

Iarnród Éireann Safety Report 2016



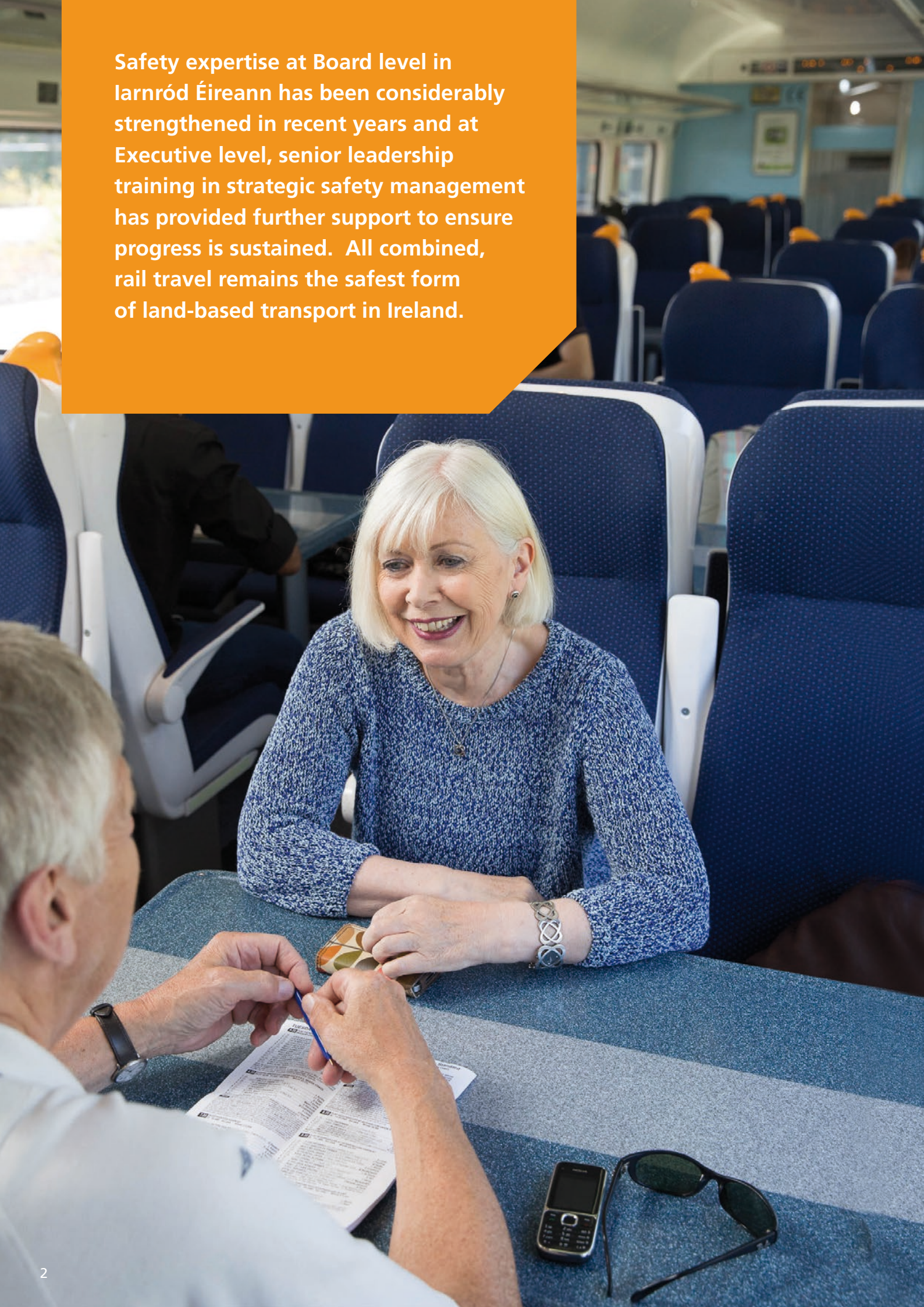


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Safety expertise at Board level in Iarnród Éireann has been considerably strengthened in recent years and at Executive level, senior leadership training in strategic safety management has provided further support to ensure progress is sustained. All combined, rail travel remains the safest form of land-based transport in Ireland.



1. Our Safety Leadership

1.1 Introduction by Chairman

Welcome to Iarnród Éireann's first annual safety report. As a railway infrastructure provider and train operator, safety is our number one priority. We commit to providing a safe railway environment for all our customers and people with *Always Safe* being the first and most important of our core values.

Over the years I have observed steady progress in our approach to safety management with performance improving incrementally each year to a level now acknowledged to be among the best of railways in the European Union. This has been driven by the hard work and dedication of Iarnród Éireann employees across the network with their efforts enabling the railway to increase passenger journeys in 2016 by 8%, bringing the total to 43 million – building on the strong growth achieved in each of the preceding two years.

Safety expertise at Board level in Iarnród Éireann has been considerably strengthened in recent years and at Executive level, senior leadership training in strategic safety management has provided further support to ensure progress is sustained. All combined, rail travel remains the safest form of land-based transport in Ireland.

Notwithstanding our success, there are still challenges to running a safe railway that we face every day. We continue to operate with constrained levels of funding that force hard choices to be made daily amongst our key safety priorities.

Underfunding in infrastructure and fleet renewal, as well as the deferral of implementation of new technology in train protection and at level crossings, has generated increased requirements for maintenance and human resource interventions. In 2016 we received some additional funds which enabled the development of a more sustainable and efficient approach towards the maintenance of fleet and infrastructure. A positive endorsement was also received for our proposal to enhance train protection with approval of funds by the Department of Transport, Tourism and Sport towards the year end for implementation of a network wide Automatic Train Protection System.

As well as ensuring our customers are safe, the safety of all Iarnród Éireann staff and contractors employed to work with us is of paramount importance to all of us. We must all play a part in ensuring that each and every one returns home safe after a days' work at Iarnród Éireann and will be giving this greater emphasis during 2017 and beyond.

In this report, we outline the current status and trends in safety management areas of particular interest, and how we manage these to provide a safe, reliable service for our customers, employees and third parties. We have also included a brief description of our approach to managing safety more broadly, including safety governance and management arrangements.

We also share our views on where we can make further progress, with details of three particular areas of development being provided as case studies, because we recognise complacency is the enemy of safety. As one team, we in Iarnród Éireann will continue to work to our value of being *Always Safe*.

Phil Gaffney

Chairman, Iarnród Éireann

Over the years I have observed steady progress in our approach to safety management with performance improving incrementally each year to a level now acknowledged to be among the best of railways in the European Union.

1.2 Chief Executive's Report

Ireland's railways are among the safest in Europe. Our safety performance is comparable to the UK, Switzerland and the Netherlands, those countries that are considered to be the best across Europe. However, being a relatively small railway, compared to some operating in the European countries referenced in Figure 1, we are acutely aware that one serious accident would have a significant impact on the normalised statistics.

I would like to take this opportunity to thank all of our employees who have made our recent performance levels possible. While it is important to acknowledge success, we do this without being complacent and recognising that hard won gains earned over time could be easily lost in a short moment in time.

