RAILWAY ACCIDENT INVESTIGATION UNIT

IRELAND

INVESTIGATION REPORT

Investigation into SPADs on IÉ Network, from January 2012 to June 2015

RAIU Report No: R2016 – R001

Published: 11/04/2016

Report publication

RAIU
2nd Floor, 2 Leeson Lane
Dublin 2
Ireland

email: info@raiu.ie
website: www.raiu.ie
telephone: + 353 1 604 1241
fax: + 353 1 604 1351

The original publication details are given below:

Title	Investigation into SPADs on the IÉ Network
Document type	Investigation Report
Document number	R2016-R001A
Document issue date	11/04/2016

Where the report has been altered following its original publication, details on the changes are given below:

Revision number	**Revision date**	**Summary of changes**

Reader guide

All dimensions and speeds in this report are given using the International System of Units (SI Units). Where the normal railway practice, in some railway organisations, is to use imperial dimensions; imperial dimensions are used and the SI Unit is also given.

All abbreviations and technical terms (which appear in italics the first time they appear in the report) are explained in the glossary.

Descriptions and figures may be simplified in order to illustrate concepts to non-technical readers.

Report preface

The RAIU is an independent investigation unit within the Department of Transport, Tourism and Sport (DTTAS) which conducts investigations into accidents and incidents on the national railway network, the Dublin Area Rapid Transit (DART) network, the LUAS, heritage and industrial railways in Ireland. Investigations are carried out in accordance with the Railway Safety Directive 2004/49/EC, the Railway Safety Act 2005 and Statutory Instrument No. 258 of 2014 European Union (Railway Safety) (Reporting and investigation of serious accidents, accidents and incidents) Regulations 2014.

The RAIU investigate all serious accidents. A serious accident means any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway safety regulation or the management of safety.

The RAIU may investigate and report on accidents and incidents which under slightly different conditions might have led to a serious accident. RAIU investigations are conducted for the purpose of accident and incident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations in order to prevent accidents and incidents in the future and improve railway safety.

It is not the purpose of an RAIU investigation to attribute blame or liability.

Report summary

Introduction

In December 2013, two serious 'Signal Passed at Danger' (SPAD) events were reported to the RAIU by Iarnród Éireann (IÉ). After an initial review of these SPADs, and an earlier SPAD in April 2013 the RAIU made the decision to carry out a full review of *Category A SPADs* on the IÉ network from 2012 to 2014. This was later extended to include SPADs from January to June 2015. As a result, the RAIU reviewed forty-five SPAD events which occurred within a three and a half year period. These SPADs were divided into three main event types, namely: SPADs during *normal train operations*; SPADs during *degraded train operations*; and *Start Against Signal* (SAS)/ *Start on Yellow* (SOY) SPADs. The SPADs with the highest *SPAD Risk Rankings* (SRR) in 2013 were chosen as the main case studies, where a full investigation was carried out into these three SPADs: SPAD at Signal TL223, Millstreet, on the 8th December 2013; SPAD at Signal XX098, Gortavogher, on the 19th December 2013; and the SPAD at Signal WL167, Muine Bheag, on the 9th April 2013.

Summarised Investigations (the comprehensive investigations appear in the main body of the report)

Full investigations

SPAD at Signal TL223, Millstreet, on the 8th December 2013

On the 8th December 2013, the IÉ 11:50 hours (hrs) passenger service from Tralee to Heuston (Train A303) was running late. In an effort to minimise delays, the Centralised Traffic Control (CTC) Signalman and the Traffic Regulator made the decision to change the crossing point of Train A303 and the 12:10 hrs Cork to Tralee passenger service (Train A304) to Millstreet Station (Cork), instead of Banteer Station (the routes are on a bi-directional single line track with crossing loops). It was expected that Train A304 would arrive first at Millstreet Station (a one-platform station), disembark passengers and shunt into the crossing loop. However, both trains approached Millstreet Station at the same time. As Train A303 approached Millstreet Station, it passed signal TL223 at danger without authority. The SPAD resulted in the two trains occupying the same section of line, travelling towards each other, until the CTC Signalman put out a general call for the trains to stop. Both train drivers applied the brakes and the trains came to a stop 175 metres (m) apart on the platform at Millstreet Station. IÉ awarded a SPAD Risk Ranking (SRR) of 21 to this Category A SPAD therefore categorising it as a *high risk* SPAD.

The RAIU investigation found that the *immediate cause* of the SPAD was that Driver A303 did not see that Signal TL223 was displaying a stop aspect and continued driving towards Millstreet Station. Possible *contributory factors to* Train A303 arriving at Millstreet Station Platform were:

- The current basic overrun protection in the Millstreet area does not provide sufficient protection to trains on single lines with crossings loops;
- Driver A303 lost situational awareness, as he thought Signal TL223 was displaying a green aspect;
- Driver A303 had an incorrect expectation that Signal TL223 would be displaying a green aspect as he had never approached the signal displaying a red light; this incorrect expectation was reinforced by the fact that the barriers for Level Crossing XE061 were lowered on his approach and there were passengers waiting on the platform. Furthermore, he had not been made aware by radio or by any other means and he was unaware that the crossing point for the trains had changed;
- Driver A303 did not apply any form of *Error Prevention Technique (EPT)* on the approach to the yellow aspect of Signal TLR223 to remind him that Signal TL223 would be displaying a red aspect;
- Driver A303 did not apply any EPT to refocus on his driving duties after he had become stressed, distracted and preoccupied by the events at Killarney Station during the same journey, where two young children were left unattended, which resulted in Driver A303 having to return to the station. Driver A303 had also become distracted by the fact that he was unable to provide relief duties for another service, due to the late running of the train. Driver A303 may have also become distracted by the speed board, located directly after Signal TL223; and the flashing lights of Level Crossing XE061;
- The CTC Signalman and the Traffic Regulator were unaware that they had inadvertently reduced the overrun protection for the trains, as they allowed Train A304 onto the platform instead of holding it outside the station.

