controlled from other than the leading end and may involve approaching other vehicles and obstructions, entering/leaving buildings, working in depots, or requiring to stop at or before reaching a specific location. The primary control of the risks associated with shunting is the need for all personnel involved to have a complete understanding of the purposes of each movement and how it is to be made.'

The role of the shunter is changing, however, and increasingly involves other duties, such as depot driving and maintenance work. These issues are discussed in the next section.

2.2 The varied and changing role of the ‘shunter’

The risk from shunting is strongly dependent on the working environment. Thus, it will differ depending on the location, scope of work within the location and operating constraints.

FOC shunters¹, for example, generally carry out traditional shunting duties ‘on the ground’, such as controlling propelling moves, operating hand points, carrying out manual coupling, communicating with the on-board driver, and so on. TOC shunters, on the other hand, are increasingly responsible for driving the vehicles as well as controlling the moves. Some key differences between the typical TOC and FOC shunter roles are described in Table 1, below:

	FOC shunter	TOC shunter
Dual-functionality roles	Dual functionality roles are becoming increasingly popular, for example shunters are starting to carry out driving duties too. The role of a FOC shunter is generally more labour-intensive than a TOC one, however, and therefore the scope for inter-changeability is less.	Most TOC shunters are also shunt-drivers and carry out driving as part of their normal shunting duties.
Coupling arrangement	Mainly manual coupling, requiring shunters to stand in-between two vehicles.	Mainly autoconnectors, whereby shunters do not have to stand in-between two vehicles and rarely have to exit the driver’s cab.
Operating points	Mainly manually-operated points.	Mixture of manually-operated points and automatic points, depending on the design of the depot, its age and the amount of traffic at the depot.
Supervision	A large proportion based in yards and sidings, often remote from supervisors.	Mainly based at depots, often surrounded by other technical and management supervision.
Infrastructure	Often exposed to hazards on or about the track, sometimes due to poor quality rails and cabling, or contractors leaving waste.	TOCs have more control over their environment and the borders are better defined, management of contractors is therefore easier.
Workload	FOC shunters may have variable workloads, since the activity of a FOC will vary largely on the type of contract and its longevity.	TOC shunters have a relatively predictable workload. Activity levels for a TOC shunter will be primarily based on regular service requirements.
Local working/ route familiarisation	Some shunters carry out duties at various contractor sites, and may not be familiar with local routes.	Being based mainly at maintenance depots, TOC shunters are likely to be fully familiar with local working instructions and route knowledge.

¹ ‘FOC’ and ‘TOC’ have been used in this report to differentiate between the railway undertakings.

Even within each sector, shunters may have different responsibilities. For example, in the FOC community, a shunter may either travel with the wagons or be based at a specific location. From the TOC side, some businesses have opted to widen the responsibilities of technical staff at depots to include shunting of vehicles, whereas others have a distinct separation between the operational and engineering staff. These examples highlight the varying perception of the responsibility of shunters and each variety of 'shunter' will in turn carry with him/ her a different risk profile.

In many TOCs – and increasingly in FOCs – train drivers carry out shunting activities (such as coupling and uncoupling vehicles). Because this report covers the risk *to* shunters rather than the risk *from shunting* per se, such activities are outside its scope.

3 Safety overview

3.1 Shunter fatalities

There have been four shunter fatalities since 1997 within RSSB's reporting scope. An additional shunting fatality occurred in 2006 on a heritage railway, which is outside RSSB's reporting scope.

Though the rate of fatalities for this small population of workforce is sobering, it is an improvement on the previous 10 years (1987 – 1997), when there were seven fatalities within RSSB's reporting scope.

A brief description of the fatalities over the past 10 years is given below:

17 July 2006: Dagenham Dock Yard Down Siding

What happened?

A FOC shunter was crushed whilst carrying out a movement to couple a single wagon and a Class 47 locomotive. The formal investigation concluded that the shunter had tripped over on a damaged walkway into the path of the moving vehicle. It is unclear however, what effect, if any, the shunter's heart problems had on the outcome.

Lessons learnt:

- At each location, there is a need for well-maintained, safe walking routes between frequently-used areas. These include the need to sign hazards and manage substandard clearances where moving trains are present.
- Wherever possible, the loading of wagons should be planned to reduce the number of shunt moves required. This should form part of the local working instructions².
- The importance of visual management, and other robust competence monitoring arrangements.

14 January 2005: Old Oak Common

What happened?

A FOC shunter was preparing the buckeye (manual) coupler for attachment with an approaching train without first stopping the movement. The driver received a command to 'keep coming', but when the movement stopped, the shunter was trapped between the two coaches.

The investigation identified that the shunter was being briefed by the driver, ie, in opposition to the protocol laid out in the Rules.

Lessons learnt:

- Importance of understanding the accountabilities of shunters (to control movements) and drivers (to take instruction from the shunter).³

² It should be noted that the risk from moving heavy lifters (used during loading wagons) may be greater than the risk from shunting a wagon and hence, these movements should also be limited where required.

- The importance of shunters being involved with planning work (ie, as the person responsible for controlling movements in the yard).
- Importance of radio communication and the potential need for recording it.
- The need to review the effectiveness of continuous speech protocols for propelling movements (and whether there are preferred protocols).

29 June 2000: Willesden Railnet depot

What happened?

A trainee FOC shunter was allocated to a supervisor who did not see him as frequently as required. Having just seven weeks' experience, he was left to work on his own and subsequently became trapped between the buffer stops and a vehicle during a pull-away test.

It later transpired that the shunter's limitations during his initial training were not passed on to his supervisor.

Lessons learnt:

- The importance of staff supervision and management, including mentoring for new starters.
- The need for/ development of robust competence management structure.
- Consolidation of basic training to identify shortfalls, with progress communicated to local management.

27 January 1998: Cwmbargoed (Rhymney Valley line)

What happened?

A FOC shunter was run over by a train that was being berthed in readiness for loading. After the wagons had been drawn out of the siding, the points were not reversed; the locomotive then propelled the wagons back along the same road. The shunter was standing in this road in an attempt to operate the point handle at the other side of the tracks.

Lessons learnt:

- The need for/ development of robust competence management structure.
- Shunter staff to cross track where required, and stand in a position of safety, before giving a shunting move on the radio.

19 July 2006: Gwili Heritage Railway

The most recent shunter fatality occurred (outside RSSB's reporting scope) on 19 July 2006 at the Gwili Heritage Railway near Carmarthen. At Bronwydd Arms, a Class 03 locomotive was being used to attach an additional Mark 1 carriage to a train. The move was controlled by hand signals, but the guard of the train became trapped between the carriage and the rest of the formation. He sustained severe injuries and later died in hospital.

³ As laid out in Rule Book Module 2 – *Shunting*

3.2 Shunter serious injuries

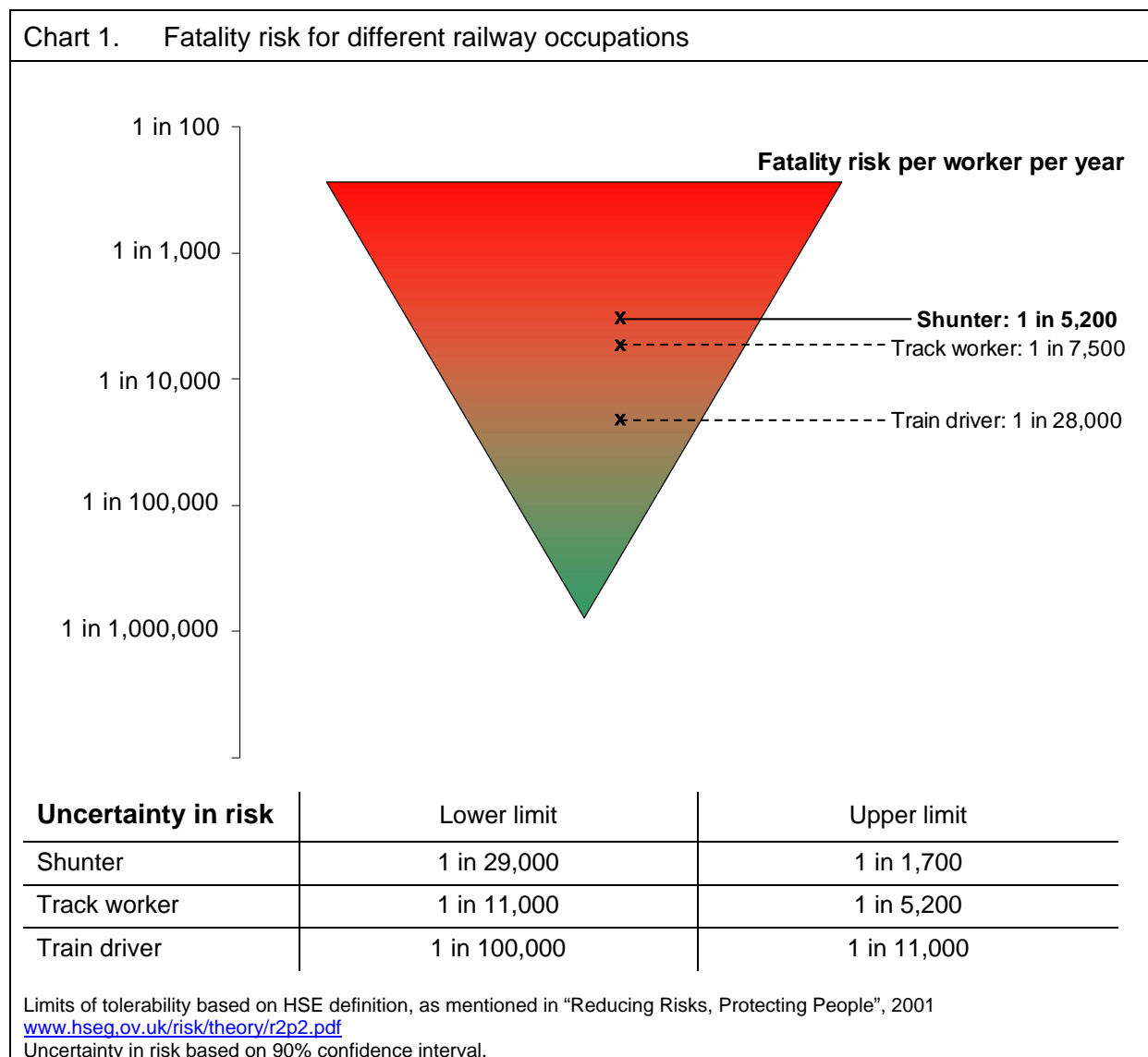
Section 3.1 showed that shunter fatalities are often the result of getting trapped in between two vehicles. In May 2007 a freight shunter survived an accident which saw him being trapped between a locomotive and a wagon at Trafford Park Sidings.

Serious injuries affecting shunters can involve legs being amputated by rolling stock running over them. Some recent examples from the freight industry include Harlow Mill (August 2007) and Scunthorpe Coal Handling Plant (June 2002), where both shunters fell under a train. These accidents have highlighted the risks from walking on the four foot without facing the traffic and riding on the footstep of a locomotive.

3.3 Shunter risk in context

3.3.1 Fatality risk

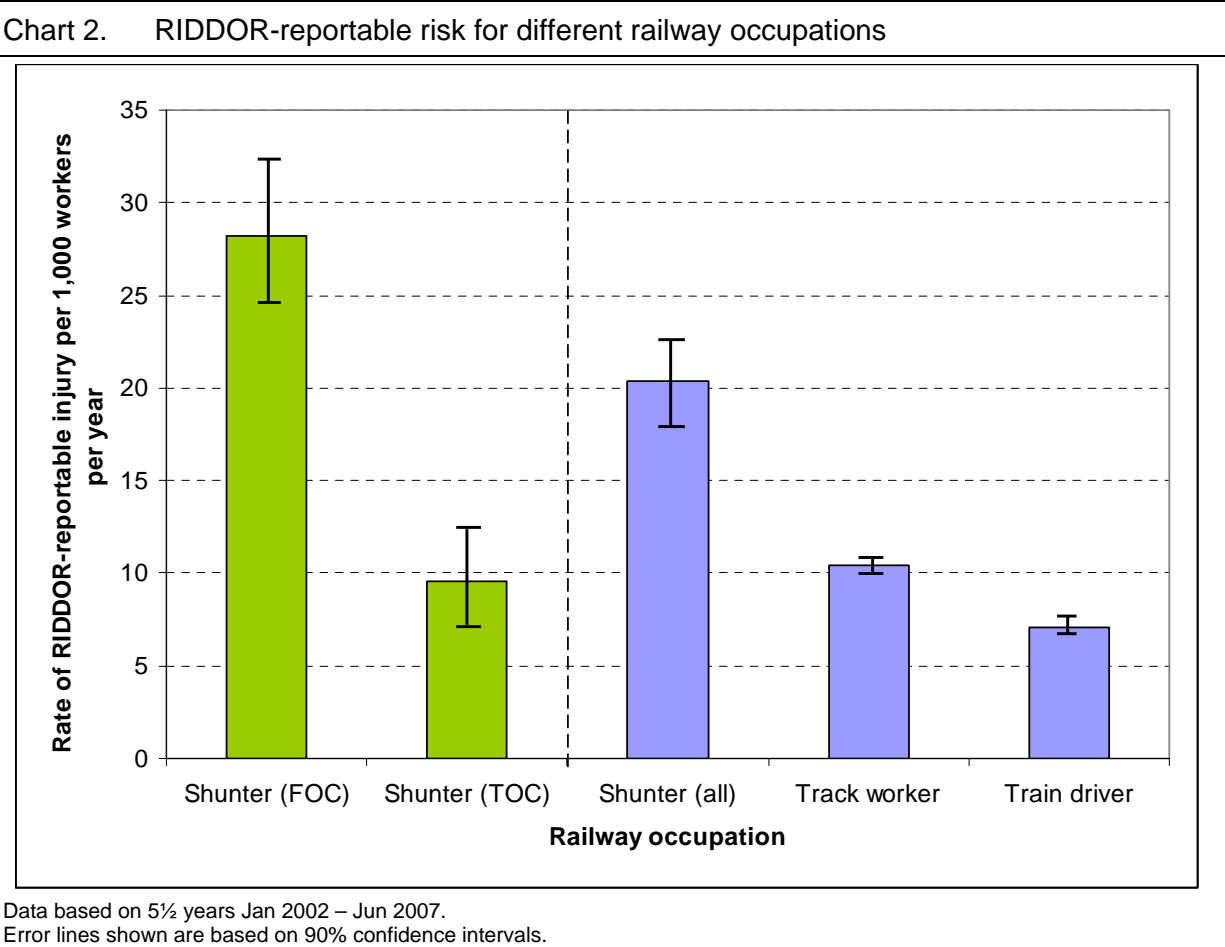
Chart 1 presents the individual fatality risk for the shunters, track workers and train crew. The analysis is based on data for the 5½ -year period between January 2002 and June 2007.