Performance over recent years is even more impressive when set in the context of increasing passenger numbers and the significant historical funding constraints to which we have been subject. Passenger numbers are fast approaching those last seen between 2006 and 2008 and we expect the current levels of growth to continue for the foreseeable future as the economy strengthens and rail becomes more attractive relative to road based modes of transport.

The regulatory environment we work within is also changing, with the European Union 4th Railway Package coming into force in 2019. This package focusses on promoting further integration in the EU railway network. This will support us in continuing our cooperation with the railways in Northern Ireland which in 2016 enabled us to introduce a new timetable and refurbished train sets on the Enterprise route between Dublin and Belfast.

Set in this context, simply maintaining the current level of performance is not good enough and we recognise that further improvements are both required and possible across a range of areas.

To this end, during 2016 we built on our safety leadership programme (*Accident Free Depends on Me*) initiated in the previous year and embedded *Always Safe* as one of our core values. We are continuing with an internal reorganisation to strengthen line responsibility for safety management, as well as enhancing safety governance and reporting arrangements across the whole of Iarnród Éireann.

Events with the potential to cause catastrophic accidents, such as Signals Passed At Danger, level crossing interfaces, bridge strikes and asset deterioration while decreasing remain too frequent and are the focus of much management attention. We are attending to other areas also to include further enhancing customer and employee safety. In the following sections of this report, we outline performance trends, how we are controlling the associated risks in each area and details on future planned actions.

We continue to work with the Commission for Railway Regulation (CRR) to ensure we comply with all legal requirements and welcome their role as a strong, independent regulator providing external challenge and enforcement.

For 2017, as we prepare to apply for renewal of our Safety Authorisations and Certificates, we plan to review our Safety Management Systems to ensure that, along with meeting the requirements of regulations, we are developing them as enabling management tools that support a progressive culture of engagement and continuous improvement.

Finally, recognising that this is the first time we have published such an annual safety report we welcome any feedback you may have on its contents, and safety on our railway by emailing us at the following address: ie.safety@irishrail.ie

David Franks

Chief Executive, Iarnród Éireann





Our safety performance is comparable to the UK, Switzerland and the Netherlands, those countries that are considered to be the best across Europe.

Figure 1 Normalised fatalities across EU railways

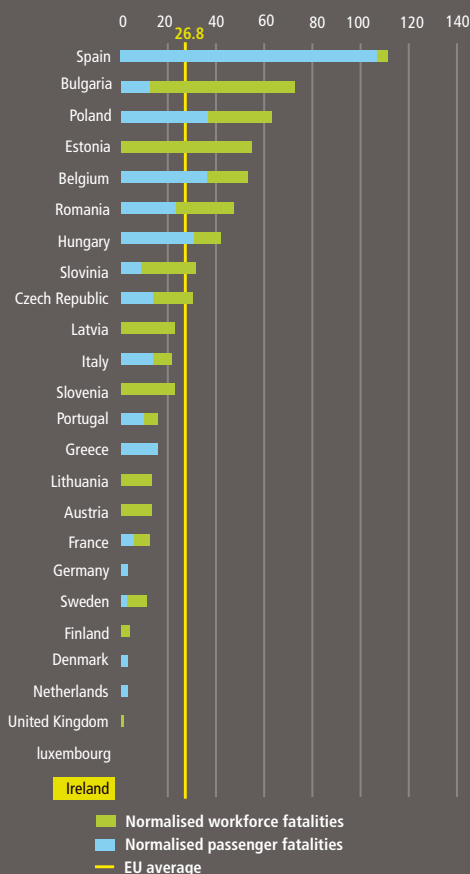
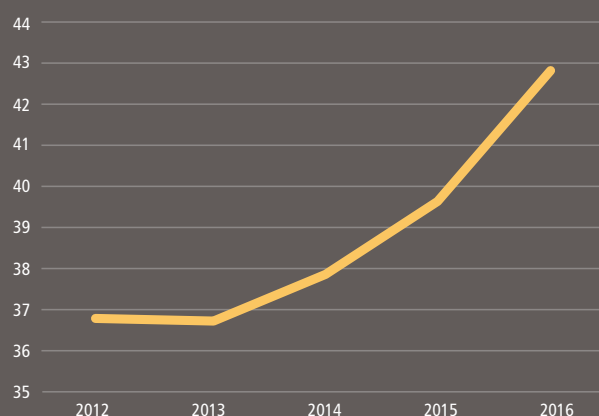


Figure 2 Passenger journeys by year (millions)



1.3 Senior Safety Leadership and Management

Iarnród Éireann Board Director and senior management positions are filled with rail professionals experienced at the most senior levels from across the industry with summary profile information on those in roles with key safety responsibilities presented as follows.



Phil Gaffney was re-appointed as Chairman of Iarnród Éireann and CIÉ Board Member in July 2014, having previously served as Iarnród Éireann Chairman and CIÉ Board Member since June 2011 and as a director of Iarnród Éireann since 2006. Mr Gaffney is a railway signalling engineer by profession. Before retiring in December 2005, Phil had spent 28 years with Hong Kong MTR. During that time his positions included Chief Engineer, Operations Director and Managing Director. He is Chairman of the CIÉ Board Safety Committee. He is also a non-executive director of London's Crossrail board and a member of the Crossrail Health & Safety Committee.



David Franks, Chief Executive, joined Iarnród Éireann in February 2013. Prior to his appointment, he was a Director of Keolis UK, the UK division of the French National Railways, SNCF. David has over 40 years' experience in the rail industry where his career has taken him from platform to the boardroom. He has held a number of senior posts in both the UK and Sweden. He is Chairman of the Institution of Railway Operators.



Jim Meade, Director, Railway Undertaking was appointed in 2013 as part of the restructuring of Iarnród Éireann to achieve compliance with EU requirements for the rail industry. He is responsible for the management, control, supervision and delivery of all rail operation activities covering the national network, DART and commuter routes, including the maintenance of the fleet. He has worked in Iarnród Éireann throughout his career, beginning in 1983, initially in mechanical engineering, before moving to operations management.



Don Cunningham, Director, Infrastructure Manager. Don joined Iarnród Éireann in 2006 firstly as Director, New Works and then Assistant Chief Executive, Engineering. Under the organisational restructuring to achieve compliance with European Union requirements, he was appointed Director, Infrastructure in 2013, covering civil engineering (track and structures), signalling & electrical engineering, New Works (capital investment projects) and Infrastructure Operations (CTC and level crossing control centres). Don has spent most of his career in the mining industry with Anglo American PLC and has also worked with Lisheen Mine in Tipperary.

The management team are supported by the Board in fulfilling their executive responsibilities with specific safety support provided by the following Directors in their roles as members of the Board Safety Advisory Group.



Tommy Wynne was appointed to the CIÉ Board in December 2013 under the Worker Participation (State Enterprises) Acts, 1977 to 2001 and to the Iarnród Éireann board at the same time. He is a member of the Safety Advisory Group. Tommy joined Iarnród Éireann as a depot man in 1991 and became a train driver in 1994. He is currently the Chairman of the Transport Sector and Utilities and Construction Division of SIPTU.