Underlying causes associated with the incident, include:

- The Traffic Regulator's Manual does not include specific instructions or any form of dynamic risk assessment in relation to the alteration of the scheduled movements of trains;
- IÉ's Lineside Signal Sighting & Spacing Signalling Standard (I-SIG-2043) does not adequately address the risks associated with distraction features in the vicinity of signals, in particular, the positioning of speed boards in the vicinity of signals.

The *root cause* associated with the incident was:

- Non-technical skills, such as EPT, are not adequately promoted, trained for, assessed or monitored during driving training and driver competency management as outlined in IÉ-RU's suite of Operations SMS documents (namely OPS-SMS-3.0, OPS-SMS-3.1, OPS-SMS-3.2 & OPS-SMS-3.5).

SPAD at Signal XX098, Gortavogher, on the 19th December 2013

On the 19th December, in Gortavogher (County Clare), lightning strikes resulted in signal and level crossing equipment failures. The touch screen in the Mallow level crossing control centre (LCCC) was not showing the status of a number of signals at the level crossings in the area and as a result the Galway Line Signalman (GLS) and the level crossing control operative (LCCO) despatched emergency operatives (EOs) to the level crossings to assess and manage the level crossings. The LCCO did not inform the GLS not to allow any trains to enter the section until the EOs were onsite and in control of the level crossings. As a result, the GLS informed the driver (Driver A780) of the 05:55 hrs passenger service from Limerick to Galway (Train A780), while he was in Ennis that there were faults with the level crossings which would be managed by EOs and gave the Driver A780 the proceed aspect to enter the section. As Driver A780 approached the first level crossing with reported faults (XE071) he stopped in rear of the stop signal until the EO cleared the signals and Driver A780 travelled through the level crossing without incident. However, the signals at the next level crossing with reported faults (XE098) were not illuminated and Driver A780 only became aware of the situation when it was too late to stop in advance of the signal and level crossing and travelled through the level crossing with the barriers raised to road traffic (the EO was onsite but had not taken local control of the level crossing). Due to issues with the train radio operating in the cab (also as a result of the lightning strikes), Driver A780 travelled for a further eleven kilometres (km) before coming to a stop. IÉ assigned an SRR of 18 to this Category A SPAD; therefore categorising it as a *medium risk* SPAD.

The RAIU investigation into this SPAD event found the immediate cause of the Driver A780 travelling past signal XE098DS at danger was that the GLS allowed Train A780 into the section of track where it was known there was two faulty level crossings, as the LCCO have not told the GLS not to allow trains into the section until the EOs had arrived at the level crossings and had verified that they were in order to allow a train approach. Contributory factors to Train A780 passing Signal XE098DS were:

- Driver A780 had not travelled toward Level Crossing XE098 cautiously, as set out in the Rule Book, as he had an incorrect expectation that he would approach Level Crossing XE098 with the signals operational;
- The visibility of the signals was affected by the adverse weather conditions, which resulted in Driver A780 losing situational awareness as to his location in terms of the level crossing and resulting in him, not seeing Signal XE098DS until it was too late to stop;

- The LCCO did not have clear understanding of the LCCC instructions, which resulted in him not telling the GLS not to allow trains into the section until the EOs had local control. In addition, the LCCO was not aware that he had to get the EO to verify the status of the level crossing;
- The GLS did not fully appreciate the role of the EO and was not aware that EOs were required to verify the status (to the LCCO) of the level crossing before allowing trains to approach them.

Underlying causes to the SPAD are:

- The LCCC Instructions are not user friendly, which has resulted in the LCCOs reverting to the Rule Book which is not fully comprehensive in terms of the operation of CCTV level crossings;
- The roles and responsibilities of the LCCOs and the Signalman are not fully established, in that the LCCOs appear to have gained more responsibility over recent years, which is not supported by any documentation.

The root causes to the SPAD was:

- Role of the LCCO and GLS do not appear to be fully outlined in any formal documentation.

SPAD at Signal WL167, Muine Bheag, on the 9th April 2013

On the 9th April 2013, at approximately 11:19 hrs, the 10:15 hrs passenger service form Heuston to Waterford (Train A504) approached Muine Bheag Station with signals WLR161 and WL161 displaying double yellow and single yellow aspects, respectively. This signalling sequence was due to, Signal WL167 (on the exit of the station) displaying a red aspect, as a Track Recording Vehicle (TRV) was due to cross Train A504 at Muine Bheag Station.

Train A504 was travelling with a driver (Driver A505, who was not the rostered driver for this service) and trainee driver. After performing a number of platform duties, such as ensuring all passengers disembarked and boarded the train safely, the Person in Charge (PIC) gave the *'Station Works Complete'* and the *'Ready to Start' signals* despite seeing that Signal WL167 was at danger. The trainee driver saw the PIC give these signals as he was looking out of the cab window and Driver A505 watched the PIC give the signals on the in-cab Man Machine Interface (MMI) screen. Driver A505 did not observe Signal WL167, which is positioned approximately 215 m off Muine Bheag Station Platform.

Driver A505 then departed Muine Bheag Station and on approaching Signal WL167 saw that Signal WL167 was displaying a red aspect and immediately applied the emergency brake, coming to a stop a short distance past the signal. The signalman contacted Driver A505 on the train radio to inform him he had passed Signal WL167 at danger and not to move the train.

The RAIU investigation found that the immediate cause of the Driver A505 starting against and travelling past Signal WL167 at danger was that he did not check the signal prior to departing Muine Bheag Station. Contributory factors to Driver A505 not checking Signal WL167 prior to departing the station:

- There was no DRA in the driving cab which may have reminded Driver A505 to check the signal prior to starting against Signal WL167;
- Driver A505 had an incorrect expectation that Signal WL167 was displaying a proceed aspect due to an over-familiarisation with the normal signal sequencing at Muine Bheag Station; not knowing that a TRV was due to cross his train at Muine Bheag Station; and receiving the 'Ready to Start' signal from the PIC Muine Bheag;
- Driver A505 was distracted by the presence of the Trainee Driver in the driving cab;
- Driver A505 was unable to apply any EPTs to remind him to check the signal and manage the distraction in the cab, as he did not have appropriate EPT training;
- PIC Muine Bheag giving the 'Ready to Start' signal despite knowing the signal was at danger.