Shunters face the highest risk of the occupations displayed, followed by track workers and train crew. It should be noted however, that the number of staff working as shunters is relatively low. A single fatality therefore has a substantial impact on the level of *estimated* individual risk; thus there is a large amount of statistical uncertainty in the figure quoted (as shown in the table).

3.3.2 RIDDOR-reportable injury risk

Chart 2 compares the RIDDOR-reportable risk for the three workforce groups. The risk for shunters has also been split into FOC and TOC to show the difference between them.



It is clear that shunters again face the highest risk compared with the other two occupations. The lower limit of the risk for the combined shunter population is significantly larger than the upper limits for either of the other two. It is worth noting, however, that much of this risk is attributed to FOC shunters, whose rate is considerably larger than their TOC counterparts.

It is also worth noting that TOC shunter risk is comparable to that of track workers and is higher than that for train drivers.

4 Shunting safety analysis

4.1 Summary of analysis

4.1.1 Headlines

- On average, there are approximately 4 lost-time injuries per 100 shunters per year for FOC shunters. This compares to 1.5 lost-time injuries per 100 shunters per year for TOC shunters.
- In general, FOC shunter incidents tend to be more severe than TOC shunter incidents; 30% of reported FOC shunter incidents result in lost-time, compared with 20% for TOC shunters. Of these, 9% of FOC shunter lost-time incidents resulted in more than 13 weeks off, compared with 2% for TOC shunters.

In general, the average lost time for each shunter in a year is as follows:

0.7 days for FOC shunters

0.2 days for TOC shunters

- Slips, trips and falls amount to one-third of all lost-time incidents for both FOC and TOC shunters. Most slips, trips or falls occur whilst *'moving around or between work areas'*. This highlights the importance of regular planned general inspections, personal track safety and managing hazards in the surroundings, such as objects on the track or deteriorating walkways.
- Sprains and strains are the most common type of injury for both FOC and TOC shunters, but there is also no overriding causal activity. This suggests that shunters are susceptible to these types of injuries in almost everything they do.
- FOC shunters are more susceptible than TOC shunters, to lost-time injuries attributed to awkward movement and manual handling. This is likely to reflect the greater amount of manual coupling carried out by FOC shunters.
- There have been four FOC shunter and no TOC shunter fatalities as a result of accidents involving train movements. This is indicative of the different nature of a typical TOC shunter and a typical FOC shunter, the latter being predominantly based on the ground and therefore more exposed to unprotected trains.
- Boarding and alighting incidents constitute a higher proportion of TOC shunter risk, compared with FOC shunters. This reflects the increased requirement for TOC shunters to board and alight vehicles in order to carry out their shunt-driver duties.
- The highest proportion of shunter incidents occurs between 00:00 - 02:00 for TOC shunters, compared with 10:00 – 12:00 for FOC shunters.
- The highest proportion of lost-time and RIDDOR-reportable injuries for FOC shunters occurs during the third and sixth hours in the shift. This coincides with breaks and may suggest that the timing and content of food consumed may play a role in a shunter's ability to carry out his/ her duties safely.

4.1.2 Data

Railway Group Members are currently not obliged to record shunting incidents that take place off Network Rail Managed Infrastructure (NRMI) into the Railway Group Members' Safety Management Information System (SMIS), although a number find it useful to do so. Shunting is an activity predominantly carried out at depots, yards and sidings and therefore, other than for fatalities, SMIS data is unlikely to provide a comprehensive picture of shunter safety.

Data Scope

In order to align the analysis with the broad responsibilities of shunters mentioned in section 2.2, data used for TOC analyses includes incidents affecting shunt drivers as well as groundstaff. FOC data predominantly includes incidents affecting groundstaff only.

The scope of the data available in SMIS is not reflective of the shunter risk. The disadvantages of incidents occurring at depots, yards and sidings not being recorded in SMIS include the following:

- It is difficult to gain a national picture of the risk from shunting.
- A thorough assessment of shunter safety has not been carried out, which may be indicative (and partially responsible for) the lack of attention this area has received compared with, say, train drivers and track workers, for example.
- It is outside the scope of the SRM, which is widely used by companies to assess their safety risk, as well as being the basis for devising the entire industry's strategic safety plan (SSP).

Data sources

In order to build a comprehensive picture of shunter safety for this report:

- TOC data was extracted from SMIS in cases where companies have declared that they input non-NRMI incident details (note that these were supplemented with companies' own information for completeness).
- FOC data was solely sourced from a sample of FOCs. The sample covered the large majority of shunters in the freight sector.

Data classification

The data originated from different recording systems, which have inconsistent information and classification systems. Therefore, to enable analysis of the aggregated dataset, each injury was re-coded using common classifications. These were as follows:

- A hazardous event was broadly assigned in accordance with version 5 of RSSB's Safety Risk Model (SRM v5).
- The activity being carried out by the shunter at the time of the incident was broadly described. These include, but are not limited to, '*moving around or between work areas*', '*coupling / uncoupling*' and '*operating hand points*'.
- The nature of the injury was included in broad categories, such as '*cuts / bruises / grazes*', '*sprains / strains*', and so on.

In some cases, (and for some companies' recording systems), there was insufficient information to categorise an event in one or more of the areas. Each analysis is therefore based on the data where sufficient information was available.

In order to categorise the severity of the incident, RSSB normally uses three classes: fatality, major injury and minor injury – each being 'weighted' accordingly. SMIS uses the same severity-classification, but there is no obligation for individual companies to do the same in their own safety data. It was not possible, therefore, to use the usual categories of injury degree in this analysis. Companies are, however, obliged to record RIDDOR-reportable incidents and tend to include whether an incident involves lost time.

RIDDOR-reportable injuries that are relevant to shunter data include the following⁴:

- *Fatalities.*
- *A 'major' injury, relevant to workforce only and including specific injuries such as amputation, fracture, dislocation of spine, medical treatment, eye injuries, hot metal burns, loss of sight.*⁵
- *Any injury that results in workforce lost-time of over three days.*
- *Any incident that results in the injured requiring hospital attention for greater than 24 hours.*

Injuries that are classified as 'major' in accordance RIDDOR 1995 are also deemed 'major' according to the RSSB classification. Hence, all 'major' injuries are reportable, but not all reportable injuries are necessarily 'major'.

In order to avoid any errors in the data, all incidents have been categorised according to whether they resulted in lost-time, are RIDDOR-reportable or otherwise. By its definition, some RIDDOR-reportable incidents are also lost-time incidents. Therefore, any incident labelled as 'lost-time only' within the analysis, will not be RIDDOR-reportable and will be of less than three day's (ie, <3 days) duration.

Normalising the data

Shunter numbers have been used to normalise the data. Shunter numbers provides the best measure of individual shunter safety, allowing the frequency of incidents to be calculated *per shunter*. For the greatest accuracy, Whole-Time Equivalent (WTE) staff numbers would be used, though this is difficult to determine, due to the diverse nature of shunters' responsibilities within different organisations. Where suitable, however, injuries occurring whilst undertaking tasks that are not specific to shunting, but are carried out by those who routinely carry out shunting tasks, have been included in this analysis. This method goes a step further to bring the normalising data in line with WTEs.

As the data included information from a sample of companies, the total number of shunters within the sample population was used in calculations. These numbers were supplied by the companies covered in the sample.

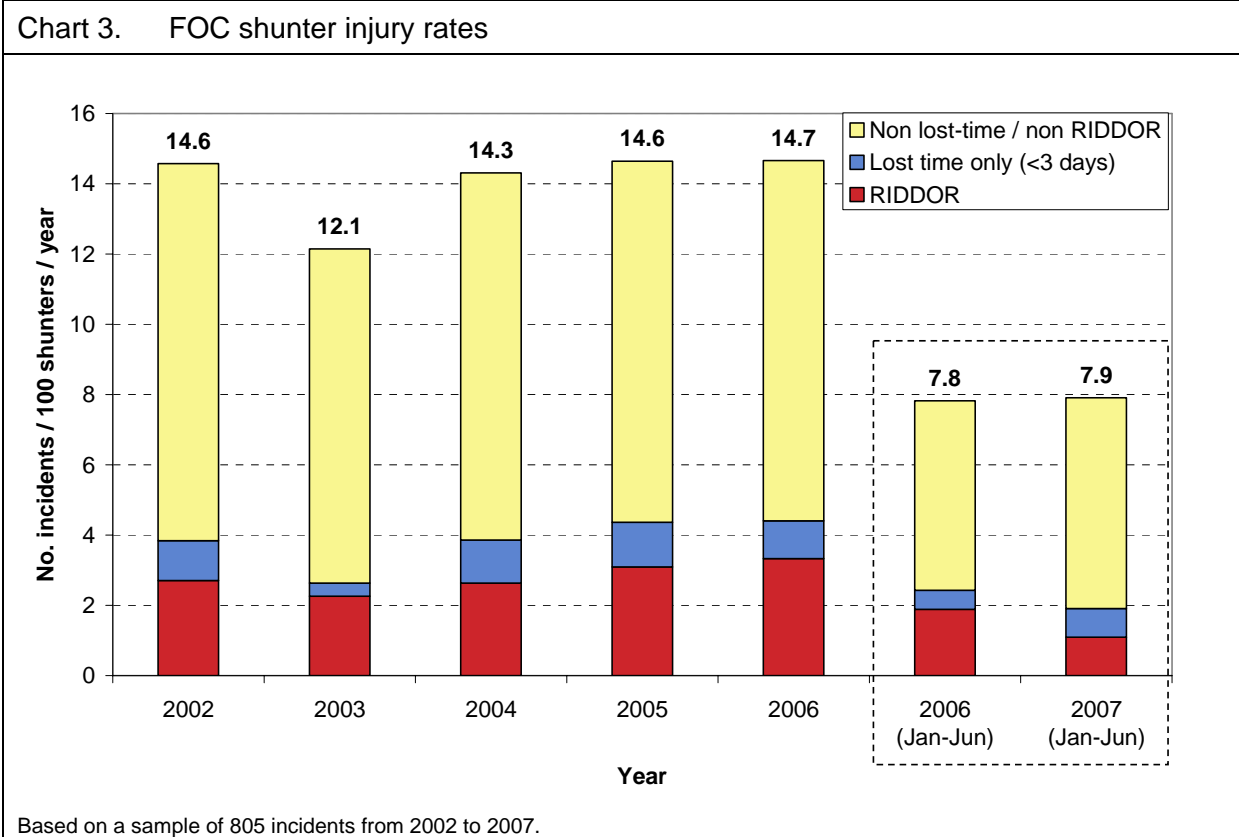
⁴ GE/GN8522 RIDDOR 1995–Supplementary Guidance on Statutory Reporting, Iss. 1, Oct '99, Part D

⁵ GE/GN8522 RIDDOR 1995–Supplementary Guidance on Statutory Reporting Iss. 1, Oct '99, Clause 4.3: Major injury - Schedule 1

Trends in FOC shunter accident rates

4.1.3 Shunter injury rates

For FOC shunters, the overall injury rate (per 100 shunters) has remained approximately static since 2002. There is a slight increasing trend in lost-time and RIDDOR-reportable incidents since 2002, though these are of marginal significance. This is evident in Chart 3.



On average, 20% of reported injuries are RIDDOR reportable. In addition, approximately 7% result in lost-time of up to three working days.

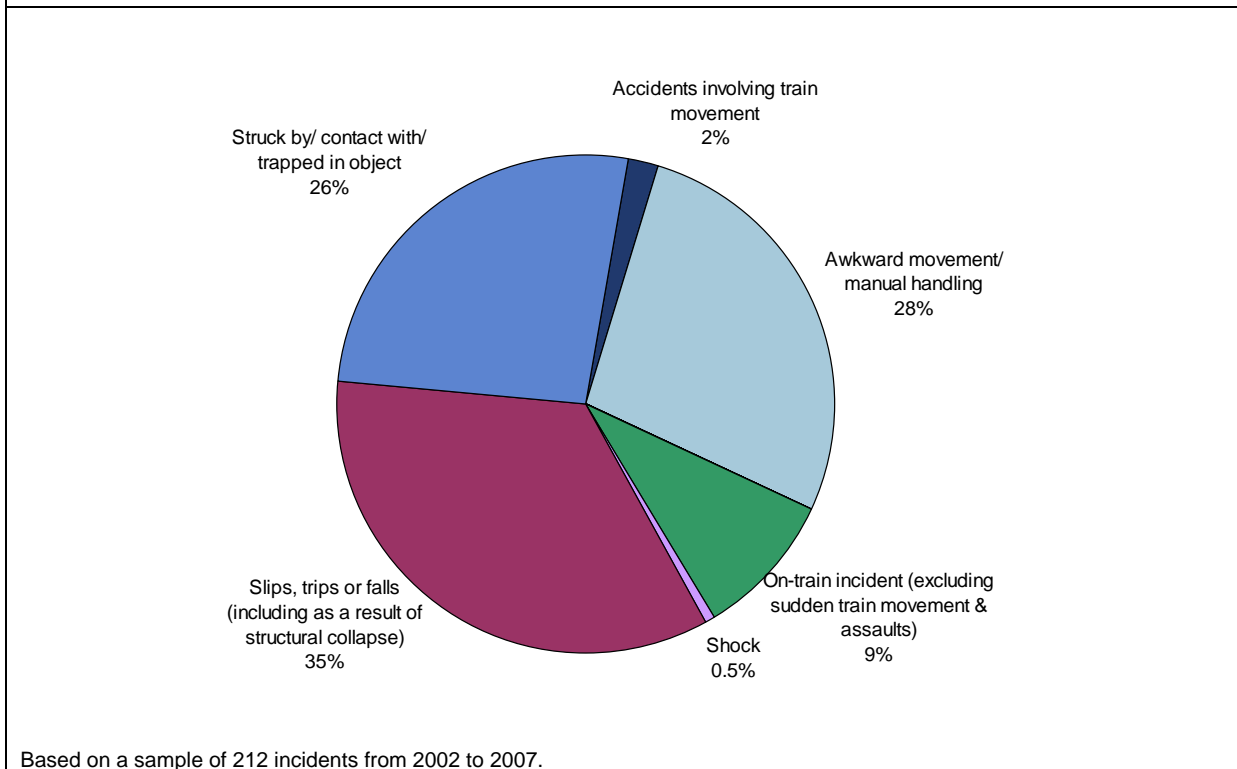
4.1.4 Breakdown of FOC shunter incidents

The breakdown of hazardous events leading to lost-time incidents for FOC shunters is shown in Chart 4. Around one-third of lost-time incidents are attributed to ‘slips, trips or falls’, with a high proportion of incidents also due to ‘awkward movement/ manual handling’ and shunter ‘struck by/ contact with / trapped in object’.

‘Accidents involving train movements’ contribute 4% of lost-time injuries. All shunter fatalities and most incidents resulting in amputation over the past 10 years lie within this category and it has by far the greatest average severity level of all the events. It is important to note, therefore, that the chart is not weighted by severity.

Further details of shunter fatalities and serious injuries may be found in section 3.1.