Carolyn Griffiths is Chair of the Safety Advisory Group and a non-executive Director of Iarnród Éireann. Carolyn is a Fellow of both the Royal Academy of Engineers and the Institution of Mechanical Engineers. She is President Elect of the Institution and a Trustee of the Institution and also Engineering Council. She has extensive experience of the railway industry having worked in various sectors in the UK, Singapore, Germany and Sweden. Her two most recent positions were Senior Vice President of a multinational company and the founding Chief Inspector of the Rail Accident Investigation Branch in the UK. She was awarded an Honorary Doctorate by Cranfield University in 2013 for her achievements in and contributions to the rail industry.



Mal McGreevy is a non-executive Director of Iarnród Éireann, a member of the Safety Advisory Group and Chair of the Board Train Advisory Group. Mal, who recently retired from the position of General Manager, Rail Services, Translink, Northern Ireland Transport Holding Company, has extensive experience in the transport sector. A Mechanical Engineer by profession, Mal has held senior positions in both bus and rail companies since joining Ulster Bus in 1988, culminating in his appointment as General Manager – Rail Services in 2004.



Cliff Perry is a former Chair of the Iarnród Éireann Safety and Train Advisory Groups and is retained by the Board as one of a small number of advisors in the main railway disciplines (Infrastructure, Signalling, Trains and Operations). Cliff has spent his career in the rail industry across a range of diverse roles to include being Managing Director of both Thameslink and AEA Technology Rail. He is a Mechanical Engineer by profession and a past Chairman of the Railway Division of the Institution of Mechanical Engineers.





Taking part in Cycle for Suicide round Ireland cycle event

1.4 Demonstration of senior leadership commitment to safety

A progressive safety culture is being established across the organisation with the following examples indicating how this is being achieved in practice:

- High level of nominations for inaugural safety awards
 - Level of attendance and participation at safety workshops and conferences
 - Usage of Driver Reminder Appliances at significantly higher levels than for similar train operating companies
 - Frontline involvement in Safety Management System standard reviews
 - Participation in Safety Tours
 - Engagement in the process for selection of new Personal Protective Equipment
 - Participation in company supported health and wellbeing initiatives
- These are being achieved by a Safety Leadership Programme introduced in 2015 under the banner of 'Accident Free Depends on Me'. The objectives of the programme are to co-ordinate and progress actions that foster a positive safety culture while developing competency in safety leadership across the organisation. A range of measures initiated under the programme in 2015 were built on during 2016 to include the following:
- A new corporate Mission, Vision and suite of Values, including being 'Always Safe', were developed and are now being established as our way of working across the organisation
 - Communication processes have been enhanced with information on key performance indicators, incidents, improvement projects and notable international rail accidents shared with all colleagues through regular email, weekly circular updates, board briefing calls, Breakfast with the Boss sessions and other related initiatives
 - In support of overall leadership development, as well as for succession planning and talent management, 270 of our managers from across the organisation have received external training in safety leadership during 2015 and 2016



Control room meetings for effective and safe work planning

- Two conferences were held during 2016, attended by over 100 staff nominated to represent them on safety, with engagement on a range of relevant and current topics including Human Factors leading to safety incidents, the procurement of Personal Protective Equipment along with the challenges and choices involved in proactively managing men's health.
- An inaugural annual Safety Awards Scheme was launched at the start of the year to acknowledge and share good practice. This generated high levels of engagement and many nominations in the build up to an April award ceremony attended by over 100 colleagues with further details provided as a case study in this report. This initiative was built on by the Infrastructure Manager later in the year with the introduction of their Safety Shield award and plans for further forms of acknowledgement in 2017
- Safety Management System standards are being reviewed with increased engagement of frontline colleagues leading to more effective and applicable outcomes

A follow up to the 2014 Arthur D. Little independent strategic review was conducted and concluded that whilst there were observations of areas requiring further work – which is now in progress as part of continuous improvement programme – they reported that:

- 'Iarnród Éireann has responded positively, launching initiatives that have contributed to observed improvements across the safety management system;
- safety performance and safety management has improved with demonstrable strengthening of safety governance;
- analysed indicators show an overall reduction in harm.'

Safety Tours are an important part of our management processes providing an opportunity for teams to reflect on the approach to safety being adopted at a site under review and create engagement across different levels of organisation. Over 2,000 such tours were conducted across all sites during 2016 generating corrective and progressive suggestions that are then actioned by local safety review groups.

The Infrastructure Manager Safety Manager attended the International Railway Safety Council in Paris in 2016, co-chaired by Frédéric Delorme, SNCF Executive Officer for Safety and Florence Rousse, Executive Director of EPSF, the French National Safety Authority. This provided an excellent opportunity to engage with other railways, share best practice and learn lessons. We look forward to hosting the Conference here in Ireland in 2018.

2. Our Safety Focus Areas

2.1 Signals Passed at Danger

Current Status and Trends

Signals passed at danger (SPADs) are one of the main precursors that can lead to train collisions and serious train accidents. We have made considerable progress in reducing the numbers of SPADs and are currently investigating the possibility of further mitigating the associated risks through technological solutions.

Figure 3 illustrates SPAD performance over the past ten years and clearly shows the marked reduction in number of occurrences over that time. It compares performance with that of the UK with both sets of numbers indexed at 100 for 2007 to enable comparison. As can be seen Ireland has made greater progress over that time by reducing the occurrences of SPADs to approximately one third of the level a decade ago. This was achieved despite the lack of a modern train protection system as compared to that used across the UK rail network.

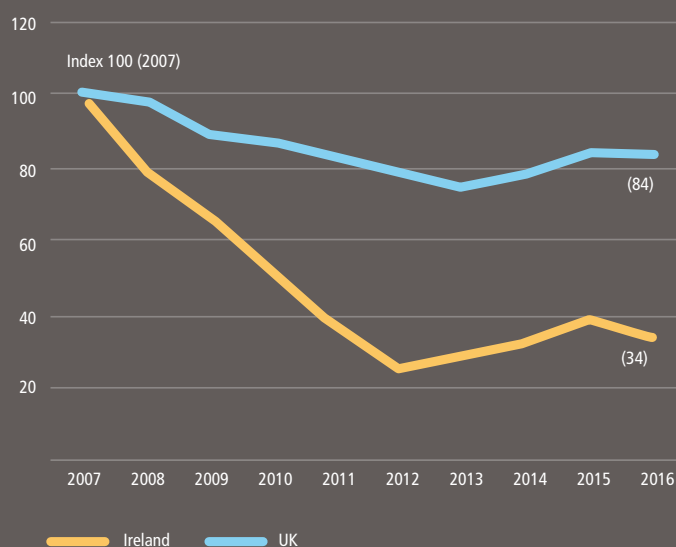
The 2016 number, at 13, was a reduction of two on the previous year.

Different SPADs can have different levels of risk associated with them. We use a ranking system (developed by the Rail Safety and Standards Board (UK) (RSSB) for the Great Britain rail industry and adapted for use in Ireland) to assign scores to all SPADs and this shows that over the past ten years there has been a marginal improvement in the average risk score. There was one higher risk SPAD in 2016 with the overall average risk reducing by 8% when compared with 2015 performance.