Underlying cause to the SPAD is:

- Training in EPTs and competency management systems are not sufficiently robust, especially for SAS SPADs which account for the largest amount of SPADs on the IÉ network, and where there was, historically, no DRA present in the driving cabs.

Infrastructure

The RAIU investigation found that enhanced overrun protection, which mitigates against disregard of signal aspects warning of a signal at danger and against disregard of a signal at danger by a train starting from rest, is provided on IÉ in the form of either advisory (Continuous Automatic Warning System (CAWS)) or mandatory train control systems (Automatic Train Protection (ATP)). CAWS accounts for is available on 41.6%, while ATP is available on 4.6 % of the IÉ network, which means that over half of the IÉ network is protected through basic overrun protection, meaning that there is a strong reliance of the performance of drivers in the prevention of SPAD events.

Collective review of all Category A SPADs

Factual findings

A collective review of all Category A SPADs was then carried out by the RAIU which made a number of findings in relation to the prevalence of SPADs, SPADs are most likely to occur:

- To drivers with between three and five years of driving experience;
- In the afternoon or evening time;
- Within the first thirty minutes driving.

It was also noted that a quarter of drivers involved in the SPADs reviewed by the RAIU, had previous SPADs; while nearly 40% had been involved in a safety related occurrence that required that the driver be reclassified.

Human factor contributory factors related to Category A SPADs

The RAIU found that loss of situational awareness, distraction and/or preoccupation and incorrect expectation were the main contributory factors associated with the causation of SPADs. The occurrence of these human factors varied related to event type, for example:

- Loss of situational awareness, distraction and/or preoccupation, and incorrect expectation of signal aspect were all major contributory factors in SPADs occurring during normal train operations;
- Incorrect expectation was the major contributory factor in SPADs occurring during degraded train operations, which was generally as a result of inputs from other operational staff, such as signalmen;
- Incorrect expectation, distraction and/or preoccupation, and loss of situational awareness where all major contributory factors in SPADs occurring during normal train operations;
- Distraction, loss of situational awareness and incorrect expectation were all major contributory factors in the occurrence of SOY SPADs, with distraction being a contributory factor in nearly all SOY SPADs.

Use of EPTs to manage human factors

Irrespective of the different human factor contributory factors or event types, the RAIU found that the vast majority of the drivers involved in Category A SPADs, did not apply any form of EPTs, or incorrectly applied EPTs, to manage these human factors. As a result, the drivers were unable to refocus after distraction, avoid incorrect expectation or maintain situational awareness as they had not developed appropriate EPTs. This was as a result of drivers receiving inadequate training in EPTs and the lack of any form of assessment in terms of EPTs. The RAIU found that, post incident, the majority of drivers had developed some form of EPTs, which they found to be very effective in the management of distractions, incorrect expectations and situational awareness, and consider that if they had applied these EPTs on the day of the SPAD incident, the SPAD would not have occurred.

SPAD Management

IÉ have adopted a system for the calculation of SPAD severity which appears to ‘underscore’ the severity of SPADs, with a large number of SPADs being awarded an SRR of 0; as a result a true reflection of the SPAD severity on the IÉ network cannot be determined. IÉ have engaged a consultant to review this process (awaiting report). In terms of IÉ’s collation of SPAD event information, the databases provided to the RAIU are inconsistent, sometimes inaccurate and not complete (as they generally do not include any findings from IÉ reports). In terms of the internal investigation of SPADs on the IÉ network, a large number of the reports take an excessive amount of time to complete (exceeding their own requirements of six months); while some reports remain in draft format. The reports indicate that there is a lack of consistency in the investigative terms used resulting in the frequent misuse of common investigation terms.

It was also found that drivers on the IÉ network generally do not report near miss events (only one near miss SPAD has ever been reported in IÉ between 2012 and 2015). If an adequate near miss reporting system was adopted it could be used as a tool by IÉ in relation to the proactive management of the prevention of SPADs; however, as this is not occurring, there is no early detection for the early identified of SPADs by certain drivers or at certain signals on the IÉ network.

Driver management

Drivers, in some cases, are permitted to make a number of movements post SPAD event in order to recover the situation. However, it is evident that SPAD events are traumatic for drivers and although they may feel they can carry out the movements, errors sometimes occur. In addition, even after 'very serious' incidents, drivers have been permitted to carry out train movements, despite other drivers being available. In terms of other operational staff, in a lot of SPAD events, these operational staff were not removed from duties, despite it being later found that their actions were contributory to the SPAD event. This variance in the treatment of operational staff, has led to the perception of some drivers involved in these incidents that the drivers are. The general treatment of the drivers, post SPAD event, has also increased the perception as it has been found by the RAIU that in some cases drivers are treated poorly, with the suggestion of further sanctions and accusations of having SPADs on purpose. Actions taken against some drivers appeared quite punitive. The above factors have resulted in drivers not reporting near miss SPADs or other incidents, for fear of further sanctions; or fear of being removed from the driving grade and IÉ.

Additional observations

Suspected self-harm incidents

A number of the drivers interviewed as part of this investigation had been involved in fatal incidents on the railway line as a result of individuals purposefully placing themselves in front of the moving train. The drivers who experience these incidents found the event itself to be very traumatic.

In certain cases, drivers were left alone on the train for long periods of time without any instruction from management (this is likely the result of trying to arrange emergency services and arrangement for the transfer of train passengers to a bus service). In addition, in some instances drivers were required to attend the Coroner's Court and were questioned by the families of the deceased, the drivers who experienced these scenarios found them to be very stressful and found that they had no support from the company when required to attend these courts. However, it should be noted that in some depots, drivers are well supported through this time.

Drivers involved in these incidents are initially offered six counselling sessions. Some drivers have stated that they have requested additional support from the CMO, while some drivers do not consider that they need the counselling service.