Chart 4. Freight: Distribution of hazardous events



Where there was sufficient information in the data, shunter activities leading to the hazardous event have been included in the analysis. The distribution of hazardous events by activity is shown in Chart 5. The following key points are evident:

- Most *'slips, trips or falls'* occur whilst the shunter is walking on and about the infrastructure. This is understandable, given the nature of the trackside environment in which the shunter population is predominantly based.
- Most instances of *'awkward movement/manual handling'* occur whilst operating hand points or during coupling and uncoupling manoeuvres.
- Instances resulting in shunters being *'struck by/contact with/trapped in objects'* are more evenly spread across the activities, with most instances involving trapped hands during coupling/ uncoupling and being struck by objects whilst preparing vehicles (while positioning stanchion pins, for example).



Chart 5. Freight: Proportion of hazardous events per activity

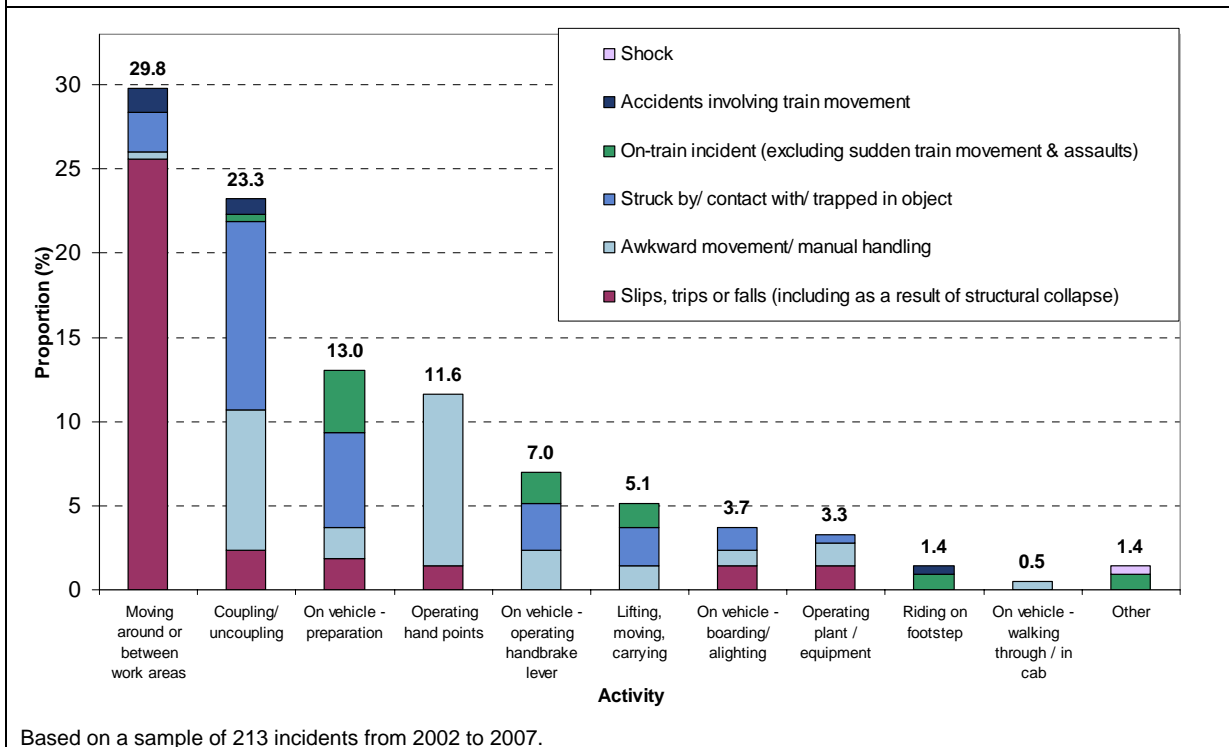
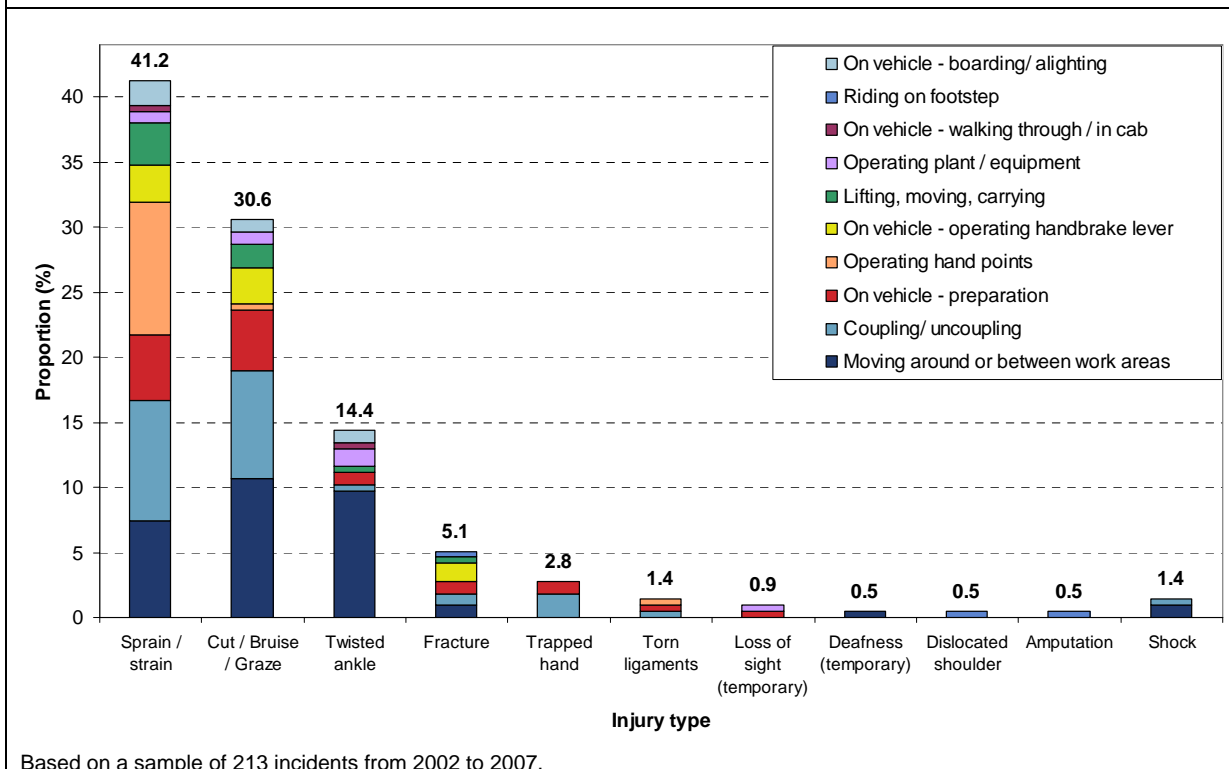


Chart 6 shows a breakdown of the types of injuries obtained as a result of all lost-time incidents for a range of typical shunter activities.

Chart 6. Freight: Injuries obtained as a result of lost-time incidents (by activity)



The key results include:

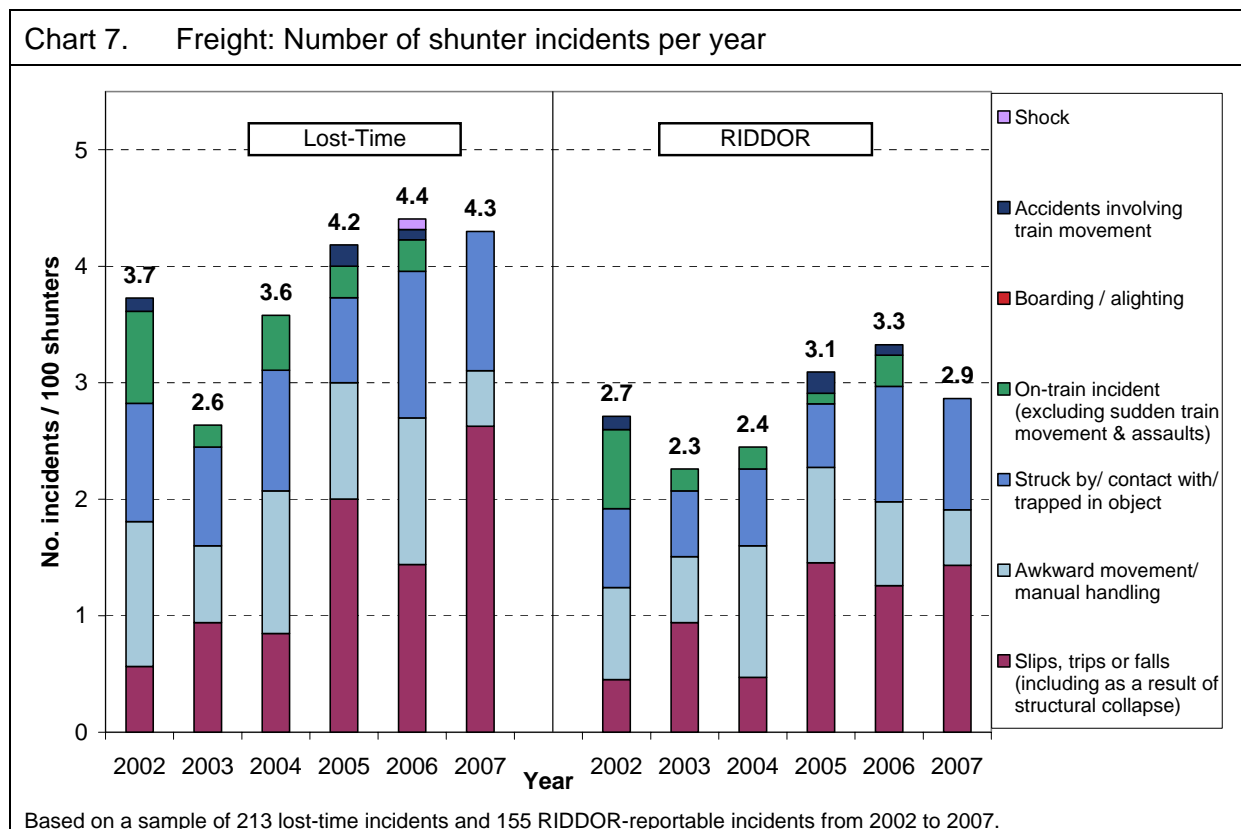
- The highest occurring injury types for FOC shunters are ‘sprain/ strain’ and ‘cut/ bruise / graze’. There is no one overriding activity that leads to either of these injury types. They can occur during many shunting duties.
- In terms of injuries, the most severe consequences have arisen when ‘coupling / uncoupling’ and when ‘riding on footsteps’. Though not shown in the chart, fatalities are normally associated with coupling / uncoupling, especially during propelling moves, and amputation can be associated with ‘riding on vehicles’.
- Though moving around or between work areas is a high-frequency, relatively low-consequence activity, it is worth noting that an uneven path may have contributed to the fatality at Dagenham Dock (see section 3.1).

4.1.5 Injury trends

4.1.5.1 Distribution of lost-time and RIDDOR-reportable incidents

Chart 7 depicts the rate of lost-time and RIDDOR-reportable incidents from 2002.

It shows that, for both lost-time and RIDDOR-reportable incidents, the number of incidents has marginally increased over the past five years.

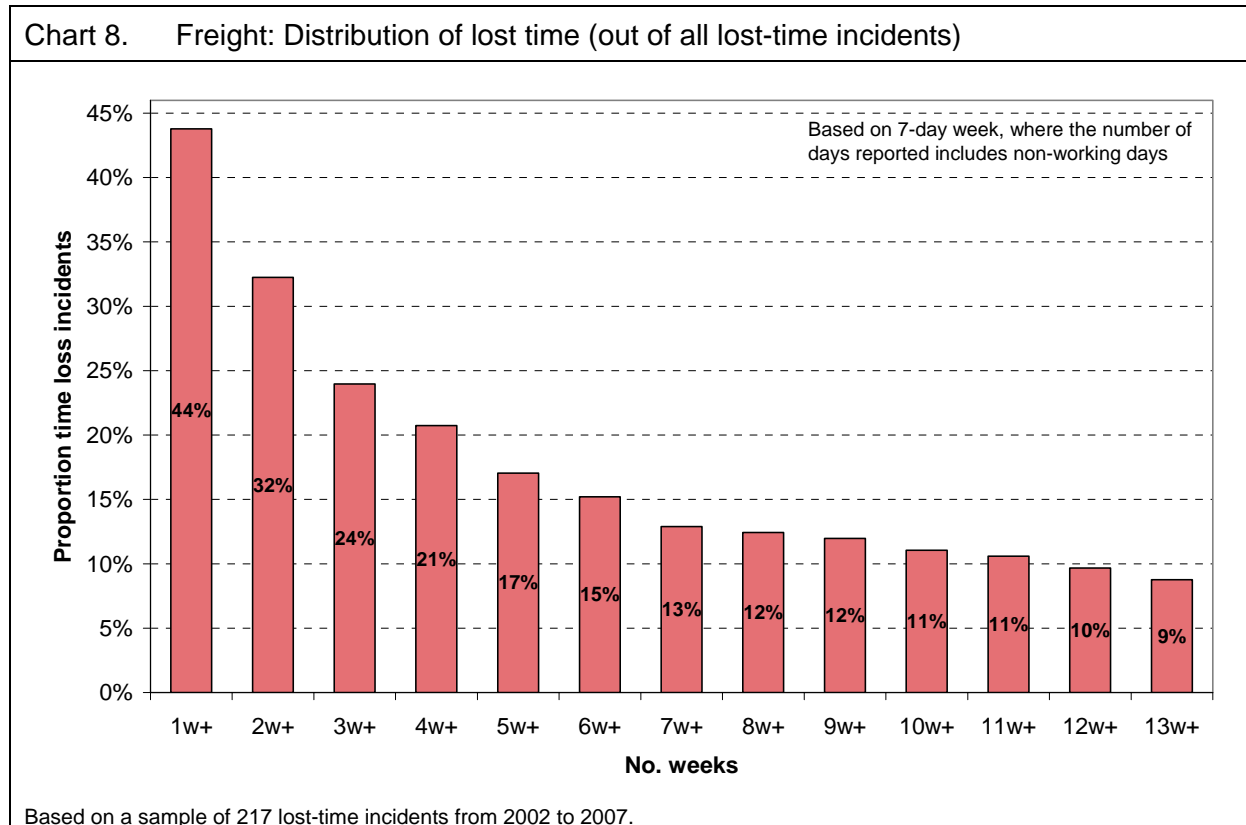


Incidents of slips, trips and falls have made an increasing contribution to both lost-time and RIDDOR incidents since 2002. The frequency of other hazardous events changes little throughout the period, with the exception of on-train incidents (excluding sudden train movements), which have decreased. A possible explanation for this decrease in on-train incidents may be that newer vehicles and improved competency management systems have reduced the risk from train preparation, handling stiff doors and operating handbrake levers.

4.1.5.2 Lost time

Thirty per cent of reported injuries result in lost-time; Chart 8 gives a breakdown of the amount of time taken off work at weekly intervals.

Note that approximately 44% of all lost-time incidents result in more than one week's absence. Therefore, in 56% of the cases, the employee returned to work within a week of the accident.