Actions Taken

The reducing pattern of SPADs and those of higher risk in particular is attributed to the initiatives implemented over recent years with those actioned during 2016 including:

Figure 3 SPAD performance over past 10 years



- Utilisation of Driver Reminder Appliances installed across all fleets towards the end of 2015 as an alert mechanism to drivers in advance of starting against a signal
- Enhancement of processes to brief drivers and other colleagues on hazards leading to SPADs
- Driver engagement in review of historical SPADs to identify and apply lessons learned
- Upgrade of our SPAD risk ranking tool and the competence of those that use it
- Comprehensive review of SPADs over the past ten years to identify contributory human factors

The introduction of a Driver Reminder Appliance early in the year has been accompanied by very high usage compliance rates by drivers and has without doubt led to the avoidance of further SPADs. The benefits of this and other initiatives were evidenced by a reduced rate of occurrence in the second half of the year in particular with the last 2016 SPAD taking place in September and by the turn of 2017 were on the way to establishing the longest gap between SPADs we have ever achieved.

Future Activities

We have been progressing the possibility of upgrading the Iarnród Éireann train fleet and infrastructure with a technologically advanced train protection system to eliminate SPADs, prevent over-speeding, and improve our protection of single line sections.

With confirmation of Government funding recently received, we are now preparing plans to commence installation. Functional testing of the proposed system is well advanced and discussions with the Commissioner for Railway Regulation on obtaining the necessary safety approvals are taking place with the intention of starting installation works before the end of 2017. Recognising that it will be some years before this project begins to deliver benefit, a range of interim actions, principally focused on human factors, will continue to be taken to further progress the downward trend in SPAD occurrence and risk levels.



Case Study 1 – Providing a National Train Control Centre

Signalling control across the Iarnród Éireann network is primarily from the existing Centralised Traffic Control Centre (CTC). The migration to new signalling technology has been driven primarily by the programme of signalling renewals, but has not included the CTC, which is at maximum capacity and no further signalling control areas can be accommodated within the current control centre (see Figure below).

Figure 4 Existing Areas of Signalling Control





Launching our Level Crossing awareness campaign

A plan to develop a new National Train Control Centre (NTCC) and replace the existing CTC is well advanced. The new centre will provide a modern, modular, fully integrated Traffic Management System (TMS), with the eventual capability to re-control all existing signalling on the IE network and to be scalable to allow for future re-signalling projects and network expansions to be taken under the control of the NTCC.

The fully integrated National Train Control Centre will provide the following:

- Signalling control of the entire network including intelligent auto-routing/conflict management train regulation systems;
- Service regulation and incident management (to include an emergency strategic command centre);
- Communications with the entire network including Customer Information Services (CIS) and Public Address (PA) systems
- Control of suburban level crossings and the electrical power to overhead lines;
- Enhanced emergency communication and train radio facilities.

The National Train Control Centre will include a Network Management Centre and training facilities such as a signalling simulator. It will eliminate a number of existing safety hazards across the network and support the continued improvement in safety performance.

Discussions are currently taking place with stakeholders to secure funding for the development of this important national transport resource.

2.2 Level Crossing Incidents

Current Status and Trends

Road vehicle incursions on to the railway primarily occur through misuse of level crossings. The overall number of level crossing incidents declined again in 2016 as measures implemented over previous years take effect. The key indicators tracked are road vehicles striking level crossing gates and near miss collisions by vehicles crossing in front of trains with both these indicators showing reductions over 2015 values.

Actions Taken

The actions taken to mitigate the risks of a road vehicle entering the running railway include

- Road user awareness campaigns across different media and in partnership with the Road Safety Authority and Commissioner for Railway Regulation
- CCTV with capacity to record vehicle registration details has been installed at three priority sites on the DART network, with evidence of crossing misuse being made available to Gardaí in support of their follow up on violations
- Targeting crossings at which there is known misuse with support from Gardaí in escalating awareness where a pattern of violations is evident
- Continuing with a programme of level crossing closures, we were able to remove a further 11 crossings during 2016, including one near Killmallock, County Limerick on the main Dublin to Cork line that was considered high risk and subject to a prohibitive speed restriction of 60mph
- Design of new road user warning systems for installation at certain types of crossing on approval

Future Activities

The initiatives developed in recent years will be built on during 2017 with further emphasis on the usage of new technologies to increase road user awareness through social media messaging and to record evidence for follow up. A new warning system designed for use at certain types of crossings will be deployed at a selection of trial sites on completion of its safety approval process.

2.3 Bridge Strikes

Current Status and Trends

The risks from road vehicles striking bridges varies significantly from the majority that cause superficial structural damage at most to those rare events with potentially catastrophic consequences. Fortunately the long term trend in bridge strikes across the IE network is improving with actions taken to improve signage, road user awareness and bridge heights supported by the diversion of many heavy goods vehicles towards the motorway network as it was completed.

The trend in incidents, while the 92 recorded in 2016 was higher than 2015, shows a marked reduction over the last 10 years from a level of over 200 per annum recorded during the middle years of the last decade.

Actions Taken

An Iarnród Éireann initiated campaign based on the cheeky title 'dumb truckers' received much publicity especially on social media during the summer months and created heightened awareness amongst its primary target audience. This less than subtle approach was taken after an increase in incidents over a few consecutive months necessitated a more direct form of intervention and is believed to have contributed to a subsequent improvement in performance.

An important project planned during 2016 to renew and raise the height of a frequently struck rail bridge (UBL154) over the N25 near Carrick-on-Suir on the Limerick Junction to Waterford line was successfully completed in February 2017.

Future Activities

Innovative signage technologies to alert road users of upcoming height restrictions are being developed for application on trial at known risk sites with longer term measures to increase bridge heights being progressed in conjunction with local authorities where feasible. Plans are being advanced to develop remote monitoring of bridges and other structures with trials to commence in 2017.

Awareness campaigns will continue to be a central feature of plans with greater use of social media intended for sharing images to encourage safe road/rail interfaces.

2.4 Customer safety

Current Status and Trends

During 2016 there was an increase in the number of accidents involving customers and third parties to 261 from 202 in the previous year. When normalised by the number of passenger journeys (and recognising that there has been an 8% increase in passenger numbers between 2015 and 2016) it is comparable to the rate of similar customer accidents on UK railways. However, the adverse trend is of concern and comes in spite of considerable work in improvement of station surfaces as part of our Accessibility project.

Elsewhere similar trends have been linked to changes in passenger behaviour, including the increased use of smartphones in inappropriate situations.

The majority of injuries incurred were minor in nature occurring from slips, trips and falls at stations. A smaller number, representing a third of the total, occurred at the interface between the train and platform. Accidents of this type tend to pose the greatest risk of personal injury and are prioritised accordingly.

Actions Taken

The primary actions taken during the year to reduce the risk of customer accidents include:

- Implementing specific measures at identified risk locations to include improved surfacing, escalator and stair initiatives and more targeted staff deployment
- Promoting awareness of station and train use risk
- Improving frontline response to customers in need of particular assistance
- Enhanced incident recording leading to better informed action planning

Future Activities

Building on the actions taken and anticipating likely future passenger growth over the coming years further SMART (Specific, Measurable, Attainable, Realistic and Timely) measures are planned for 2017 to reverse the performance of 2016. These include an independent review of our control processes at highest risk stations and comparison with best practice railways from other countries.