Near miss reporting

It is clear that a number of unsafe acts must occur prior to the occurrence of a SPAD, however, drivers are not reporting these incidents, and to date, there has only been one near miss SPAD reported to IÉ which resulted in the driver being placed on a DD&SS. Drivers are not reporting these incidents because of concerns of being placed on a DD&SS or other sanctions.

Actions taken or in progress by IÉ, RSC and BBRI

The actions taken or in progress by IÉ, RSC and BBRI are detailed in section 4 part 13.

Safety recommendations made by the RAIU

As a result of the findings of the RAIU report, the RAIU make the following fourteen safety recommendations:

- IÉ-IM must introduce adequate train protection systems on IÉ network for the protection of trains; this system should be robust and to an acceptable standard within Europe; and have the appropriate ATP and speed supervision functionality;
- IÉ-IM should review the functionality of the ATP's running release to ensure that the train protection function in relation to passing a signal at danger is appropriately maintained where drivers are approaching signals displaying red aspects. If this is not feasible with the current equipment it should be included when upgrading the ATP equipment**;**
- IÉ-IM should review the functionality of signals in the Connolly area so that the instances of abnormal downgrades are minimised;
- IÉ-RU should commission an independent review, in terms of human factors, to determine why there is a prevalence for the occurrence of SPADs: at certain times of the day; at certain times of drivers shifts; and for drivers with three-five years driving experience;
- IÉ-RU should review the culture within the company so that actions taken after SPAD's supports learning within the driver grades should errors occur, and that the DD&SS is used for redeveloping competence in driving skills and supporting the drivers in returning to driving duties, after a SPAD event**;**
- IÉ-RU should introduce a near miss reporting system, whereby, drivers may report near misses without the fear of sanctions being imposed;
- IÉ-IM should identify high risk signals and, where the technology exists, introduce a mechanism to monitor the approach speed to these signals; to ensure that near misses are identified and managed**;**

- IÉ-IM should review the Traffic Regulator's Manual with a view to introducing guidance for Traffic Regulator's in terms of the management of train delays and the switching of crossing points;
- IÉ-IM should review their training and competency management for Traffic Regulators so that they have the appropriate skill set in terms of identifying potential risks associated with the regulating of trains;
- IÉ-RU and IÉ-IM should carry out a review of the interfaces between different operational staff (i.e. drivers, LCCOs, signalmen and EOs) so that all operational staff can adequately manage train operations during degraded situations. Part of this review should focus on the safety critical communications between operational staff;
- IÉ-IM should identify all locations where safety critical communications are not recorded and develop a programme of works for the introduction of recording safety critical communications at these locations;
- IÉ-IM should review the procedures applicable to signalman, Level Crossing Keeper, LCCO and level crossing emergency operators with particular emphasis on the actions to be taken by each when a fault is detected at a level crossing. This review should consider circumstances where a train may already have entered the affected section of line, and circumstances where the signal may be missing or extinguished**;**
- IÉ-IM, should review their procedures for the placement of speed boards and brief relevant staff to be vigilant in the placement of lineside signage with respect to the potential for obscuring of signals or otherwise unintentionally providing distractions to drivers, especially in the case where there are fixed colour light signals or they have potential to cause SOY SPADs;
- IÉ-IM & IÉ-RU should review the current system of reporting SPAD events so that reports are consistent and published within a set period of time.

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Part 2 – Infrastructure: Signals & Train Protection

Part 3 – SPADs on the IÉ Network

Part 4 – Driver Training, CMS & DD&SS

Railway Accident Investigation Unit

PART 1 – Introduction to RAIU Investigation

RAIU decision to investigate

1 In accordance with the Railway Safety Act 2005 and Statutory Instrument No. 258 of 2014 European Union (Railway Safety) (Reporting and investigation of Serious Accidents, Accidents and Incidents) Regulations 2014, the RAIU investigate all serious accidents, the RAIU may also investigate and report on accidents and incidents which under slightly different conditions might have led to a serious accident.

2 On the 8th December 2013, two trains were travelling towards each other in the same section of track, only stopping when the signalman made a call for the trains to stop, the trains stopped 175 m apart at Millstreet Station Platform. As part of the initial RAIU investigation, the RAIU reviewed other Category A SPADs in IÉ in 2013. Although none of these SPADs resulted in fatalities, the consequences of SPADs can lead to multiple fatalities, such as the SPAD at Cherryville Junction, Co Kildare, in 1983; where the 18:50 hrs Galway to Dublin passenger service passed Signal CY161 at danger and collided, rear-on, with the 17:15 hrs passenger service from Tralee to Dublin which was stationary, killing seven passengers. This SPAD incident is the most recent SPAD incident which has resulted in fatalities on the IÉ network.

3 As a result of these factors, the RAIU made the decision to carry out an investigation, under article 19 (2) of the Railway Safety Directive (EC, 2004), into the SPAD at Millstreet on the 8th December 2013; as, given that under slightly different conditions, this SPAD incident may have led to a head on collision (serious accident), which had the potential for fatalities and serious injuries.

4 The decision was also made to expand the investigation to include all Category A SPADs from January 2012 to June 2015, inclusive, in order to see if there were any trends into the types and causations of SPADs on the IÉ network. These other Category A SPADs were divided into different event types, namely:

- SPADs during *normal train operations*;
- SPADs during *degraded train operations*;
- SAS and SOY SPADs.

Scope of investigation

5 This RAIU investigation reviewed Category A SPADs which occurred on the IÉ network from January 2012 to July 2015, inclusive, with the exclusion of *low rail adhesion* (LRA) SPADs. As a result, the RAIU are reviewing forty-five Category A SPAD incidents.

6 The investigation will focus on three main SPADs, the SPADs at Millstreet on the 8th December 2013, the SPAD at Gortavogher on the 19th December 2013 and the SPAD at Muine Bheag on the 9th April 2013 as these best reflect the SPAD event type on the IÉ network, i.e. SPADs during normal train operations, SPADs under degraded train operations and Start Against Signal (SAS) /Start on Yellow (SOY) SPADs, respectively.