What is perhaps most alarming about Chart 8, however, is that it shows 9% of all lost-time incidents to result in greater than 13 weeks lost time (ie, quarter of a year).

On average, 1 in 26 FOC shunters suffer injuries resulting in lost-time per year. The potential for days lost as a result of FOC shunter incidents is as follows:

- FOC shunters lose an average 0.73 days per year as a result of injuries sustained at work.
- For a lost-time injury, the average number of days lost is 19.

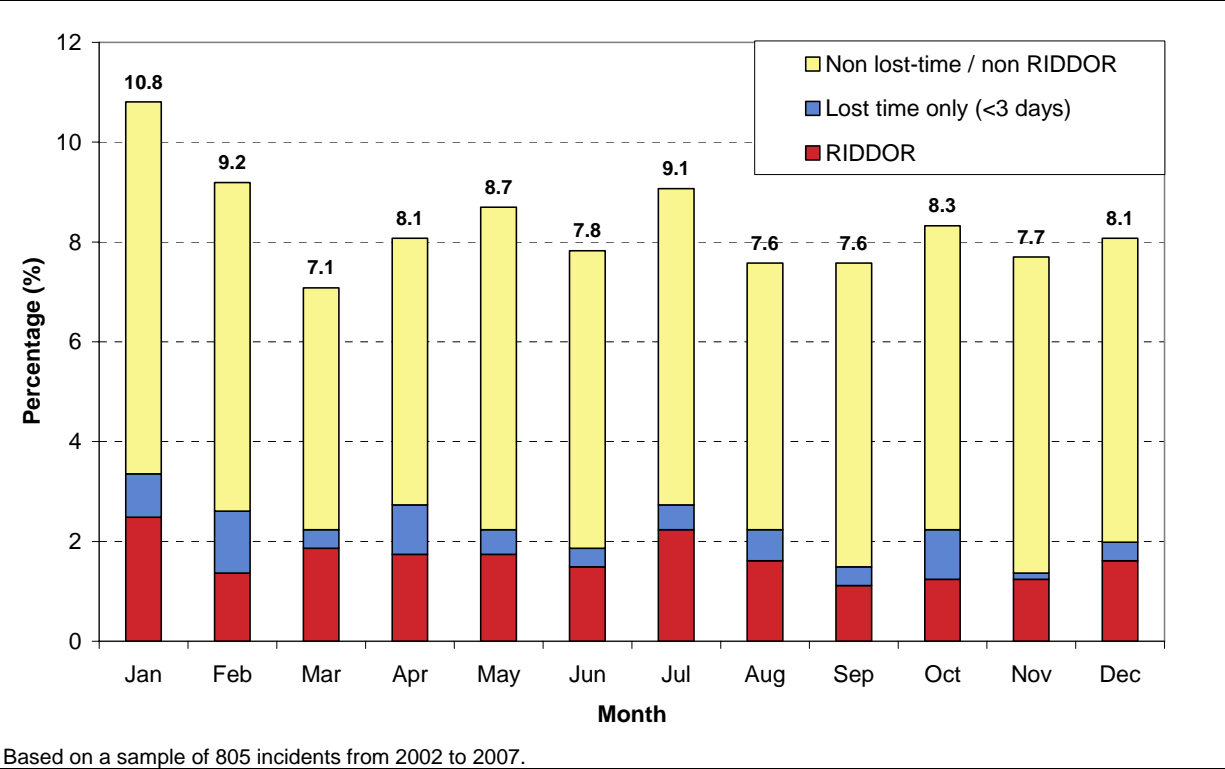
4.1.5.3 Monthly variation

Chart 9 displays the proportion of incidents per month. Overall, there is little evidence of significant variation between the months, although the number of injuries in January is significantly higher than the expected values for both total and combined lost-time/ RIDDOR reportable proportions.

The underlying data shows no predominant events that contribute to the high proportion of incidents in January compared with other months. The relatively high proportion of incidents in January and February, however, may result from longer hours of darkness, more debris,

and adverse winter weather conditions. That these do not have a more marked effect may be because people take more care when working in these conditions or winterization procedures in the workplace effectively control the risk.

Chart 9. Number of incidents per month



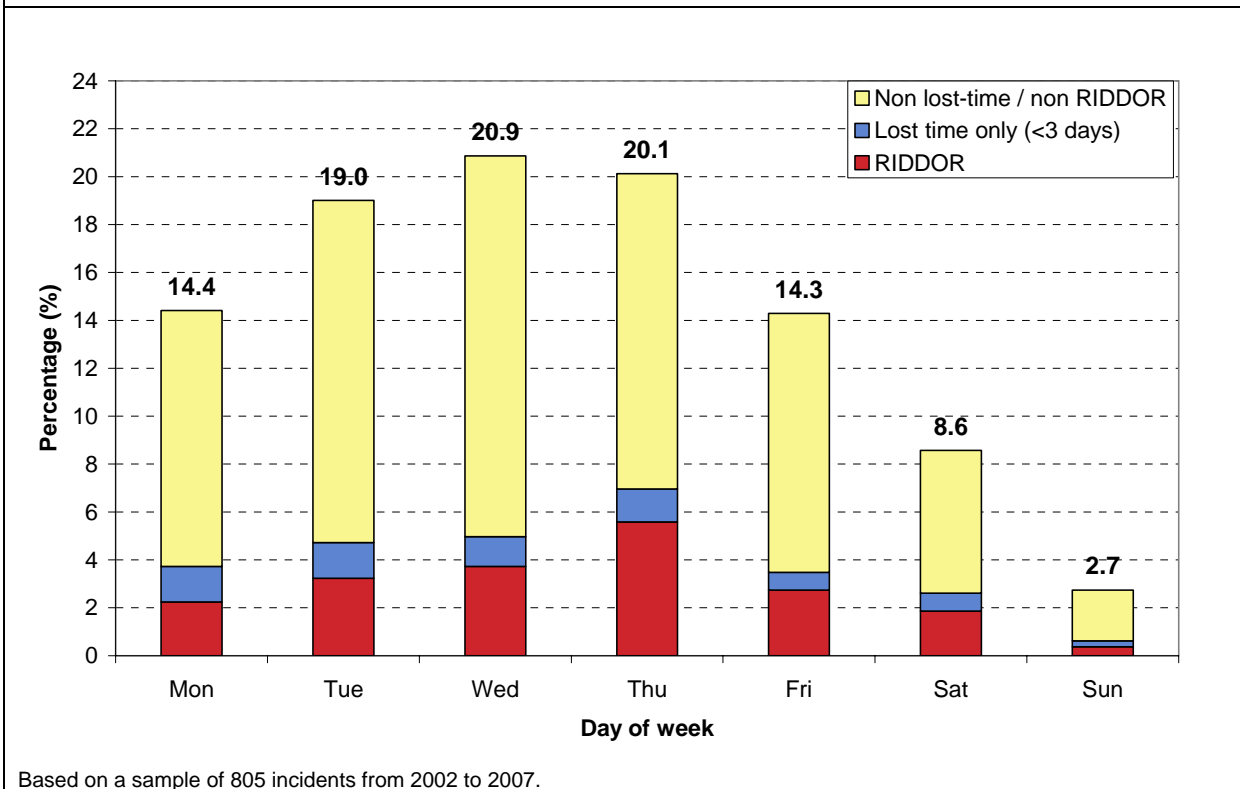
July had the second highest incident rate. Increased heat and vegetation may be a contributory factor, as well as increased overtime working to meet required resource levels during the holiday period.

In general, FOCs will have varying activity levels depending on the industry type and time of year. Major contracts for Network Rail and the coal industry are prominent between September and December, in preparation for the winter. These potentially higher activity levels do not seem to have an effect on the frequency of injuries.

4.1.5.4 Daily variation

Chart 10 displays the proportion of shunter incidents per day. It is clear that the proportion of incidents occurring on Sunday is significantly less than other days of the week, including Saturday. The latter has a lower total proportion of incidents compared with weekdays, but there is not much difference in the proportion of RIDDOR-reportable incidents.

Chart 10. Freight: Number of incidents per day of week



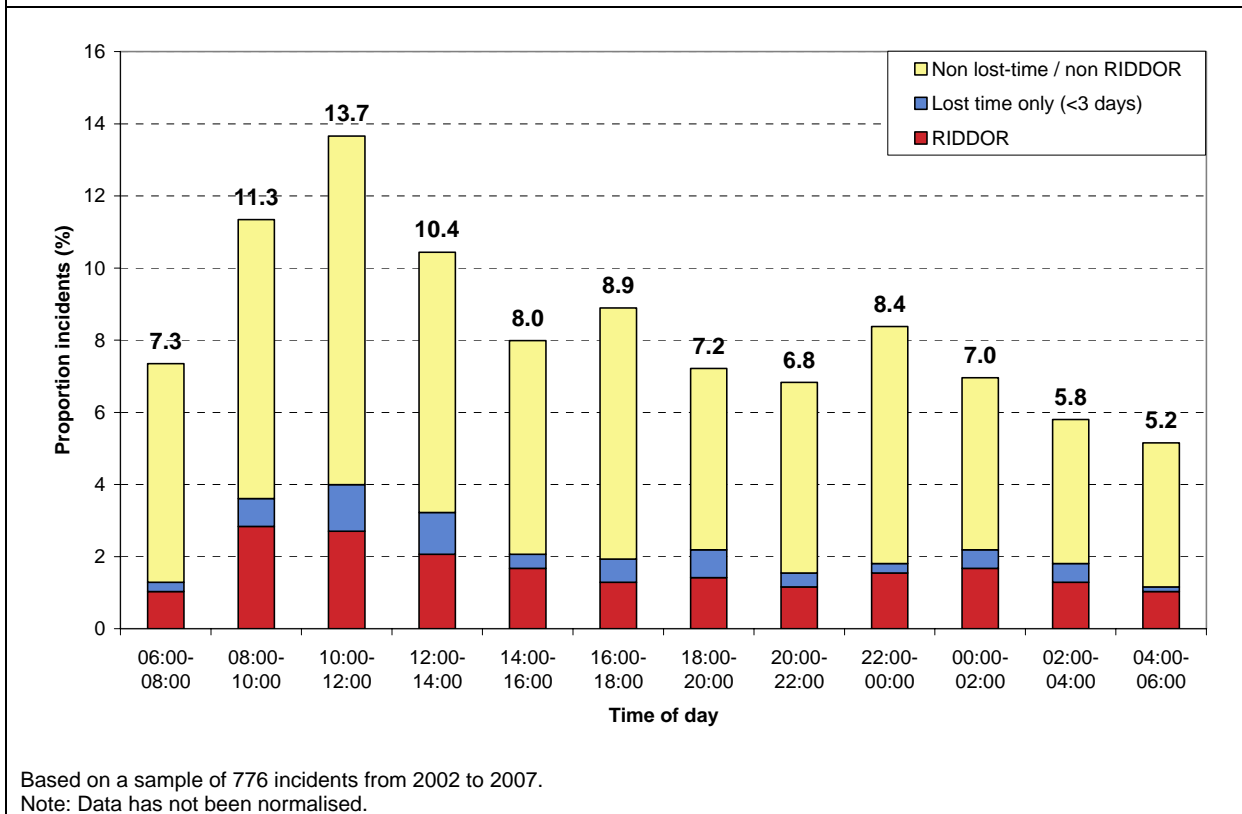
Thursday has a significantly higher proportion of RIDDOR-reportable and lost-time incidents, while Wednesday has the highest proportion of incidents that are neither RIDDOR-reportable nor lost-time. However, there does not seem to be any specific reason for these patterns. Indeed, activity levels within the freight sector are generally highest on Friday, due to preparing stock for weekend moves, yet this is not reflected in the data. Perhaps surprisingly, there seems to be no correlation between activity levels and injuries during the week (ie, Friday sees fewer injuries than Tuesday-Thursday), but the lower injury rate on Sundays can be explained by the low level of activity.

4.1.5.5 Hourly variations

Chart 11 displays the proportion of incidents occurring at different times of the day. The chart suggests that FOC shunters are more susceptible to incidents in the daytime rather than at night.

It shows that a quarter of all shunter incidents occur between 08:00 and 12:00, with a downward trend in the total number of incidents until 04:00-06:00, when the total proportion is at its minimum.

Chart 11. Freight: Incidents by time of day



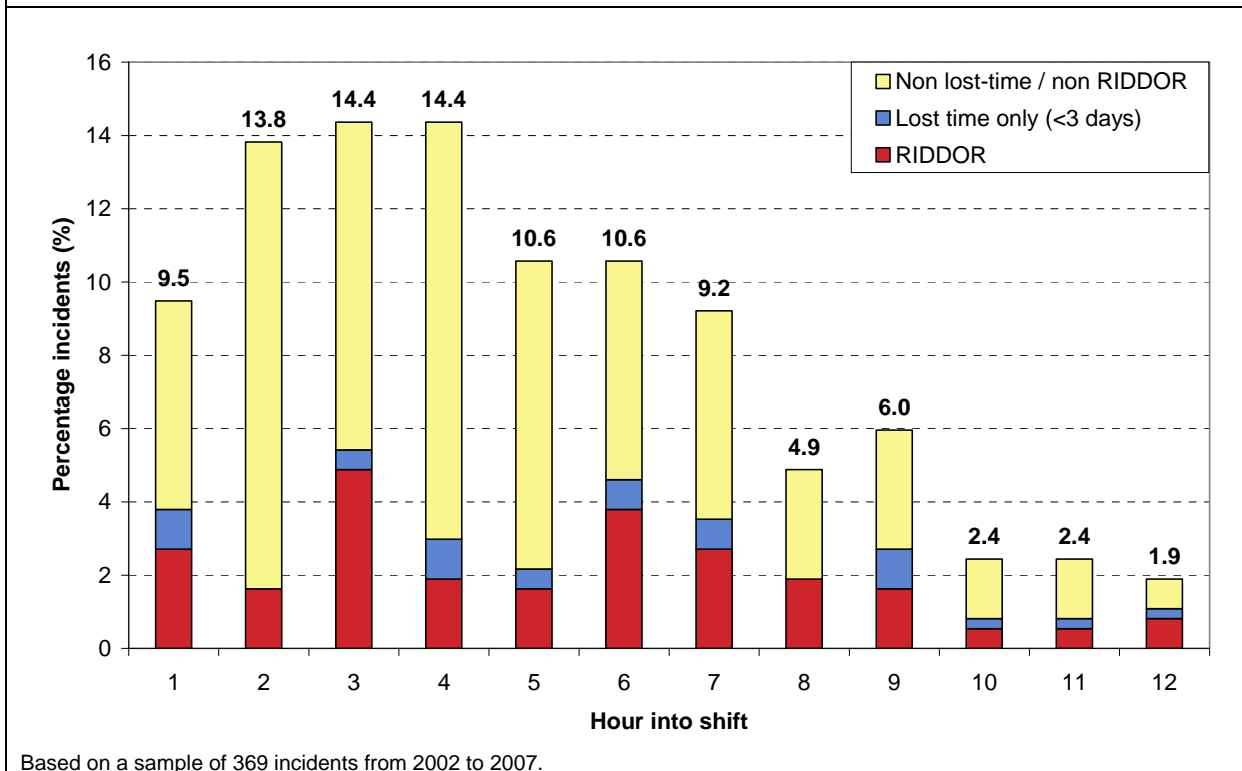
A significant proportion of RIDDOR and lost-time incidents occur between 08:00 and 12:00. At all other times, the proportion of RIDDOR-reportable instances is roughly as expected.