Figure 5 Bridge strike performance

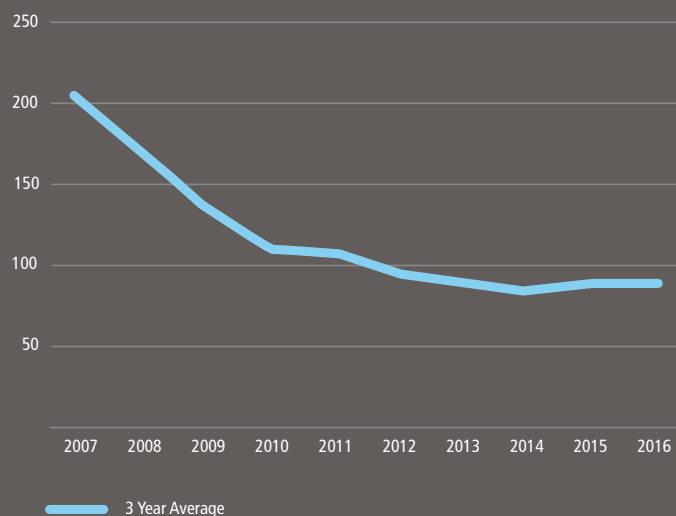
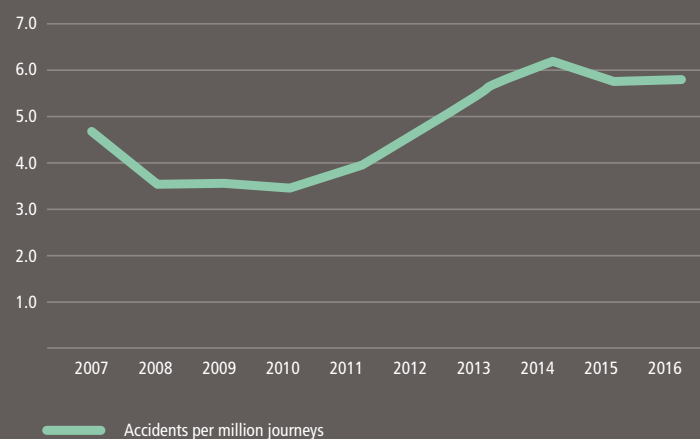


Figure 6 Customer and third party accidents

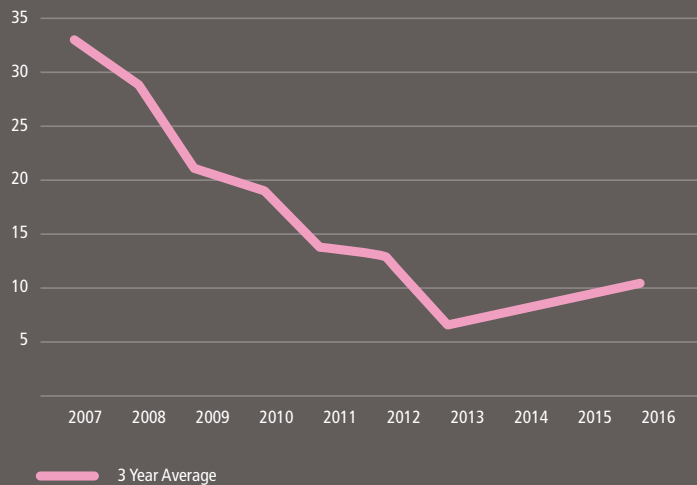


An image from a campaign to create awareness of bridge strike risk



Managing platform/train interface risks

Figure 7 Derailments and collisions



2.5 Other major incident precursors

Current Status and Trends

Precursors that could lead to major incidents include derailments, track defects and train collisions (as described in section 3.1). Our performance in these critical safety areas has improved considerably over the last decade as evidenced by the trend line in the Figure 7 chart. The majority of the incidents concerned are train derailments on sidings which represent a low safety risk and which account for the increase in numbers since 2013. However, we recognise that there are challenges in specific areas and are proactively working to address these. Many of our structures, earthworks and level crossings were provided at a time when traffic levels and loads were much lower, and the link between climate change and extreme weather events was not apparent. Adapting our assets to cope has costs and priorities that must be recognised.



Providing customer security



Rail grinding machine now in use

Actions Taken

We have completed a range of safety initiatives that will improve our ability to manage these precursor areas with the following representing the type of actions taken;

- A new risk model and decision support tool for cuttings and embankments has been developed and implemented. Incidents at these have the potential to block live railway lines if not properly maintained and, given the number of such features, modelling the risk at each is vital to ensure inspection and maintenance resources are appropriately targeted
- New track measurement and rail flaw detection systems have been brought into use to give our maintenance teams greater visibility of rail defects at an early stage, enhancing risk and cost management
- We began to operate rail grinding services in 2016 to remove flaws found in track that may grow into defects risking potential derailments
- Improving driving standards continues the positive buffer stop trend with no incidents during the year

- Following a partial culvert collapse on the Cork Line we implemented a design and inspection regime improvement along with a renewal programme for similar culverts to help maintain the integrity of this part of the railway infrastructure

The following initiatives were taken to improve fleet safety

- We agreed a rectification plan with the Commission for Railway Regulation (CRR) to resolve an axle bearing issue on the InterCity Railcar (ICR) units
- 2016 saw the establishment of sound data from a newly installed monitoring system for tracking wheel bearing performance that now covers the whole fleet
- Equipment for the application of sand to rail tracks during times of reduced adhesion was fitted to class 2600 diesel rolling stock units and planned for fitment to class 201 locomotives
- Real time condition monitoring capability was extended to ICRs and a plan developed to roll out to other fleets

Case Study 2 – Addressing the risk of bridge scour

In August, 2009, the partial collapse of Malahide Viaduct occurred with the very narrow aversion of a catastrophic incident. The root cause of the incident was progressive and undetected scouring around a central support pier. This incident precipitated significant organisational change along with a fundamental review of how we manage our infrastructure assets, especially for supporting structures at risk from scour. The organisational change involved the creation of separate inspection and maintenance teams with the establishment of a new and clearly prescribed safety management system progressed in parallel.

Initially following the incident, a comprehensive baselining of the condition and potential for scour was undertaken at all bridge assets traversing water. Following this, a specific cyclic inspection regime was established for all relevant assets. This regime is managed through our Infrastructure Asset Management System (IAMS) which gives full visibility as to the inspection and maintenance requirements of each asset. There are 490 bridges identified as potentially scour vulnerable and so form part of the cyclic scour management process.

The system established for the management of scour has 3 stages as follows:

i. **Bridge Scour Investigation (BSI):**

Each bridge undergoes a cyclic Bridge Scour Investigation involving a detailed underwater survey to assess bridge condition. It involves taking river bed levels which have been baselined and allows the continuous mapping of the river channel for deterioration identification. This survey is undertaken on a typical schedule of 1, 3 or 6 years on a risk prioritised basis.

ii. **Hydrological Assessment:**

The output from the BSI is provided to a hydrologist expert who reviews the report and takes account of any other potentially relevant issues such as changes in land use, conditions upstream of the bridge and other relevant environmental factors. A Scour Vulnerability Rating (SVR) is then attributed to each asset as a risk evaluation of the bridge that is used to determine the return period for the next inspection.

iii. **Scour Countermeasure design:**

Depending on the SVR of the bridge, countermeasures may be required to be developed to protect against scour manifestation. This stage involves the hydrologist undertaking a scour countermeasure design with the required works programmed for physical application as part of annual bridge maintenance and renewal programmes.