7 To present the findings of the RAIU investigation, the RAIU have divided this report into five sections:

Section 1

- Part 1 – Introduction to the RAIU investigation;
- Part 2 – Infrastructure: Introduction to Signals & Train Protection;
- Part 3 – Introduction to SPADs on the IÉ Network;
- Part 4 – Driver training, CMSs & DD&SSs.

Section 2

- Part 5 – SPAD at Millstreet on the 8th December 2013;
- Part 6 – SPAD at Gortavogher on the 19th December 2013;
- Part 7 – SAS SPAD at Muine Bheag on the 9th April 2013.

Section 3

- Part 8 – A Review of All Category A SPADs (January 2012 – June 2015);
- Part 9 – SPAD Management;
- Part 10 – SPAD Management of Drivers.

Section 4

- Part 11 – Additional Observations;
- Part 12 – The Role of the RSC in relation to SPADs;
- Part 13 – Relevant actions taken or in progress;
- Part 14 – Safety Recommendations.

Section 5

- Part 15 – Additional information.

8 The RAIU must establish the extent of the investigation to ensure that only pertinent information is recovered and reviewed. Therefore, for this investigation, the RAIU have defined the following scope:

- Establish the sequence of events of the three named incidents (SPADs at Millstreet, Gortavogher and Muine Bheag);
- Establish, where applicable, the *immediate cause, contributory factors* (CF) and *underlying causes* (UC) and *root causes* (RC) to these incidents;
- Examine the operation of the signalling and train protection systems;
- Examine the standards and procedures associated with the signalling and train protection systems;
- Examine the training and driving records for the train drivers involved;
- Examine the standards and procedures for the selection, training and competency management of drivers, in particular aspects associated with human factors;
- Examine any other systems in place for the avoidance of SPADs;
- Examine the process for the reporting of near-miss SPADs and review the reported near-miss SPADs;
- Examine how drivers and other operational staff who had been involved in SPADs are managed;
- Examine the relevant elements of the safety management system (SMS);
- Examine the role of the RSC, if any, in relation to SPADs;
- Examine any other significant safety deficiencies identified as a result of this investigation;
- Identify any *additional observations* (AO) indirectly associated with the incidents, where applicable.

Investigation and evidence

9 During the on-site and off-site investigation the RAIU collated the following evidence:

- IÉ Investigation Reports from SPADs dating from January 2012 to June 2015;
- Photographic record of signalling system and infrastructure in the location of the incidents;
- Signalling system layouts and other information;
- Witness evidence from parties involved in the incidents;
- Other evidence from IÉ staff with information pertaining to the incidents;
- IÉ standards, procedures and other documentation;
- Standards, procedures and documentation from other relevant bodies;
- SMS documentation from the IÉ;
- Other relevant documentation.

10 As part of the investigation the RAIU formally interviewed over forty operational staff, ranging from drivers to signalmen to persons in charge (PIC) of platforms. All operational staff interviewed fully co-operated with the RAIU investigation and gave an open and honest account of their respective incidents to the RAIU.

11 In addition to the operational staff the RAIU formally interviewed several senior managers within IÉ in relation to the existing standards and procedures and the current system of investigating SPAD incidents.

Parties directly involved in the investigation

Iarnród Éireann

12 IÉ is the railway *infrastructure manager* (IM), managing the design, installation, testing, inspection, maintenance, renewal and operation of the railway's physical assets. The IÉ-IM departments involved in the investigation included:

- *Signalling, Electrical and Telecommunications* (SET) – Responsible for the design, installation and maintenance of signalling equipment;
- *Infrastructure Manager Operation* (IMO) – Responsible for the operations, performance and control of signalling and level crossing staff; and the control of train movements through CTC and regional controlling signal cabins.

13 The responsibility of reporting on, issuing of remit, and finalisation of investigation reports, rests with IÉ-IM, in accordance with IM-SMS-007, Reporting and Investigation of Accidents and Incidents, published in March 2013; these remits may be issued from IÉ-IM to the relevant RU (IÉ-RU, Balfour Beatty Rail Ireland (BBRI), etc).

14 IÉ is also the *railway undertaking* (RU) that owns and operates mainline railway services in Ireland. IÉ-RU departments associated with this incident include:

- RU Operations – responsible for the supervision and operation of trains; this includes the supervision of train drivers.

15 The IÉ-RU and IM roles directly involved in incidents will be included in the relevant sections of the report.

Balfour Beatty Rail Ireland

16 BBRI is part of the Balfour Beatty Group, and have being operating as a RU since March 2014. BBRI operate and maintain On Track Machines (OTMs) on behalf of IÉ. BBRI staff comprises of a number of On Track Machine Driver Operators (OTMDOs) and fitter groups which are located throughout Ireland.

17 The OTMDOs are trained at the IÉ training school, however, the competency management of the OTMDOs is managed by BBRI, discussed in paragraph 157.

18 As an RU BBRI are invited to take part in IÉ's SPAD mitigation meetings on a regular basis. Both the operations management and the training and standards team attend these meetings. It gives both companies the chance to share information pertaining to SPADs on the IÉ network. BBRI are furnished with an active SPAD list, an active multi-SPAD list, and a list of bad acting signals (signals which have accrued four or more SPADs in the last ten years) from IÉ, this information is made freely available to the BBRI OTMDOs. Also, as an RU, BBRI are invited to take part in the regular Rule Book meetings organised by IÉ.

Parties indirectly involved in the investigation

Railway Safety Commission (RSC)

19 The RSC is the national safety authority, (The name of the Railway Safety Commission changed to Commission for Railway Regulation, CRR from Monday 29th February 2016) which is responsible for the regulatory oversight of the SMS and enforcement of railway safety in the Republic of Ireland in accordance with the Railway Safety Act 2005 and the European Railway Safety Directive.

20 The RSC's mission is to advance the safety of railways in Ireland through diligent supervision and enforcement. The RSC is required to ensure that each railway organisation operating in the State understands and effectively manages the risk to safety associated with its activities.