The high proportion of incidents that occur between 08:00 and 12:00 may be seen in Chart 12, which displays the proportion of incidents against the time into shift. Note that incidents are prone to occur within the second to fourth hours from commencement of work. Typically, a day shifts begins between 06:00 to 08:00 and this may explain the surge seen in Chart 11.

There seem to be a fewer proportion of incidents occurring during night shifts. This may be due to reduced activity levels during the night (since most train preparation movements around the yard are carried out during the day). As one might expect, this correlation suggests that the lower the activity levels, the lower the proportion of incidents.

Chart 12 provides some information about the effects of fatigue and taking breaks. The nature of the work means that there is scope for overtime. Therefore, a typical shift may be anywhere between eight and 12 hours long. The exact numbers of shunters that work up to 12 hours is unknown, therefore the apparent reduction beyond the seventh hour is likely to be attributed to a smaller population of shunters, rather than a population that is less susceptible to incidents at these times.

Chart 12. Freight: Incidents against time into shift



RIDDOR-reportable incidents have a slightly different pattern to the profile of total incidents. The highest proportion of RIDDOR-reportable incidents occurs in the third hour into the shift, followed by the sixth hour. When combined with lost-time, these hours have significantly higher injury rates than the average values. Such patterns may be associated with lack of adequate breaks or peaks in workload.

It is perhaps surprising that there is not a marked increase in the proportion of incidents occurring at the end of a shift, when shunters may be prone to rushing and irregular working in order to 'get the job done' in time. Indeed, the highest proportion of **all** incidents occurs between the 2nd and 4th hours. A similar pattern has been found when looking at the time into shift when train drivers are most likely to have SPADs. Like the latter, shunter safety performance may be affected by the timing of breaks (and perhaps the food eaten, as mentioned below).

Another new area of research that has been carried out on train drivers, but will apply to shunters too, concerns the effect of the type of food that workers eat during their breaks. Studies have concluded that there is a correlation between the rate of incidents and the food eaten, with high carbohydrates and fatty foods generally having an adverse effect. This raises a wider issue about the accommodation for shunters, including whether they have the facilities to prepare and store food.

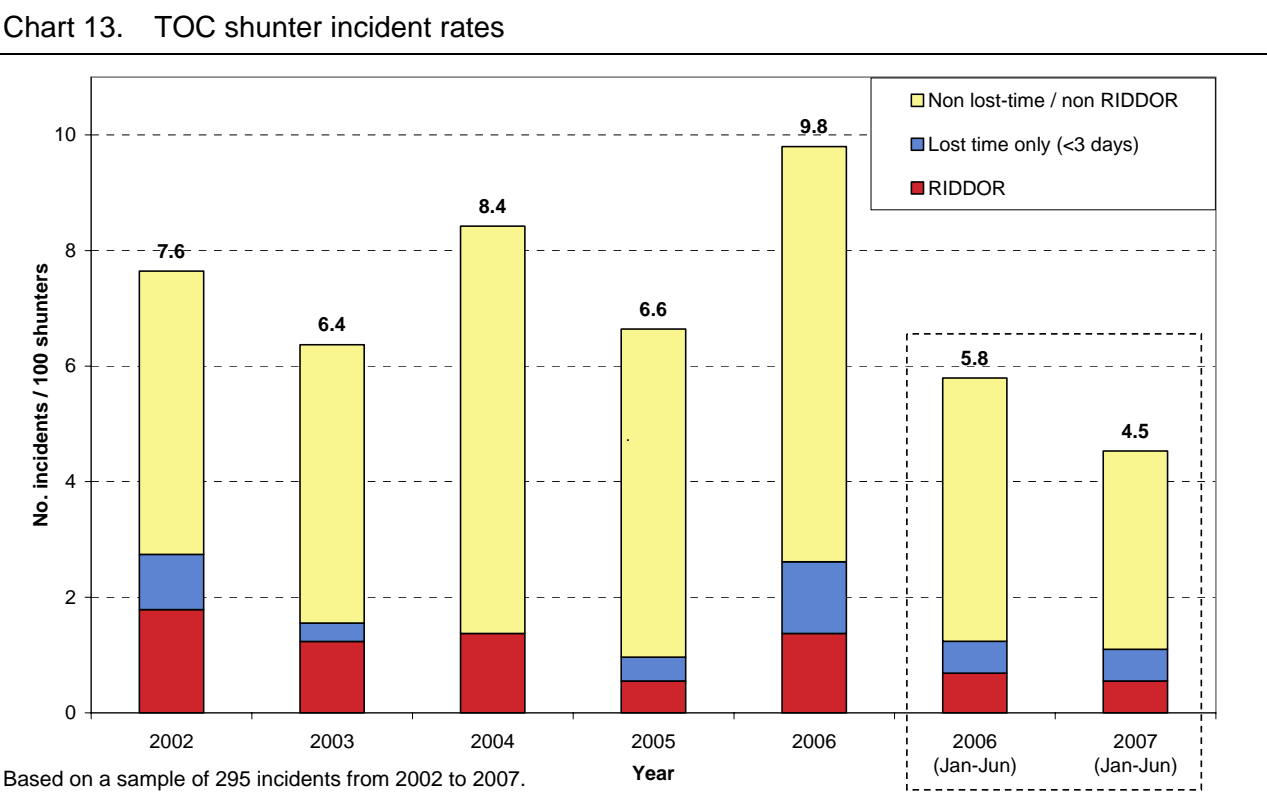
For more information on specific initiatives to improve shunter safety in the freight community, see section 6.1.

4.2 Trends in TOC shunter accident rates

4.2.1 TOC shunter incident rates

The rate of TOC shunter incidents from 2002 is shown in Chart 13.

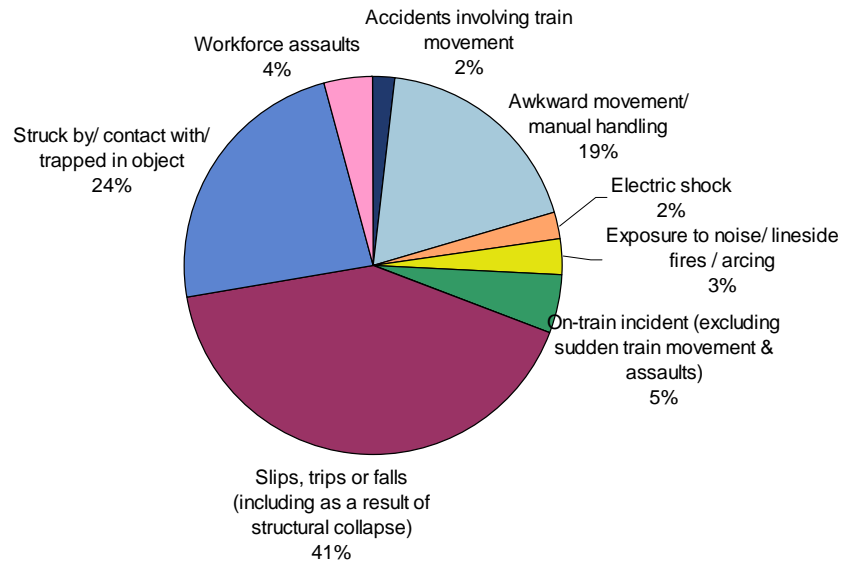
Over the period analysed, the annual occurrence of lost time injuries was around 1 per 68 shunters, 2006 saw the highest total of reported incidents and more lost time injuries than any year except 2002.



The breakdown of hazardous events leading to lost-time incidents for TOC shunters is shown in Chart 14. Over one-third of lost-time incidents are attributed to ‘*slips, trips or falls*’. This is inherent of their working environment.

TOC shunters are also largely exposed to injuries relating to being ‘*struck by / contact with / trapped in object, awkward movement / manual handling*’ and ‘*boarding / alighting*’.

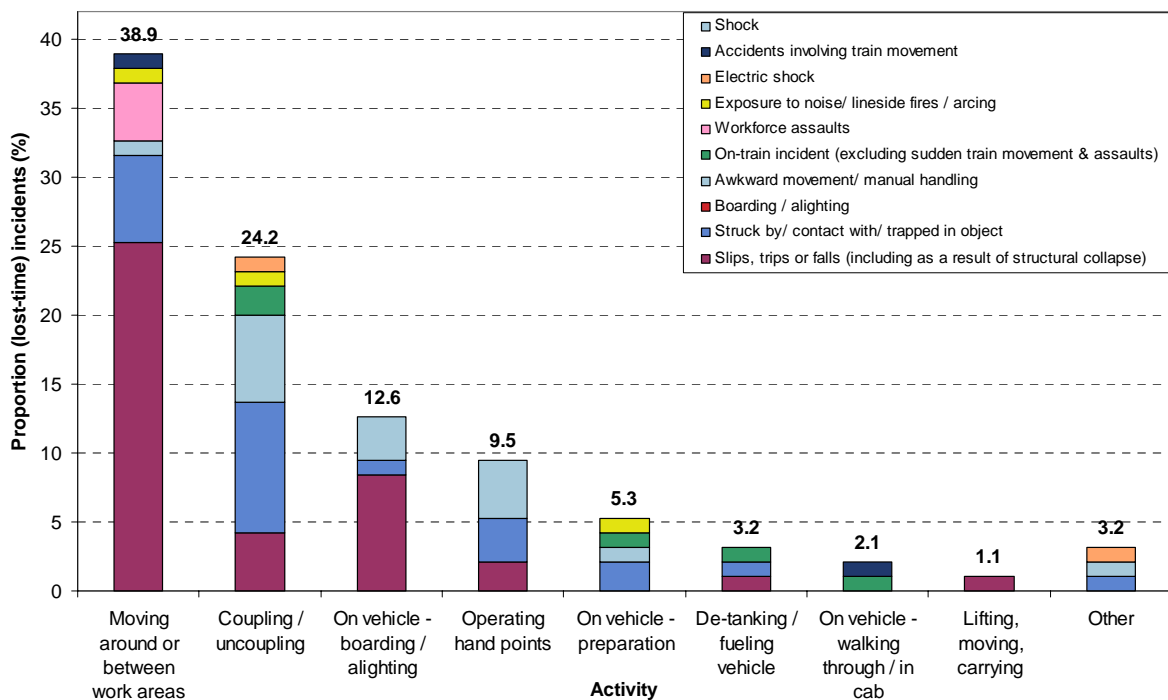
Chart 14. Passenger: Distribution of hazardous events for injuries resulting in lost-time



Based on a sample of 97 lost-time incidents from 2001 to 2007.

Where there was sufficient information in the data, shunter activities leading to the hazardous event were included in the analysis for incidents resulting in lost-time. These are shown in relation to their activity type in Chart 15.

Chart 15. Passenger: Proportion of hazardous events per activity – lost-time incidents



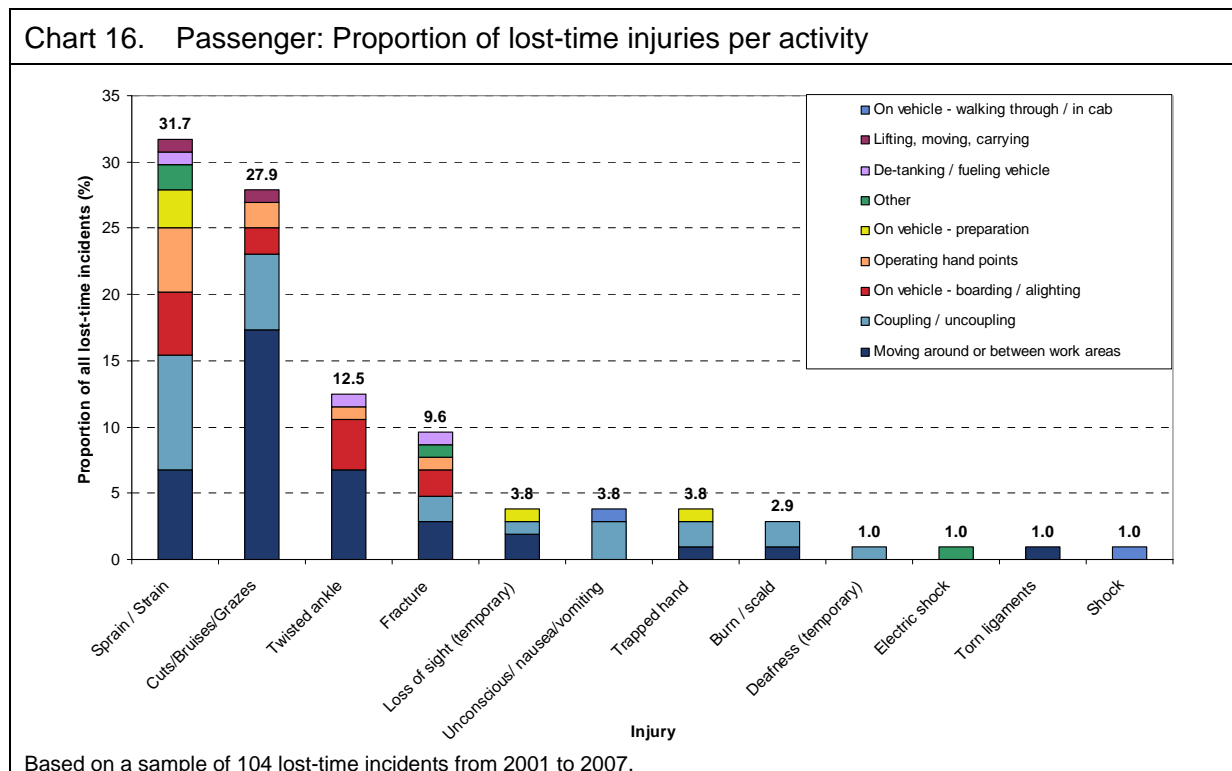
Based on a sample of 93 lost-time incidents from 2001 to 2007.

From the data, the following key points are evident:

- *'Moving around or between work areas'* is the largest contributing activity to lost-time injuries. This is possibly due to environmental factors related to working on railway infrastructure.
- *'Coupling / uncoupling'* is the next most common activity to cause injury. This is despite most TOC shunters operating vehicles with autoconnectors. The main events include getting *'struck by / contact with / trapped in'* the coupling assembly (particularly in the case of locos connected to passenger carriages), though this has decreased since 2002, as units with manual coupling arrangements have been progressively phased out.
- Injuries from *'accidents involving train movement'* may occur either on-board trains, for example, resulting from sudden train movements, or whilst *'moving around or between work areas'*. *'Accidents involving train movement'* contribute only 2% of lost-time injuries, but can have potentially severe consequences.