A further on-going programme of work associated with scour management includes foundation analysis of those bridges where the detailed information on foundations is not available to the standard desired. This is a key contributor to the scour vulnerability and so is an essential programme in terms of attaining the asset knowledge to facilitate the effective management of scour.

Overall, the processes for response to scour risk are comprehensive and are fully managed transparently through our Infrastructure Asset Management System. The learnings from the Malahide Viaduct part collapse and enhanced approach taken afterwards to the management of the risk of bridge scour have been applied to other similar infrastructure assets to better provide for maintenance and mitigation of failure risks.



Case Study 2 – Scour remediation works in progress on the Dublin/Cork Line



Coastal defence at The Murrrough

Future Activities

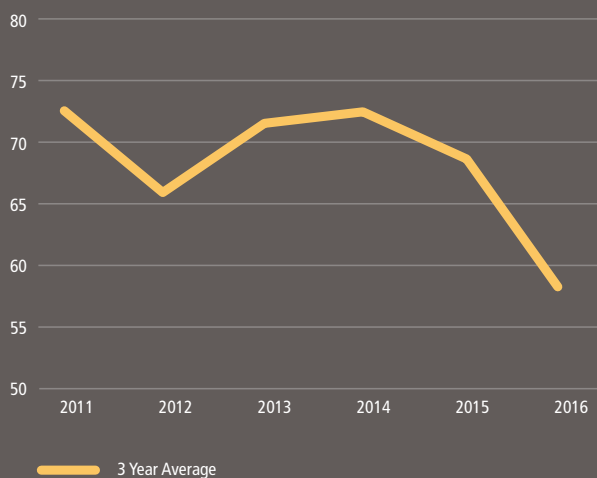
Our future activities to reduce the number of potential precursor events include:

- Coastal defence works at The Murrrough, County Wicklow were completed and will be added to with plans for similar works in other areas
- Systems for remote monitoring of rail structures will be introduced
- Targeted measures to address bridges frequently struck by road vehicles are being designed
- Preparations are being made to introduce new track condition recording systems
- Processes for managing safety when conducting infrastructure maintenance are being enhanced
- Remote monitoring of fleet is being extended to different types of rolling stock

The range of initiatives already completed and the planned projects will further enhance the risk controls already in place to prevent major accidents and maintain the railway as a safe operation.



Figure 8 Employee Lost Time Accidents



Railways in Ireland continue to be among the safest in Europe.

2.6 Workplace Safety

Current Status and Trends

With a large number of people working for the organisation, across a diverse range of roles to include construction, mechanical, port and frontline services, on a 24/7 basis the risks to employees and contractors are ever present. While the majority of lost time accidents are minor in nature and result from slips, trips and falls some are more serious with a requirement to respond accordingly.

At an overview level employee lost time accidents has been trending positively over recent years as evidenced by the chart presented in Figure 8. A total of 51 such accidents occurred in 2016, compared with 48 in the previous year, including 7 arising from psychological stress principally incurred by drivers involved in incidents of self-harm by members of the public.

Actions Taken

Actions taken during the year to reduce the risk of employee accidents include:

- Improving risk assessments and safe systems of work
- Applying lessons learned from accidents and near-miss incidents
- Targeted training towards areas of identified risk
- Ensuring appropriate Personal Protective Equipment (PPE) is available and in use

Our approach to workplace safety includes proactively engaging with contractors that provide a wide range of services to different parts of the organisation. Recognising that each party has its respective responsibilities our role is to ensure that contractors

are taking account of all potential risks to their employees and others and have established safe systems of work.

Two contractor incidents occurred during the year resulting in relatively serious injuries with one contract employee suffering electrical shock on accidentally cutting through a live cable and another breaking a leg and pelvis when he fell from a dumper truck while working on a coastal defence project in County Wicklow.

Future Activities

Activity during 2017 will focus on the implementation of lessons learned from accident investigations over recent years, concentrating on causal human factors and responding by increasing awareness, manual handling training and task based risk assessments. A review of Personal Protective Equipment (PPE) initiated in 2016 will conclude with the introduction of new supply arrangements during the summer of 2017. A campaign to ensure that issued protective items are used when required will be implemented in parallel.

3. Our Safety Landscape

3.1 Current Safety Performance and Comparisons to other EU railways

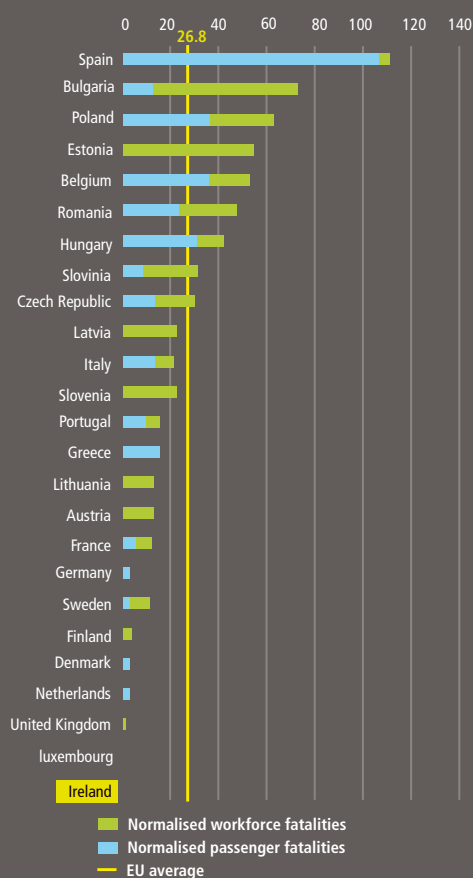
Railways in Ireland continue to be among the safest in Europe, with a very good safety record when compared to other well performing railways in the EU, as evidenced by the details on the Figure 9 chart.

This performance is also consistently demonstrated even when normalised by network size and passenger volumes, and we have worked hard to maintain this over the past decade in the face of continuing pressure on funding.

We apply lessons learnt from accidents in other administrations by reviewing our practices in the light of emerging facts and investigation reports. We note that two train collisions in 2016 in Germany and Italy with fatalities occurred on single line sections of the railway, which constitute the majority of our rail network and this has further motivated our efforts to improve train protection systems. Furthermore we are acutely aware that as a small railway with low numbers of precursor events our position in this safety league would be significantly changed by one fatality. We recognise through all our staff the need for vigilance not complacency. In safety, as with many other things, past performance is no guarantee of future success.

The European Union Agency for Rail (ERA) also records a range of indicators known to be precursors of serious railway accidents. Given the rarity of railway accidents and their high potential consequences, tracking these precursors and their causes is critical to improving railway safety. The precursors tracked by the ERA relate to incidents under the following

Figure 9 Normalised workforce and passenger fatalities across EU countries



Source: UK RSSB Annual Safety Performance Report 2015-2016

headings. To normalise the data, Iarnród Éireann is the 9th smallest railway out of the 28 EU member states based on passenger numbers.