21 The RSC is required to ensure that each railway organisation operating in Ireland understands and effectively manages the risk to safety associated with its activities.

22 This is achieved in through:

- Conformity Assessment - Assessing SMSs 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 authorising placement in service;
- Supervision & Enforcement – Auditing railway organisations' compliance with the procedures and standards prescribed in their respective SMS, and inspection of railway assets to assess compliance with fitness for purpose criteria. Compliance with safety recommendations is assured through monitoring of implementation plans and by taking enforcement proceedings where necessary;
- Economic Regulation – Monitoring the performance of IÉ under the terms of the multi-annual infrastructure contract between the Minister for Transport Tourism and Sport and the Infrastructure Manager in regard to expenditure, maintenance output, and service delivery; oversight of the IÉ track access allocation and pricing regime and adjudication on appeals by RUs; and the licensing of RUs;
- 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.

23 The role of the RSC in terms of this investigation will be reviewed in Part 12 of this report.

PART 2 – Infrastructure: Introduction to Signals & Train Protection

Introduction

24 This part of the report outlines the main infrastructure associated with a SPAD, namely the signalling and train protection systems. In relation to signalling, this part provides an overview of the types of signals and their observance requirements; as well as providing information on the sighting required for signals. In relation to train protection, this part of the report outlines the basic and enhanced protection systems available in the island of Ireland.

Signalling

Types of signals

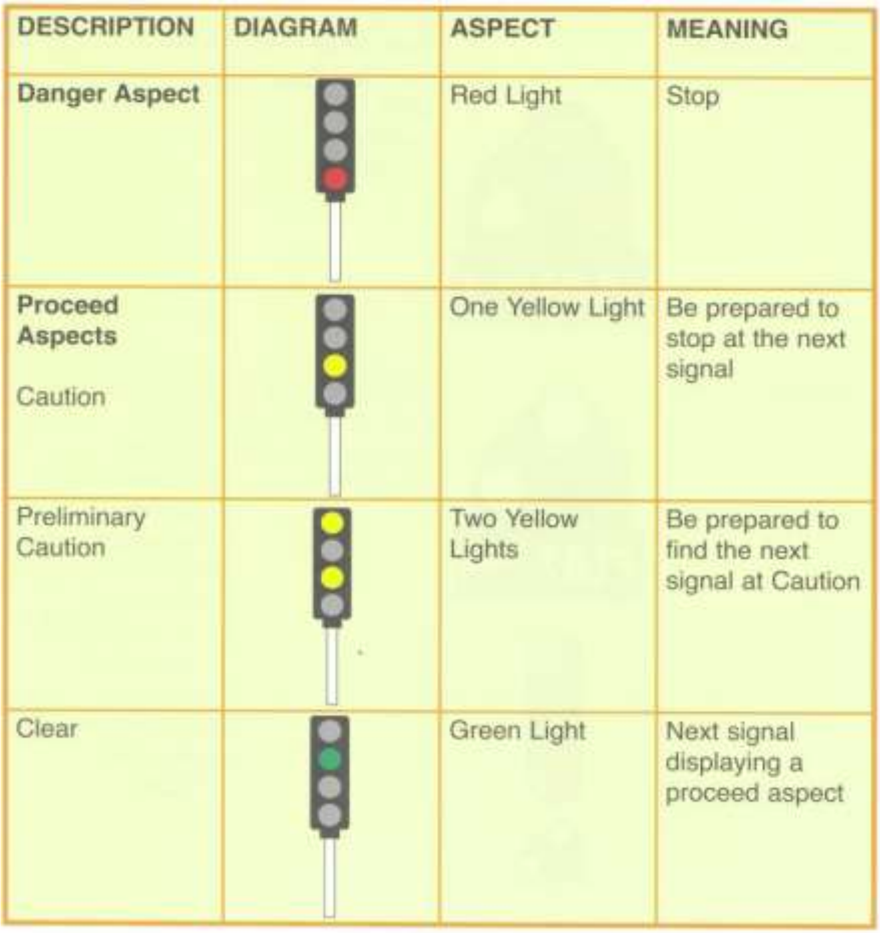
25 The IÉ network is made up of a number of different types of colour light signals (two, three and four colour light signals) and semaphore signals which the drivers must observe in order to travel through the network, see Figure 1 of examples of four aspect signals.

26 For the purposes of this report, also included are signals capable of displaying a stop aspect or indication, such as:

- Stop Boards or Indicators;
- *Shunt signals*/ limit of shunt indicators;
- Position Light/ Shunting/ Disc Signals;
- Possession Limit Boards;
- Marker Boards at the entrance to or exit from a worksite within a possession;
- Stop indications given by a Handsignaller or Signalman.

Observance of signals

27 Part 3.0, Section C, 'Instructions to Drivers', of the Rule Book, published in 2007, sets out the instructions to drivers in relation to the observance of colour light signals. A table in provided in 3.1.1 in relation to the colour light aspects and their meaning, see Figure 1.



DESCRIPTION	DIAGRAM	ASPECT	MEANING
Danger Aspect		Red Light	Stop
Proceed Aspects Caution		One Yellow Light	Be prepared to stop at the next signal
Preliminary Caution		Two Yellow Lights	Be prepared to find the next signal at Caution
Clear		Green Light	Next signal displaying a proceed aspect

Figure 1 – Observance of colour light signals

28 In summary, the aspects have the following meaning:

- Red light – Danger aspect, meaning the driver should stop;
- One yellow light – Cautionary proceed aspect, meaning the driver should be prepared to stop at the next signal;
- Two yellow lights – Preliminary cautionary proceed aspect, meaning that the driver should be prepared to find the next signals at caution (one yellow light);
- Green light – Clear proceed aspect, meaning driver can proceed, as the next signal will be displaying a proceed aspect (green or yellow).

29 Section 3.5 ‘Observance of signal failures or irregularities’ of the Rule Book, states under Section 3.5.1 ‘Signals which are out, missing or indistinctly shown’ that where there is an “absence of a signal where one should be shown” drivers should consider these signals at danger i.e. if a signal is not showing any aspect, it should be considered to be at danger.