Chart 16 shows the nature of injuries that have resulted in lost-time by activity.



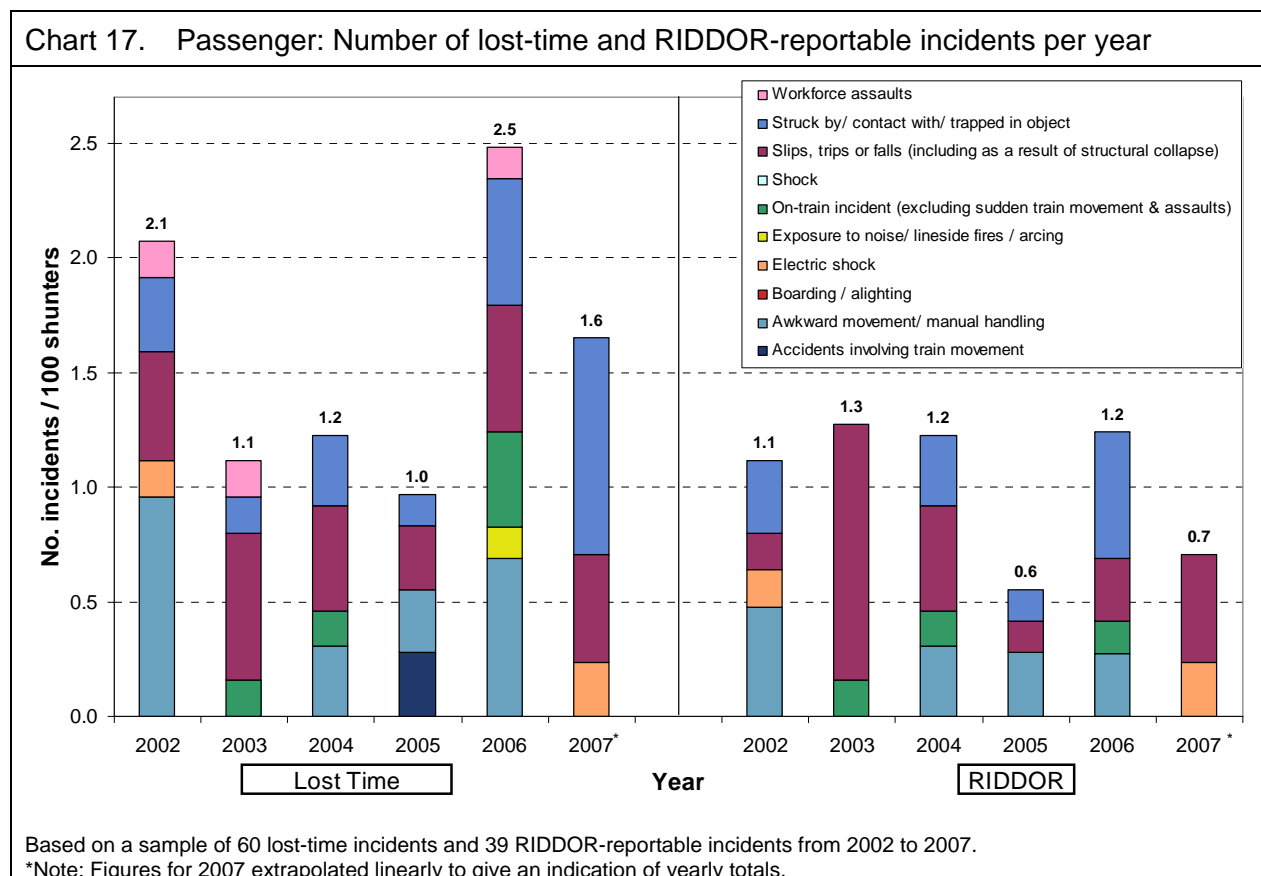
The key results include:

- The overwhelming majority of injuries result in either ‘sprain / strain’ injuries or ‘cuts, bruises and grazes’.
- Incidents resulting in ‘cuts, bruises and grazes’ predominantly occur when ‘moving around or between work areas’ on site.
- Injuries comprising ‘sprain/ strain’ are evenly distributed between the different activities, showing that there is no overriding activity that leads to this type of injury.
- Fractures account for around 9% of all lost-time injuries. Incidents resulting in fracture injuries are attributed to a range of TOC shunter activities.

4.2.2 Injury trends

4.2.2.1 Distribution of lost-time and RIDDOR-reportable incidents

Chart 17 depicts the rate of lost-time and RIDDOR-reportable incidents from 2002. As discussed in the *Data* section, most RIDDOR incidents are also lost-time incidents. The data shows that 2006 had a relatively high number of lost-time injuries. Rates of RIDDOR-reportable injuries have however, remained relatively constant.



- ‘Slips, trips and falls’ have been the largest contributor to lost-time and RIDDOR incidents in 2003 and 2004. It continues to be a factor, confirming the importance of keeping the underfoot conditions as clear as possible.
- Perhaps surprisingly, ‘accidents involving train movements’ do not appear in the RIDDOR-reportable section for this data. This is because, for TOC shunters, accidents involving train movements are most often low-speed derailments or collisions, resulting in

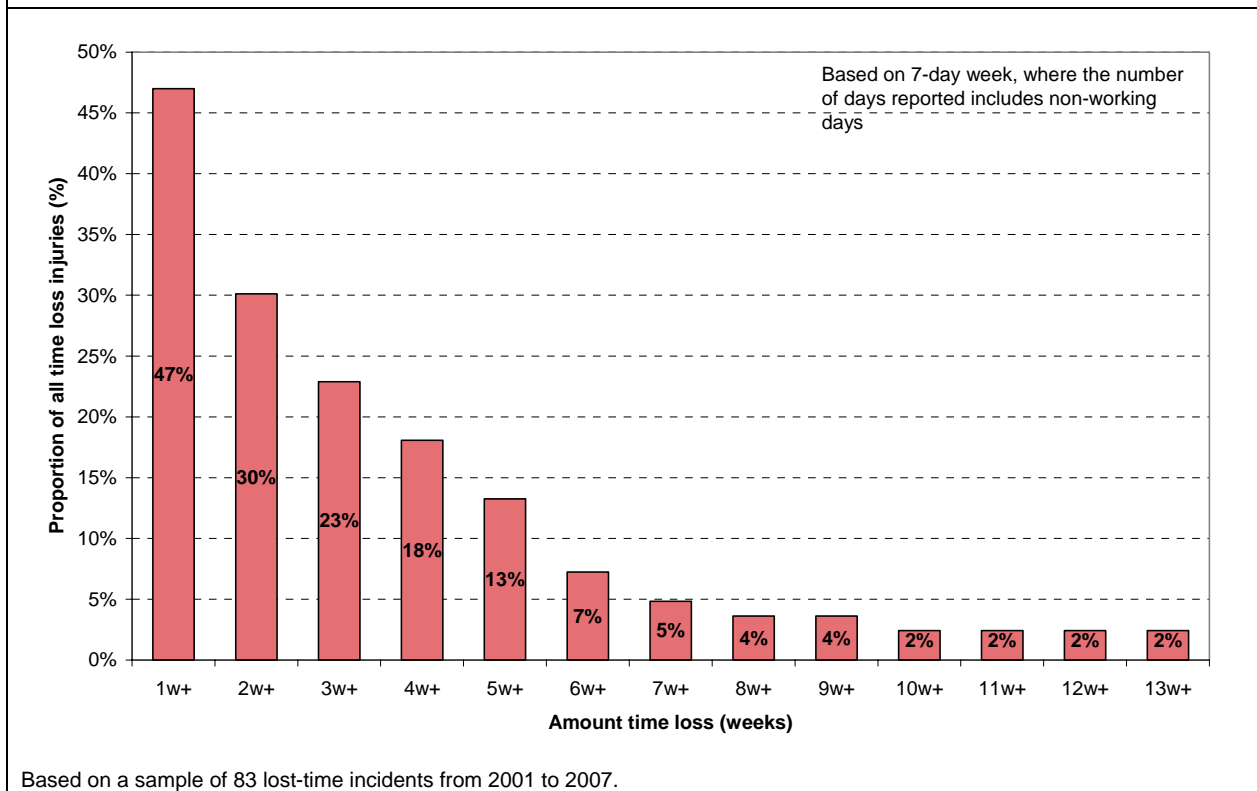
the shunter (or depot driver) suffering shock. FOC shunters are more at risk from being physically injured by moving trains.

4.2.2.2 Lost time

Lost-time injuries constitute 20% of the total injuries for TOC shunters.

Where the number of days absent was provided in the incident data, an assessment could be made about the distribution of the amount of time taken off work. Chart 18 shows this distribution at weekly intervals.

Chart 18. Passenger: Distribution of lost time (out of all lost-time injuries)



Of all lost-time injuries, 47% result in greater than one week lost-time. Only 5% lost-time incidents result in more than seven weeks lost-time. This is reduced further to 2.4%, resulting in greater than 13 weeks lost time.⁶

On average, 1 out of 68 TOC shunters suffer injuries resulting in lost-time per year. [The potential for days lost as a result of TOC shunter incidents is as follows:](#)

- TOC shunters lose an average 0.19 days per year as a result of injuries sustained at work.
- For a lost-time injury, the average number of days lost is 13.

⁶ This corresponds to only two incidents

4.2.2.3 Monthly variation

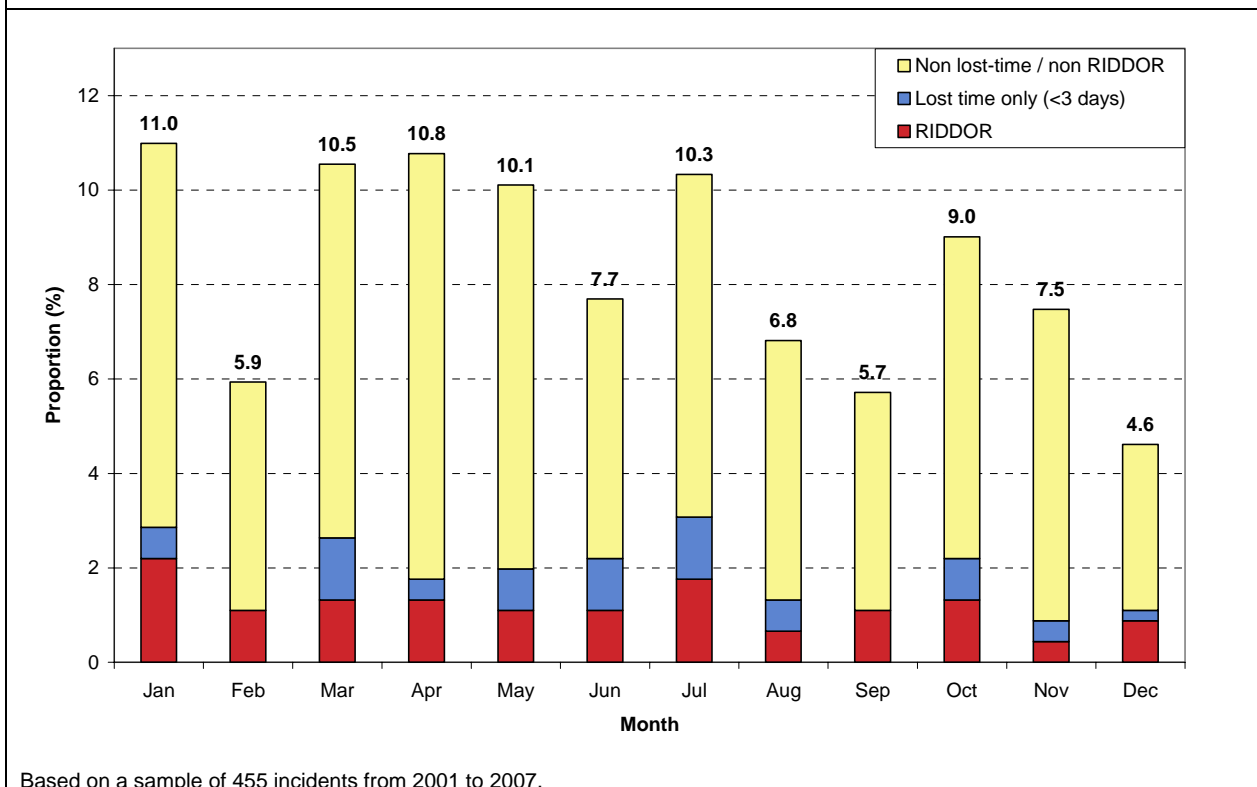
Chart 19 displays the number of incidents by month.

Passenger operations are in general constant throughout the year, with slight variations at Christmas. At other times, any variance should have a negligible effect on the workload of a shunter, so long as the changes are planned and communicated accordingly.

The highest proportion of *total* incidents occurs in January and April, whereas a significantly lower proportion occurs in September and December. Levels of lost-time and RIDDOR-reportable incidents are relatively similar throughout the year, however. Other key points to note include the following:

- The results for December may be indicative of reduced activity over the Christmas period. RIDDOR and lost-time incidents are similar to other months. The results do show however, that timetable changes do not seem to have an adverse effect on shunter safety (this is supported by results from June, which shows a relatively small proportion of incidents).

Chart 19. Passenger: Number of incidents per month

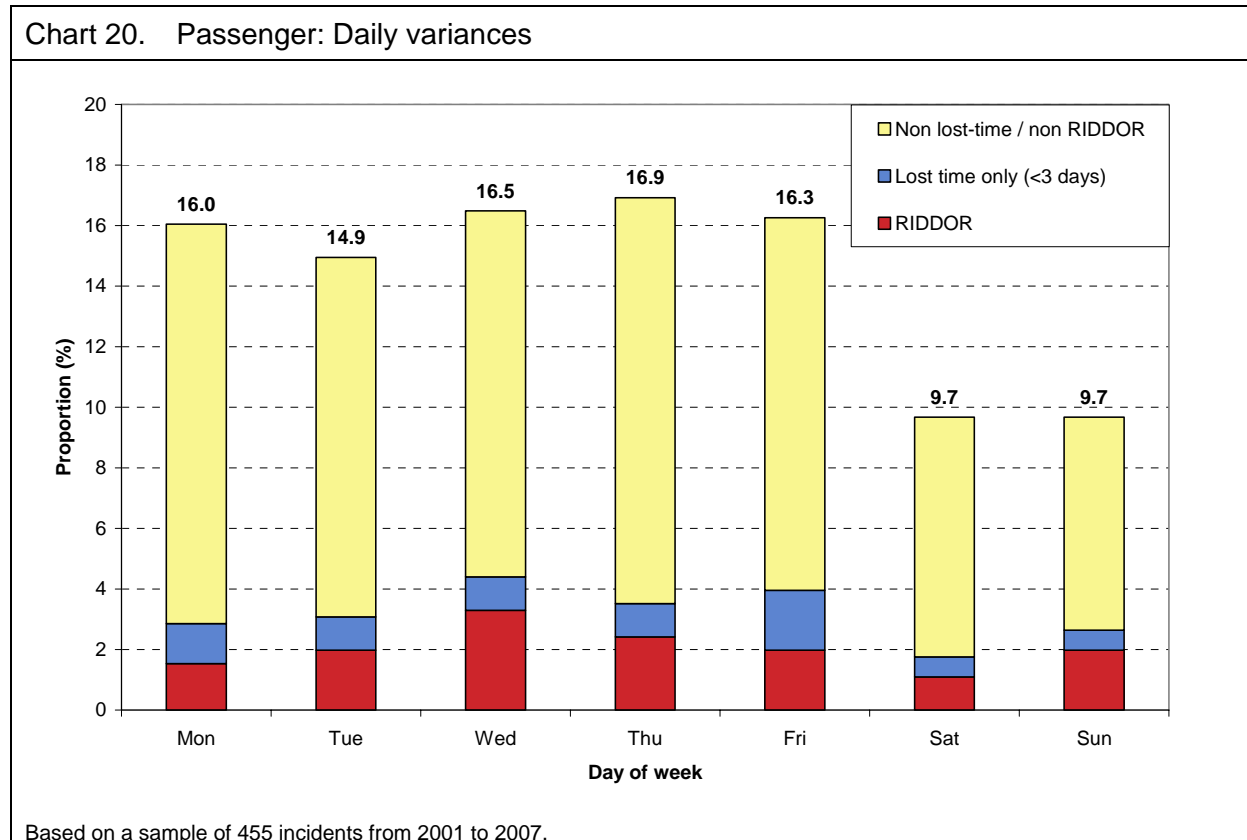


- What is perhaps surprising about the monthly variations is that seasonal variations in underfoot conditions do not seem to affect shunter safety significantly. This may indicate that shunters take more care in leaf fall and frosty seasons, or that depot winterization processes effectively manage the risk.