IÉ Position in Europe (28) 2014 Data	
Broken rails	5th best
Broken axles on rolling stock in service	Joint 1st
Broken wheels on rolling stock in service	Joint 1st
Signals passed at danger	7th best
Track buckles and other track misalignment	Joint 1st

Twelve countries are participating in a safety culture study with Iarnród Éireann twinned with OBB (Austria) and PRO Rail (Netherlands) to assess safety maturity.

There have been no occurrences of broken axles or broken wheel on in-service rolling stock since 2008 in Ireland. For the other indicators, as discussed in Chapter 2 of this report, we have already put in place plans to reduce their occurrence where necessary and are developing longer-term plans to eliminate them, such as with train protection systems to protect against signals passed at danger and potential train collisions.

There were no Wrong Side Failures, those failure that result in an unsafe state, for train doors during the year compared to 2 in 2015. There were 22 wrong side failures of signals with the majority attributable to rail head contamination occurring towards year end during the Low Rail Adhesion season with rail cleaning and a sand mix applied at know risk locations to reduce occurrences.

Figure 11 Overview of safety management and governance structure



On both 'lagging' measures of safety performance, such as train collisions, and precursors to accidents, the Irish railway remains one of the safest in Europe, with no passenger or worker fatalities in the last decade.

Platform for Rail Infrastructure Managers Europe (PRIME)

Established in 2013, PRIME stands for 'Platform for Rail Infrastructure Managers Europe'. The Senior PRIME Group is supported by a number of sub-groups, of which one is concerned with Safety. An objective of the Safety sub-group is to gauge the level of maturity of 'safety culture' in rail organisations across Europe.

Twelve countries are participating in the study with Iarnród Éireann twinned with OBB (Austria) and PRO Rail (Netherlands) to assess their safety maturity level and report through the Senior PRIME Group and European Commission by the end of 2017. Participation in this group is providing useful learning opportunities to benchmark other infrastructure managers with lessons learned for application on the Irish network.

3.2 Roles and responsibilities for safety management in EU railways

The European Union has established a common framework for railway safety, as a necessary component for establishing an effective single market for rail transport services. The Railway Safety Directive 2004/49/EC and its supporting Common Safety Methods (CSMs) form the EU wide framework. The Directive also established the European Railway Agency (now the European Union Agency for Railways) and each Member State had to create a National Safety Authority (NSA) and National Investigation Body (NIB). In Ireland the Railway Safety Commission was established as the NSA and the Railway Accident Investigation Unit as the NIB. Subsequently the Railway Safety Commission was renamed the Commission for Railway Regulation (CRR) on 29th February 2016 reflecting the wider range of regulatory responsibilities that were assigned to it under the European Union (Regulation of Railways) Regulations, Statutory Instrument No 249 of 2015.

The role of the **Commission for Railway Regulation** is to ensure that each railway organisation in Ireland has implemented and is complying with Safety Management Systems (SMS) that conform to legislative requirements.

The **Railway Accident Investigation Unit (RAIU)** is an independent investigation unit within the Department of Transport, Tourism and Sport (DTTAS). The purpose of an investigation by the RAIU is to improve railway safety by establishing, in so far as possible, the cause or causes of an accident with a view to making recommendations for the avoidance of accidents in the future. It is not the purpose of the RAIU to attribute blame or liability. Although forming part of DTTAS, the Chief Investigator is independent in, and solely responsible for, the conduct of investigation and publication of reports on matters concerning railway incident and accidents.

The RAIU investigates all serious accidents. A serious accident means any train collision or derailment of trains resulting in: the death of one person; serious injuries to five or more people and/or extensive damage to rolling stock, the infrastructure or the environment. The RAIU may investigate and report on accidents and incidents that under slightly different conditions might have led to serious accidents.

Iarnród Éireann, which is a subsidiary of Córas Iompair Éireann, provides passenger and freight rail services as well as operating Rosslare Europort. Córas Iompair Éireann owns both the land underlying the railway infrastructure and the stations. Iarnród Éireann is split into an Infrastructure Manager (IM) and Railway Undertaking (RU), both of which have a Safety Management System that has been reviewed and approved by the CRR. The approvals (Safety Authorisation for the IM and Safety Certification for the RU) are valid for five years, and both the IM and RU expect to be applying for renewed safety approvals in advance of their expiry in March 2018.

3.3 Commission for Railway Regulation Processes

As National Safety Authority, the Commission for Railway Regulation (CRR) follows a number of Common Safety Methods (CSM). These cover assessing conformity of railway safety management systems with the requirements for obtaining railway safety certificates and railway safety authorisations (named 'the CSM on Conformity Assessment') and for supervision by national safety authorities after issuing a safety certificate or safety authorisation (named 'the CSM on Supervision').

The CRR is required to ensure that each railway organisation operating in Ireland understands and effectively manages the risk to safety associated with its activities. This is achieved in three ways:

- **Conformity Assessment – Assessing Safety Management Systems (SMS)** to ensure that they conform to all requirements prior to awarding safety authorisation or safety certificates, and assessment of new or significantly altered railway infrastructure and rolling stock to ensure safety compliance prior to placing in service
- **Compliance Supervision & Enforcement** – Auditing compliance with the procedures and standards prescribed in each approved SMS, and inspection of railway assets to assess compliance with fitness for purpose criteria. Compliance with safety recommendations is assured through the monitoring of implementation plans and by taking enforcement proceedings where necessary
- **European & Legislative Harmonisation** – Supporting the harmonisation of legislation with European Directives and Regulations, and ensuring that the consequent implementation of related technical and procedural measures conforms to mandatory European requirements.

As would be expected, given the size and nature of the railway industry in Ireland, there is frequent engagement between our organisation and the CRR with routine meetings held during 2016 to progress items reflecting the respective roles and responsibilities of both organisations.

An audit of the Railway Undertaking's Operations Safety Management System by consultants Ricardo Rail on behalf of the CRR towards the end of 2016 reported that:

'the general attitude towards safety throughout IÉ was sound, with evidence of safety improvements being developed' and 'there appeared to be strong interest in promoting safety and the recently introduced initiatives such as 'Leadership in Safety' introduced in 2015 further demonstrates this.'

The audit recorded one minor non-compliance, some actions for improvement and areas of notable good practice.

One Improvement Notice that may require amendment of our Drugs and Alcohol sampling process was received during the year and is being addressed within the required timeline.

The Commission for Railway Regulation in publishing its 2015 Annual Report towards the end of 2016 raised concerns on its view of a changing Iarnród Éireann approach to safety regulation. This reflected some tensions that existed between the two organisations at senior levels. The Company has reiterated its commitment to having a positive working relationship with the CRR and a programme of joint leadership meetings has been scheduled for 2017 to give further effect to this with quarterly updates been given to the Minister for Transport, Tourism and Sport by the CRR.