Lineside Signal Sighting

General description

30 IÉ's Signalling Electrical and Telecommunications (SET) Department Signalling Standard, 'Lineside Signal Sighting and Spacing', I-SIG-2043, Version 3, operative since the 31st March 2013 (which will be referred to as I-SIG-2043 for the remainder of this report) sets out the requirements for signal positioning.

Signal Sighting Requirements

31 Signal sighting requirements must ensure that:

- All new and altered signals and indicators must be positioned so that they afford train drivers adequate advance sighting and convey a clear and unambiguous message;
- The effectiveness of the signal must not subsequently be impaired;
- The distance between the first signal displaying a cautionary aspect and the signal at which the train is required to stop must be sufficient to enable the train to be stopped safely at the stop signal.

32 As a result, I-SIG-2043 sets out the requirements for the:

- General arrangements and positioning of stop, colour light and *semaphore signals*;
- Signal sighting;
- Positioning of platform screen displays;
- Provision for telephones;
- Inspection requirements;
- Signal spacing distances.

Sighting distances and reading time

33 Signal sighting is carried out to determine the most suitable and safest positions for all new and altered signals (including stop boards), associated notice boards, indicators and equipment. Signal Sighting Committees are convened as required to carry out these duties and are made up of competent staff from the SET and IM Operations Departments, as well as drivers.

34 I-SIG-2043 states that "Drivers must be able to view a signal long enough to assimilate the aspect and conditions displayed by the signal. Normally, signals must be positioned to give drivers an approach view for a minimum of 8 seconds and an uninterrupted view for at least 4 seconds. Where these timings cannot be achieved but the signal sighting committee is satisfied that an adequate approach view is achieved, they must record their decision and reasoning on the signal sighting form". I-SIG-2043 provides guidance and spreadsheets related to calculating the

Minimum Reading Times (MRTs) for driver, which in turn allows for correct sighting and positioning of signals.

Signal Sighting Distractions

35 In relation to distraction and signal sighting and reading time, I-SIG-2043 states that "distracting features must not generally be located on the approach to signals (e.g. lineside signs requiring driver action – typically, these are permanent speed restrictions, CAWS commencement boards, train radio boards)". It continues "the signal sighting committee may need to consider relocation of the signal or of the distracting feature".

36 I-SIG-2043 also states that "where there are perceived difficulties in identifying or interpreting a signal, or where there are significant distractions or other factors which would increase the likelihood of a driver misreading the signal, the minimum reading time must be increased from the standard 8-second value". The appendix of I-SIG-2043, 'Calculating Minimum Reading Time (MRT) – Assessment Worksheet', calculates this additional time to be 1-second.

Principles of Train Protection

Introduction

37 Train protection is equipment fitted to trains and the track that can reduce risks from SPADs and over-speeding, which includes enhanced and basic overrun protection systems and in-cab reminder appliances.

Enhanced Overrun Protection

General description

38 Enhanced overrun protection mitigates against disregard of signal aspects, warning of a signal at danger and against disregard of a signal at danger by a train starting from rest. The requirements for enhanced overrun protection are set out in IÉ's Infrastructure Signalling Standard, I-SIG-2062, 'Principles of Train Protection', Issue 2, issued in September 2007, which will be referred to as (I-SIG-2062 for the remainder of the report). Risk assessments, using an approved method, must be undertaken to determine whether enhanced mitigation measures are required to reduce the risk of collision or derailment to as low as reasonably practicable (ALARP). As a minimum a risk assessment must be carried out at:

- Platform starting signals protecting a conflicting route ahead;
- Other signals from which trains regularly start from rest and which protect a conflicting route ahead;
- Signals protecting junctions where there is an extended opportunity or time window for conflict, e.g. entering single line sections;
- Other signals presenting high risk e.g. where a distracting feature (such as a station, level crossing, rising gradient or speed restriction) intervenes between a signal and a preceding caution signal, or where the signal has a history of SPADs.

39 Enhanced overrun protection is usually provided in the form of either advisory or mandatory train control systems. Mandatory train control systems include Automatic Train Protection (ATP); while advisory train control systems include Continuous Automatic Warning System (CAWS).

Automatic Train Protection (ATP)

40 ATP must monitor the speed of the train and alert the driver if the speed of the train exceeds the permissible speed, or exceeds a speed which is consistent with stopping at a signal at danger. The ATP system must initiate a brake application if the driver fails to respond to the alert by controlling the train speed. The brake application must be sufficient to bring the train to rest if a

signal at danger is reached and it must only be capable of being overridden if the driver takes sufficient action to control the train.

41 Approximately 4.6 % (99 track-km) of the IÉ network is provided with ATP and this number is confined to the electrified route, the DART, between Greystones and Howth/Malahide, see the red areas of Figure 2 for the locations of ATP on the IÉ network.

Continuous Automatic Warning System (CAWS)

42 CAWS must alert the driver to a change in signal aspect, warn of a more restrictive signal aspect, and initiate a brake application if the driver does not acknowledge the warning.

43 CAWS works by repeating the aspects shown by the lineside colour light signals on an Aspect Display Unit (ADU) inside the driver's cab. The ADU continuously displays the aspect that was shown by the previous signal until updated approximately 350 m before the next signal. The ADU then displays the aspect shown by that signal. A change of ADU display to a less restrictive aspect (e.g., double yellow to green) is termed an upgrade which is accompanied by a momentary 'warble', while a change to a more restrictive aspect (e.g., single yellow to red) is called a downgrade which is accompanied by a continuous audible tone and the illumination of the acknowledge switch that must be pressed by the driver within seven seconds to prevent an automatic brake application occurring (i.e. failure to acknowledge within seven seconds results in an emergency brake application and the driver cannot reset the system for 60 seconds as the system is locked out). Acknowledgement by the driver within the first seven seconds immediately silences the tone. CAWS does not act in the event of a signal being passed at danger if the red aspect has been acknowledged, however, CAWS does continue displaying red aspect in the cab to act as a reminder.