4.2.2.4 Daily variation

Chart 20 displays the proportion of TOC shunter incidents according to the day of week.

The total proportion of incidents is similar from Monday to Friday. This is also the case for lost-time and RIDDOR-reportable incidents.



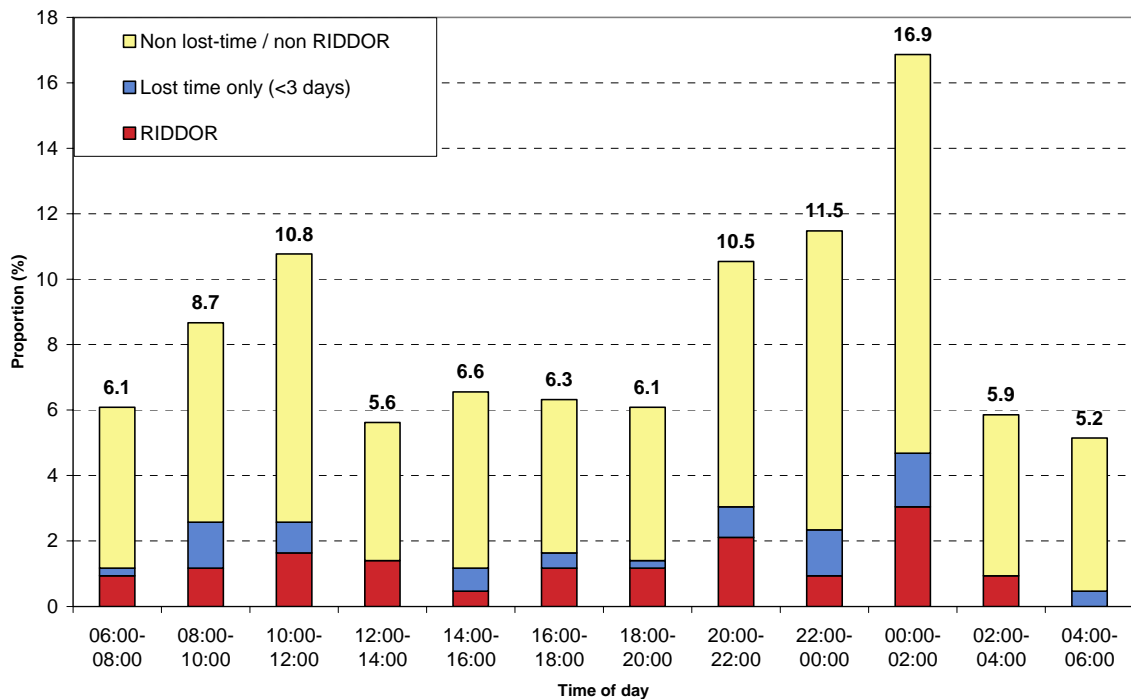
Significantly fewer incidents occur on weekends than Monday to Friday. Depots are generally quieter at weekends, as fewer trains arrive and depart at interfaces with the main line. In addition, there is extra time at weekends to prepare units for the Monday morning service – a key part of the shunter’s role. The results therefore suggest there is some correlation between shunter safety and activity levels (particularly for non lost-time/ RIDDOR incidents).

4.2.2.5 Hourly variation

Chart 21 shows the proportion of incidents occurring at different times of day.

Almost one-fifth of all TOC shunter incidents occur between 00:00 and 02:00. Within this time range, the highest proportion of RIDDOR injuries was also reported. This significant peak is unlikely to be caused by either lack of natural light or fatigue caused by shiftwork, since the trend does not continue from 02:00 to 06:00.

Chart 21. Passenger: Incidents by time of day



Based on a sample of 427 incidents from 2001 to 2007.

A relatively high proportion of shunter incidents occur between 10:00 and 12:00 and again between 20:00 and 00:00. The increased frequency within these time ranges seems to coincide with traffic being berthed in sidings or being brought into the depot shed for maintenance work. The same effect does not seem to be evident where trains are leaving sidings to re-enter passenger service. This indicates that, where the depot has more control over shunting activities within its confines, there are fewer shunter incidents. This may suggest that planning of shunter workload is positively contributing to shunter safety.

For more information on specific initiatives to improve shunter safety in the passenger operating community, see section 6.1.

5 Factors affecting shunter risk

The scope of this report embraces shunters in all sectors of the industry. Although we have discussed and analysed shunter safety in the freight and passenger sectors separately in Chapter 4, many of the factors that contribute to shunting risk are common to both. This section summarises the factors relevant to all shunters, under the broad levels of the job, the individual and the organisation.⁷

5.1 The Job

5.1.1 Workload

Shunters have a changeable workload, from spells where little activity takes place to times where it all seems to happen at once. Late arrivals of vehicles and a lack of contingency in the work plan can result in an increased workload for a shunter. Often depots can be working at, or over, full capacity. Where work is carried out in an unfamiliar environment, such as in possessions, this can also result in an increased work-demand. Where a shunter's work is not planned effectively, or where the site has limited access points for plant and machinery, it can be physically demanding (particularly for freight shunters) due to the need to walk many miles per shift.

5.1.2 Procedures

A lack of site-specific risk assessments and working instructions has been identified as a common issue. Instructions do not always reflect how work is conducted in reality and instructions can lack clarity and task definition.

5.1.3 Environment

The work of a shunter involves a great deal of time spent working outdoors, inevitably exposed to the elements and to dirty and oily equipment, as well as tripping hazards such as litter and disused rails and other materials.

Underfoot conditions can often be uneven and slippery. Where the layout of the yards has evolved over the years, with extra capacity 'bolted on' due to increased traffic, this can result in shunting moves becoming more difficult to execute. The facilities provided to shunters for taking breaks are often suboptimal. Much shunting work is conducted in hours of darkness and lighting can be inadequate.

5.1.4 Equipment

In order to do their work effectively and safely, shunters require functioning and reliable equipment. Problems are frequently reported with radios, in particular whether there is radio reception in the area and whether the radios work reliably. The operation of hand points and manual couplings can result in body strains for the operator, particularly if they are stiff.



⁷ Human factors summary (sections 5.1, 5.2, 5.3) were carried out by reviewing presentations given at the *Shunter Safety Workshop*, September 2007. The 'broad levels' discussed are in accordance with HSG 48, 'Reducing error and influencing behaviour'.

5.2 The Individual

5.2.1 Rule compliance

It was repeatedly commented at the Shunter Safety Workshop that where incidents happen, rules have usually been broken. Two examples of rule violations are standing between two carriages as they are eased up and riding on the footstep of a vehicle instead of walking alongside.

The examples highlight that a prominent factor in rule compliance is the individual's ability to perceive and react appropriately to 'risky' situations, given their potentially dangerous working environment. The reasons for breaking rules are however, potentially numerous and include: inappropriate rules, resource limitations resulting in short cuts, lack of supervision, over-familiarity between colleagues, incompetence, and so on.

5.2.2 Competence

Shunter competency was felt to be relatively well defined at the Shunter Safety Workshop, although it was believed that selection processes do not always reflect these competency requirements. The application of competency in practice seems to be where the shortfalls appear and rules are broken. A key area of competency for a shunter is effective communication. Shunters should be able to reach a clear understanding with the driver and the planner for an intended movement and should be capable of taking the lead with communications. There is some feeling that, where close relationships are built up between team members (eg, shunter and driver), communications can become overly casual such that shared understanding between parties is not always established, giving rise to incidents.

5.2.3 Motivation

It has been identified that shunters might have low levels of motivation for their work, which could be partly attributable to the relatively limited prospects for career advancement and the comparatively low pay that shunters receive. Certainly, training that emphasises the importance of the shunter's role seems to improve levels of motivation according to some railway undertakings.

5.3 The Organisation

5.3.1 Work pattern

Shunters work long shifts (up to 12 hours), frequently during the night. This can result in high levels of fatigue, which will increase the likelihood of errors. Limited opportunities to take breaks will also increase fatigue.

5.3.2 Training

Local inductions and the consolidation of basic training have been identified as key aspects to help ensure the safety of shunters. Retraining at the introduction of new fleets has also been highlighted.

5.3.3 Selection and recruitment

The selection and recruitment of shunters has generated a great deal of discussion amongst safety managers in respect of how this should be conducted in the future. It is recognised that shunters need to possess a number of key skills, including: situational awareness, ability to work in a team, communication skills, risk awareness and goal-directed behaviour.

5.3.4 Management and supervision

Inconsistent monitoring and a lack of 'visible' management may have contributed to the proliferation of unsafe working practices at some locations. Managers tend to work during the day, but a great deal of shunting operations are undertaken at night. In addition, freight shunters in particular, are often mobile and based in different locations depending on the work. Some of these locations are obscure and are often private property. These factors could account for shunters' seemingly limited engagement with management.

There has been a great deal of discussion surrounding the issue of monitoring by means of covert (CCTV, 'listening in' to radio communications and unobtrusive monitoring) and overt (driver aware of monitoring) methods. If covert methods are adopted, then careful consideration needs to be given to the potential ethical issues arising if people are unaware of, and not consenting to, being monitored. There could be detrimental effects on staff morale, motivation and the overall safety culture.

5.3.5 Culture

Productivity demands can often conflict with safety demands. Pressurising requests by managers to 'get the job done' can serve to tip the balance away from safety. It takes a strong individual to confront a senior manager to raise concerns in respect of the 'productivity versus safety' balance. Reports of 'blame culture' within the industry do not serve to build a positive safety culture for this job role.

5.3.6 Communication

Poor communication between organisational layers can result in individuals at the front line not understanding the rationale for managerial decisions taken at a higher level. Where employee suggestion schemes have been used, a lack of feedback from management in relation to these suggestions has been reported in some cases.

5.4 Standards management

5.4.1 Are the rules applicable?

The applicability of Module SS2⁸ was discussed at the Shunting Safety Workshop. In particular, the relevance of the rules, as new work practices and equipment have been introduced and as the role of the shunter has evolved, has been brought into question. Nowadays for example, activities are not necessarily split between 'shunters', 'drivers' and 'signallers' and it very much depends on the particular organisation and equipment as to how 'shunting' activities are executed. Obsolete or unpractical rules may lead to a lack of compliance.

5.4.2 Areas for potential review

Clause 4.8: 'Propelling during shunting'

What the rules state:

'Where possible you must walk ahead of the leading end of the propelling movement...'

⁸ Rule Book GE/RT8000/SS2 – Shunting - Issue 1, June 2003.

Areas of concern:

There are some occasions when walking ahead is not the optimum position of safety for the shunter and the need to protect the asset and the surrounding infrastructure from the movement has to be balanced with the safety of the shunter. RSSB have developed a rule change proposal for industry consultation on this matter.

Clause 4.2, [Communication] 'By radio'

What the rules state:

'You must [...] keep in constant communication with the driver (or other person controlling the movement) throughout each movement'.

Areas of concern:

There is concern that this method of continuous communication is not best practice in maintaining the safety of shunters and control over the movement.

Some companies have started to use what is known as the 'half-distance' rule, whereby stopping distances are called out at specific distances, with the driver acknowledging and repeating instructions. By virtue of the fact that both parties are participating and an understandable measure is conveyed, the move is more controlled and it becomes easier to reach a '*clear understanding*'.

A further area of concern is that some movements span a long distance and an extended time period. In such cases, continuous communication may be deemed inappropriate, especially as shunters may tend to lose alertness or focus on the core task.

Clause 5.3, 'Coupling or uncoupling'

The rules for train drivers, specified in Rule Book Module TW1⁹, 'Preparation and movement of trains', differ from 'SS2'. 'TW1' specifies that prior to coupling units, the driver must, '*[s]top the traction unit 2 metres away from the vehicle*'. The rules highlight that the two-metre stopping distance shall be in addition to any other distance specified within the instructions for the traction unit involved. Though this rule is applied to all coupling movements according to 'TW1', it is only mentioned in 'SS2' when making reference to occasions when shunters may need to go in between the vehicle.

5.5 Summary

When the various human factors issues are considered in relation to the role of a shunter, it can be better understood why these individuals experience accidents and incidents at a relatively high prevalence. The factors affecting the rules also contribute to the safety of shunters, but to a lesser extent. Hence, by increasing our understanding of the human factors, we can design better control measures to reduce shunting risk.

⁹ Rule Book GE/RT8000/TW1 – Preparation and movement of trains - Issue 6, October 2007

6 Developments in the management of shunter risk

6.1 Industry events to address shunting safety risk

There were three events held in 2007 which were particularly relevant to the world of shunting. One – the Shunting Safety Workshop – was specifically targeted at this area. The other two – the National Operational Risk and SPAD Conference and Workshop – touched on shunting issues as part of a wider programme.

National Operational Risk and SPAD Conference (June 2007)

Shunting formed a new area of focus at this conference in 2007. The need to put shunting risk into context with other forms of operating risk was highlighted. Improving shunter safety by carrying out risk assessments, developing shunting handbooks and good practice guides and the contribution of competence management systems were all notable outputs from the discussions.

Shunting Safety Workshop (September 2007)

This aimed to highlight the risks from shunting, while providing an opportunity to discuss and steer industry towards a solution to this ever-present safety matter. Its outputs have been discussed throughout this special topic report.

The transcript and notes from the workshop are available via RSSB's National Programmes team. For more details on this, or future workshops, contact Susan Cassidy: susan.cassidy@rssb.co.uk.