3.4 Status of recommendations from audits and inspections

The three types of activities that lead to recommendations being issued and reported on here are as follows:

RAIU Safety Recommendations

This category covers those recommendations, arising from investigations by the Rail Accident Investigation Unit (RAIU) into accidents and serious incidents that are issued against Iarnród Éireann and are reported on to the CRR for their review and final closure on receipt of satisfactory evidence.

Historical Safety Recommendations

These refer to recommendations issued by Government initiated safety reviews of which there were four between 1998 and 2006. The first three were conducted by I.R.M.S. and the fourth by AD Little. Those recommendations addressed to Iarnród Éireann by these reviews were progressed through a fifteen year railway safety programme which saw approximately €1.6 billion investment targeted at the recommended safety improvements.

CRR Audit Outcomes

These recommendations arise from CRR (formerly Railway Safety Commission) conducted audits with those items identified as Non-compliances and Action Required tracked and submitted to the CRR for closure.

Figure 10 Status of recommendation opened before 1.1.'16

No.	Infrastructure Manager (IM)	Open at 1.1.'16	Submitted in 2016	Closed in 2016	Open at 1.1.'17
1	RAIU Recommendations	11	11	4	7
2	Historical Safety Recommendations	190	186	128	62
3	CRR Audit Outcomes	61	43	40	21
Total		262	240	172	90

No.	Railway Undertaking (RU)	Open at 1.1.'16	Submitted in 2016	Closed in 2016	Open at 1.1.'17
1	RAIU Recommendations	9	9	5	4
2	Historical Safety Recommendations	76	76	39	37
3	CRR Audit Outcomes	109	108	34	75
Total		194	193	78	116

Combined IM and RU		456	433	250	206
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Figure 10 shows tables for Infrastructure Manager, Railway Undertaking and combined with a status for each of the recommendation types for those that had been opened prior to the start of 2016. It can be seen that very substantial progress was achieved with the submission of outcomes to the CRR at 433 (95%) from a total of 456 open recommendations. Good progress was also achieved in recommendation closure, in particular for Infrastructure Manager, with 250 (55%) of the combined figure closed by the year end. Discussions with CRR are ongoing to achieve closure of those that remain open.

A further 48 new Infrastructure Manager and Railway Undertaking recommendations were opened during the year (17 RAIU and 31 CRR) with action being taken to close these and report to the CRR.

3.5 Internal Safety Governance Structure

Iarnród Éireann has well established corporate governance arrangements that have been incrementally enhanced through the years in line with the Code of Practice for the Governance of State Bodies issued by the Department of Finance. These provide for safety governance and include a specific Board Advisory Group for safety along with

those for Infrastructure and Train Operations that prioritise discussion on safety arrangements for their respective functions. These structures combine meeting processes for all levels of management with those representing Board tasked with governance responsibility.

Figure 11 shows those groups that are directly involved in the safety management and governance with other functions also addressing safety as part of fulfilling on their responsibilities. Reporting is organised around four week periods with meeting cycles scheduled to review performance after each period. A dashboard with a balanced set of leading and lagging indicators is used for tracking performance against targets and noting actions being taken to address any adverse trends. Key indicators from lower level management reports cascade up through the reporting structure into an Iarnród Éireann Always Safe Dashboard which is then used at Board and other governance level reviews.

Towards the end of 2016 a Board sponsored review of safety governance was initiated and tasked to include benchmarking with rail and other organisations in Ireland and overseas as part of its assessment. The findings of this review will be discussed with key stakeholders during 2017.

Case Study 3 – Recognising Safety Leadership

As part of our Safety Leadership Programme, which was launched in 2015 to create safety leaders of the future, we presented our first set of safety awards across five categories in April 2016. The winners, the highly commended and all nominees in each category are a demonstration of the safety initiative and innovation across the organisation and support the message Accident Free Depends on Me.

Infrastructure Individual/Team of the year

Winner: The Ballast Cleaning Project Team



Gary Donoghue receives the award from David Franks, CEO on behalf of The Ballast Cleaning Project Team

This team won the award for safely coordinating and planning a huge scope of work including: pilot-working, single line working while also ensuring that passenger services continue running through the disruptive works. This has involved a massive amount of stakeholder engagement and organisation in order for the project to run safely & smoothly.

Highly commended: Three Limerick District Traffic Executives: Alan Dunphy, John Dineen and Derek Robinson

Alan, John and Derek are involved in a project to help train colleagues who act as Emergency Operators at CCTV Barrier Level Crossings. They developed a training tool that could replicate faults and incidents at the training compound at Thurles station, allowing colleagues to learn in a safe environment away from train movements.

Operations Safety Team/individual

Winner: Joe Conlan, Driver, Heuston



Joe Conlan receives his award from David Franks, CEO

On 27th April 2015 Joe was driving the 11.20 Cork to Heuston service. While driving he observed a vehicle obstructing the line. Joe immediately made an emergency call to the controlling Signaller and requested that all trains travelling in the down direction be stopped. He demonstrated an exceptional level of professionalism in the way he communicated with the controlling Signaller calmly and thus averted a potentially catastrophic incident.

Highly commended: Rory West from the Wheel Shop, Inchicore

Rory, as the Workshop Manager has proactively managed safety in his area demonstrated through close-out of actions, regularly emergency drills, active participation of the Safety Representatives and updated risk assessments.

Safety Innovation

Winner: Philip Tully for the Signalling Simulation Project



Philip Tully receives his award from David Franks, CEO

Philip was the project manager for the Signalling Simulation Project which involved the design and installation of this system in the Inchicore Training Centre. This is already benefiting Signaller training, allowing a safe and realistic environment for trainees to be taught regulations which are associated with the degraded working of trains.

Highly commended: Mick Shine, District Traction Executive, Limerick

Mick has organised a number of exercises and demonstrations with the local Fire Brigade and our colleagues on how to gain access to trains from outside in a crash situation and make them safe for extracting casualties. He has planned the exercises and followed-up with the Fire Services on any queries they had.

Safety Representative of the Year

Winner: Stuart McCormack, CCE



Stuart McCormack receives his award from David Franks, CEO

Stuart is genuinely concerned for the well-being of all staff within the division and makes an exceptional contribution to occupational safety within his and neighbouring divisions. He distributes feedback to all staff which is of great benefit as they have a clear understanding of hazards raised and are kept informed of mitigations or actions taken in relation to safety.

Highly commended: Caroline Troy, DART.

Caroline is very proactive in trying to ensure a safe place of work for all staff and keeping our DART stations safe for the public. She shows great attention to detail and always follows up on reports she receives and goes out of her way to support colleagues across the DART.



Safety Excellence Award

This award goes to the team or person, who went the extra mile to ensure that our customers and our colleagues remain safe at all times. Sometimes situations can occur that are outside of our control or outside the control of others and what is needed is quick thinking and compassion.

Winner: David Maguire, Station Controller, Drogheda



David Maguire receives his award from David Franks, CEO

David has been recognised for the manner in which he engaged with an individual on the Boyne Viaduct. The CTC signalman advised David that a person in distress was on the bridge. He made his way out onto bridge to find a very distressed man standing out on the parapet of bridge. He calmly talked the man in and escorted him into the station where the emergency services offered him assistance. The person involved called to the station the following week to thank David for saving his life and advised that he had sought professional help and is in a much better frame of mind.





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