National Operational Safety Risk and SPAD Workshop (October 2007)

Following on from the conference in June, shunting safety was the subject of a syndicate discussion at this event. Shunting was referred to as a high priority for the industry and a number of control measures were identified that would support the discussions raised at the conference. These are discussed in section 6.2. The next event is planned to take place in July 2008.

6.2 Good practice tips to improve shunter safety

Outputs from the industry events mentioned in section 6.1, and the factors summarised in section 5, has led to the formulation of the following tips for good practice:

Workload

Improved planning (or more realistic planning) of work should prevent situations where workload becomes unacceptably high. For example, upper limits could be put into place to limit the number of trains that are allocated for servicing.

Procedures

Written procedures should be provided for complex moves. Site-specific risk assessments and controls should be applied.

Environment

Adequate rest and hygiene facilities should be provided. Housekeeping duties should be undertaken to remove slip, trip and fall hazards from the working environment.

Equipment

A number of engineering and equipment solutions can be applied to design the human element out of the shunting task or to reduce the risks associated with the task:

- Remote control of points and signalling would negate the need for shunters.
- Automatic couplers would reduce the need for shunters to go between carriages to couple up.
- Where new depots are designed, thought should be given to their layout to make operations as efficient and safe as possible with future expansion also taken into account.
- Where radios are needed, these should be functional and reliable.
- Ergonomically designed hand-operated points should prevent over-exertion during operation and improve visual feedback onto the points.
- Accessibility to appropriate PPE, especially for shunters working at yards and sidings, who may not be based near depots.

Motivation

The status of the shunting role should be promoted as a key operational and safety critical role. The potential to see a clear career path can be important in improving motivation and morale, for example, providing the opportunity for operations and engineering staff to become depot drivers. For those who enjoy the shunting role, it is also important that a strong team is built up to ensure that morale remains high.

Work pattern

The Fatigue and Risk Index (HSE) is useful for the planning of shift work in order to minimise fatigue. This should use real roster data (clocking on and off times) rather than planned roster information to ensure that an accurate representation is used. Rosters which generate social time for staff working shifts could be considered as a means of improving staff morale. Shifts should be planned to suit individual preferences as far as is possible (eg, older people tend to prefer early starts and dislike working nights). Ensure that breaks are planned and taken.

Training, briefing and competency

Training should be task-specific and backed up by a competence management system that caters for all different conditions of working, including both day and night working.

Training should be motivating and encourage people to act and feel professional, be aware of their safety critical responsibilities and the risks of not following safe working practices. When new or refurbished train fleets are introduced, or depot layouts are altered, it is important that training is updated to reflect these new features.

Awareness of industry or company-wide safety initiatives applicable to their roles should also be briefed to individuals.

Selection and recruitment

The precise competency required to be a shunter needs definition and the selection and recruitment processes should be aligned with it. This process should also be developed with

the proposed work location and specific responsibilities in mind. The ability to perceive risk is however, something that could be considered at the selection stage, for example, in exercises to consider safety related behaviour. A shunter's training could also address risk perception and safety behaviour.

A current RSSB research project is looking to update the selection process for train drivers from which transferable lessons could be drawn.

Management and supervision

Commitment to shunting issues is required from 'the top'. Examples of ways in which management can contribute to improved shunter safety include the following:

- Some organisations have found success in allocating specific resource to depot operations such as specific management roles to deal with incidents and competence management.
- Managers are increasingly carrying out regular general inspections and implementing control measures to reduce the risk from infrastructure.
- Establishing rosters that maximise shunter efficiency, linking handover times to routinely quiet times in the workload may be successful in improving communications between shifts and reducing the risk from rushing to meet deadlines.
- Taking control of infrastructure maintenance has proved beneficial for some organisations, presumably relating to the fact that there is better control over the maintenance of the operational environment with which the staff is required to interact. Initiatives have included marking sleeper ends with distances, painting fouling points and clearly identifying sidings.
- Companies have also found success where informal monitoring has been introduced to provide support, training and improved communications. Monitoring can be undertaken to assess compliance with procedures such as communications, speed limits and movement protocols. Any safety management system that is developed should address the risk profile of the role.

Culture

Encourage real employee participation in decisions that affect staff. Do not allow the development of a blame culture, rather a 'learning' culture.

Communications

Improved safety-critical communication protocol, including adopting call signs and unobtrusive monitoring should be utilised when controlling movements by radio, particularly if there are a number of staff using the same radio frequency (or where there is a central '*control*'). For ethical reasons, it is essential that any changes in monitoring are communicated to the shunters.

Effective communications within the organisation should be encouraged in which two-way dialogue is set up between managers and front line staff, such as that used in questions, ideas, observations and answers schemes.

Staff briefs should be carried out at regular intervals to help shunters feel part of their organisation.

Standards

Based on the issues raised in section 5.4, the Rule Book Module SS2 will be reviewed by the Traffic, Operations and Management (TOM) subject committee. A full review of the rules should be made at a local level and supported, if required, by local working instructions in order to control specific risks.

Accident and incident investigation

Investigators should have the skills to be able to identify the root causes within accidents or incidents and identify appropriate corrective action. The accident investigator should preferably not work at the location where the accident/ incident has taken place.

Reporting of hazards and events

Encouraging shunters' to report any hazards related to their tasks or surroundings by providing improved communications with management, will certainly improve shunter safety within their environments. A range of methods, including anonymous methods, should be offered to improve the reporting of hazards and events (eg, written methods, through a union representative, by telephone, and so on).

6.3 Research in understanding and improving shunter safety

The Operational Focus Group (OFG) will coordinate future research into the causes of shunting hazards, including human factors and workforce safety campaigns.

This group's purpose is to facilitate the progressive improvement of operational safety through the identification, discussion, development and promotion of justifiable effective campaigns, programmes and tools. It aims to monitor and review industry performance trends in relation to operational safety, with a view to making recommendations to the RSSB Board where appropriate.

For more information on OFG, contact Susan Cassidy: susan.cassidy@rssb.co.uk.

Reducing Accidents and Collision Damage in Maintenance Depots

Halcrow (in partnership with Halcrow and InterAction) has also produced a report on *Reducing Accidents and Collision Damage in Maintenance Depots*.¹⁰ This highlighted that the five critical hazardous events affecting shunters include derailments, SPADs, collisions, striking or being struck and striking buffer stop. It also recognised that:

- Most incidents occur between 18:00 and 02:00.
- Activity levels at the depots, rather than differences in safety, are key to the accident risk.
- Newer depots have a lower rate of accidents.
- Shunter performance is critical to the risk of incidents at depot.
- Shunters who spend half their time on other duties, such as driving or carrying out maintenance work, are less likely to be involved in a shunting incident. This relationship may have arisen in response to the move to dual-functionality in TOC-

¹⁰ Report available at <http://www.rssb.co.uk/research/index.asp>.

managed depots, where the requirement for shunters is limited as a result of automatic points and couplers.

OPSWEB

The industry's operational safety risk website, OPSWEB, was launched by RSSB in November 2007 and now includes a specific section on managing shunting risk.

This section of the site is actively promoting the sharing of good practice associated with both freight and passenger shunting operations through the *Red Alert* series and Good Practice Guides.

Red Alert and Good Practice Guides

The *Red Alert* series has been expanded to include information on shunter risks, in addition to train driver risks.

Information posted on www.opsweb.co.uk, includes good practice shunting guides from Halcrow, as well as individual operators.



Also available from RSSB

Shunting safety is examined in RSSB's Workforce safety performance report (SPR). It is also assessed in the workforce sections of the Annual Safety Performance Report (ASPR) and subsequent quarterly SPRs.

RSSB has recently undertaken a project to assess the effects of human factors on shunting safety for a large TOC.

RSSB's research and safety performance reports are available on the website, www.rssb.co.uk.

7 Conclusions

- Shunter responsibilities are changing for all FOCs and TOCs. There is a move towards dual-functionality roles, which is already common nowadays for TOC shunters. In general, there is a considerable difference in the responsibilities and risk from shunting for freight operations, compared with passenger operations.
- There have been four shunter fatalities in the past 10 years, all involving FOC shunters who were carrying out shunting duties 'on the ground'. Three of the injuries were attributed to getting trapped in between two vehicles whilst carrying out manual coupling. This rate compares to seven shunter fatalities in the previous 10 years (1987 - 1997).
- Shunting is among the highest risk of all the railway occupations.
- Most shunter injuries occur in depots, yards or sidings and so there is no obligation to report them into SMIS. In turn, they fall outside the scope of most RSSB safety reporting and the Safety Risk Model.
- On average, each FOC shunter loses 0.7 days each year as a result of injuries at work. This compares with 0.2 for TOC shunters. There is no evidence of any trend in shunter incident rates in the 5½ year period since Jan 2002. Results from the first half of 2007 suggest the trend has not increased or decreased.
- The greatest contribution of lost-time injuries result from slips, trips or falls whilst '*moving around or between work areas*'. Strains and sprains are the most common types of injury resulting in lost-time.
- Human factors have a critical impact on shunter safety. In particular, management visibility, effective resource planning and a robust risk-based competence management system, were identified as some of the essential elements for maintaining shunter safety.
- There have been a number of industry events that have highlighted the risk from shunting. A set of control measures and good practice tips have been identified, including plans for effective management of staff, equipment, procedures and morale.



Appendix 1. Definitions

Term	Definition
Accident	An unexpected, unplanned occurrence, resulting in physical harm to an individual, damage to property, a loss or any combination of these effects.
Accidental death	Such has occurred if the victim had no intention to take his/her own life or cause self-injury. Note that if reasonable doubt exists, the death is treated as accidental, and not a suspected or attempted suicide. Accidental death can occur to those engaging in dangerous activities, including trespass, as well as those going about their legitimate business.
Coupler	The element that mechanically connects the vehicles together.
Coupling/ uncoupling	The process of attaching or detaching vehicles.
Coupling System	The mechanical system, including buffers, drawgear and gangway where fitted, that connects two rail vehicles together and the electrical and pneumatic connections where fitted between vehicles. Coupling system types include Tightlock, BSI, instanter, buckeye, etc. Where a coupling system can be automatically coupled by propelling the vehicles together, the coupler is 'Automatic'. Where manual intervention is required, the coupler is 'Manual'.
Depot driver	A train driver who works within the confines of the depot. A depot driver may also be responsible for undertaking shunting movements.
Fatality	Including where death occurs within one year of an incident.
Groundstaff	Rail workers who operate on or about the track. They may switch hand points, couple/ uncouple trains (with manual coupling systems) for example.
Half-distance rule	A term used in shunting, to communicate the stopping distance at specific distances (and with the driver acknowledging and repeating instructions).
Incident	A notable event or occurrence, which may be either individual, or the result of another occurrence. Incidents do not necessarily result in physical harm or damage to individuals or the infrastructure. Within this report, incidents are pertinent to the safety of shunters.
Lost-time injury	An injury occurring at work and resulting in lost-time from duties.
Major / minor injuries	This is as defined in RIDDOR 1995, and applies to passengers, staff and members of the public. Major injuries include fractures, amputations, loss of sight or those resulting in admittance to hospital for a period of more than 24 hours. All other injuries are minor, except in the cases of shock/ trauma that has not resulted in medical treatment. Though these injuries are typically used in RSSB's safety reports, they are not used in this report, since it was often difficult to exactly classify injuries in this way.
Movement accidents	These are accidents to people involving trains (in motion or stationary), but excluding injuries sustained in train accidents.
Network Rail Managed Infrastructure (NRMI)	This falls within the boundaries of Network Rail's operational railway and includes the permanent way, land within the lineside fence, and plant used for signalling or exclusively for supplying electricity for operational purposes to the railway. It does not include stations, depots, yards or sidings that are owned by, or leased to, other parties. However, it does include the permanent way at stations and plant within these locations used for signalling or exclusively for supplying electricity for operational purposes to the railway.

Term	Definition
On-track plant	This refers to rail-borne vehicles used to repair/maintain the track (such as rail grinders, ballast tampers and on-track machines).
Possession	The complete stoppage of all normal train movements on a running line or siding for engineering purposes.
RIDDOR	<p>This, the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, 1995, is a set of health and safety regulations that require any major injuries, illnesses or accidents occurring in the workplace to be formally reported to the enforcing authority. It defines major injuries and lists notifiable diseases – many of which can be occupational in origin. It also defines notifiable dangerous occurrences – such as explosions, structural collapse, electrical overloads, fires, and so on – where no injury occurs but subsequent investigations may be needed.</p> <p>RIDDOR reportable injuries include the following:</p> <ul style="list-style-type: none"> • Fatalities. • A 'major' injury, relevant to workforce only and including specific injuries such as amputation, fracture, dislocation of spine, medical treatment, eye injuries, hot metal burns, loss of sight. • Any injury that results in workforce lost-time of over three days. • Any incident that results in the injured requiring hospital attention for greater than 24 hours.
-Safety Risk Model (SRM)	A quantitative representation of the safety risk that can result from the operation and maintenance of the GB rail network. It comprises 120 individual computer-based models, each representing a type of hazardous event (defined as an event or incident that has the potential to result in injuries or fatalities).
Shunter	The person in control of a specific shunting movement (refer also to section 2).
Shunting movement	Any movement of a train or vehicle other than a train passing normally along a running line.
SMIS	This, the Safety Management Information System, is a national database used by Railway Group members to record any safety related events that occur on the railway. SMIS data is accessible to all members, so that it may be used to analyse risk, predict trends and focus action on major areas of safety concern.
SPAD	Signal passed at danger (without authority).
Trackside/lineside	A person is on the lineside if they are within the area between the railway boundary fencing and a point three metres from the nearest rail of any line (beyond which is termed 'on or near the line').
Track workers	Workforce members employed in engineering or technical activities on or near the line or lineside (as defined in the Rule Book, including within 4 feet of the platform edge). Note that traincrew members are not included in this category.
Train accidents	In general, this refers to accidents occurring to trains and rolling stock, as reportable under RIDDOR 1995 (see introduction to Chapter 6). However, non-RIDDOR reportable incidents that occur in yards, depots or sidings (such as shunting derailments that do not foul a running line) are also classed as 'train accidents'.
Workforce	All persons working for the Railway Group (either as direct employees or contractors).
Whole-Time Equivalent	In this report, Whole-Time Equivalent refers to the actual amount of time that a shunter carries out shunting activities.

Appendix 2. Glossary

Acronym	Expansion
ASPR	Annual Safety Performance Report
ATOC	Association of Train Operating Companies
DfT	Department for Transport
ECS	empty coaching stock
EWS	English Welsh and Scottish Railway
FOC	freight operating company (Railway Undertaking)
HSE	Health and Safety Executive
NRMI	Network Rail managed infrastructure
OFG	Operations Focus Group
ORR	Office of Rail Regulation
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
RSSB	Rail Safety and Standards Board
SMIS	Safety Management Information System
SPAD	signal passed at danger
SRM	Safety Risk Model
SSP	Strategic Safety Plan
TOC	Train operating company (Railway undertaking)
TOM	Traffic, Operations and Management (RSSB subject committee)
WTE	Whole-Time Equivalent

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