44 Approximately 41.6% (900 track-km) of the IÉ network is equipped with CAWS, see blue areas in see Figure 2.

Figure 2 – CAWS and ATP on the IÉ network

Train Protection Warning System (TPWS)

45 Train Protection Warning System (TPWS) is a train protection system which automatically activates brakes on a train that has had a SPAD or is over-speeding i.e. if a train approaches a stop signal showing a danger aspect at too high a speed to enable it to stop at the signal, it will be forced to stop, regardless of any action (or inaction) by the driver. Unlike ATP, it does not aim to stop trains at or before a signal that is at danger, but stop the train before the point at which a collision with another train could occur, excluding rear-end collision with a train in front. A standard installation consists of an on-track transmitter adjacent to a signal, activated when the signal is at danger, if a train passes the signal at danger, it will have its emergency brakes activated. At high risk locations, a second transmitter may be placed on the approach to the signal, so that if a train is over-speeding the brakes will be applied.

46 TPWS is not fitted on the IÉ network, but it is fitted in Northern Ireland.

Basic Overrun Protection

47 In the absence of enhanced overrun protection, the level of train protection provided throughout the rest of the IÉ network (53.8%, or 1,166 track-km) is through the use of basic overrun protection. Basic overrun protection which is provided to mitigate the risk of misjudgement by a driver who has been warned of the need to stop by the preceding signal aspects and is attempting to stop at the signal at danger.

48 The requirements for basic overrun protection are set out in IÉ's Infrastructure Signalling Standard, I-SIG-2062, 'Principles of Train Protection', Issue 2, issued in September 2007, which will be referred to as (I-SIG-2062 for the remainder of the report). In accordance with I-SIG-2062, basic overrun protection of a signalled route must be provided in the following form:

- An *overlap* of sufficient length to mitigate the risk of misjudgement on the part of a driver who has observed, and heeded, the warnings of the preceding signal(s) and is attempting to stop at the signal at danger;
- The setting of *flank points* or the inclusion of *flank track circuits*;
- *Trap points* and *sand drag* where it is not possible to provide a sufficient overlap. Trap points must be used to protect passenger lines from overruns out of sidings.

49 Basic overrun protection is not required on non-passenger lines.

50 According to I-SIG-2062, basic overrun protection does not usually provide sufficient mitigation where the driver has disregarded the warning aspects at the signal(s) preceding the signal at danger.

Driver Reminder Appliance (DRA)

51 A Driver's Reminder Appliance (DRA) is a device in a driving cab to enable the driver to set a reminder that the signal ahead is at danger. Whilst set, the DRA prevents the driver being able to take power. The main objectives of the DRA are to indicate to the driver, whilst the device is set, that the signal ahead may still be at danger; and to prevent the driver from starting away when the device is set. The DRA must be set when:

- Entering/leaving the driving cab;
- When stopped at any signal at danger (which helps prevent SAS SPADs);
- When stopped at a station platform and the next stop signal is beyond the platform after having: passed a signal displaying a single yellow aspect or a semaphore distant signal at caution; been authorised to pass at danger the signal on the approach to the platform; entered the platform under the authority of a shunting/disc signal (these requirement help prevent SOY SPADs).

52 As of December 2015 DRA was fitted to all passenger trains operated by IÉ.

PART 3 – Introduction to SPADs on the IÉ Network

Introduction

53 IÉ define a SPAD as an incident when a train has passed a stop signal at danger without authority, in their operations SMS document, OPS-SMS-2.0, entitled 'Signals Passed at Danger & Other Serious Operational Incidents', published on the 25th March 2013.

54 This part of the report outlines the SPAD Categories and SPAD Risk Ranking Tool (SRRT) for the ranking of SPAD severity, the SPAD database maintained by IÉ and the types of SPADs on the IÉ network.

SPAD categories and risk ranking

General description

55 OPS-SMS-2.0 further describes the different categories of SPAD:

- Category A – Any SPAD when a stop signal and any associated preceding cautionary indications was displayed correctly, in sufficient time for the train to stop safely at the signal;
- Category B (also referred to as a Technical SPAD) – Any SPAD when a stop aspect was displayed because: signalling or level crossing equipment failed or malfunctioned; or it was returned to danger in error;
- Category C – Any SPAD when a stop aspect or indication was not displayed in sufficient time for the train to be stopped safely at the signal because it was returned to danger in an emergency;
- Category D – When a vehicle without any traction unit attached, or a train which is unattended, runs away past a signal at danger. However, if the vehicles involved are being propelled and run away because the movement was not controlled, the incident is a Category A SPAD.

56 OPS-SMS-2.0 also defines the SRR, for Category A SPADs, as a system for measuring the severity of SPADs on a scale of 0 to 28. Category A SPADs are ranked in the following manner:

- High Risk – Score of 20 to 28 with 28 representing "the highest risk";
- Medium Risk – Score of 16 to 19;
- Low Risk – Score of 0 to 15, with 1 representing a "very low risk".

57 In the terms and definitions of OPS-SMS-2.0 the definition for the term 'SPAD Risk Ranking' is given as "A system for measuring the severity of SPADs on a scale of 1 to 28 with 1 = very low risk and 28 representing the highest risk". There is no reference to SRRs with 0[1], although the scale is measured from 0 to 28.

Method of calculating the SRR

58 According to IÉ, the SRR method gives a measure of the 'level of risk' associated with each SPAD that occurs. The methodology can be used more broadly to inform the SPAD investigation process. Each SPAD is ranked against set criteria:

- The initial direct collision potential of the SPAD;
- How close the SPAD came to an accident, and what measures were utilised to prevent the occurrence of the accident;
- The potential risk from the SPAD, considering the most likely of four potential outcomes:
    - Collision with another train or buffer stops;
    - Train derailment;
    - Collision with a road vehicle on a level crossing;
    - Train entering a possession with the potential for encountering workers on the track.

59 In line with OPS-SMS-2.0, the RU Chief Traction Executive (CTE) calculates the SRR for all SPADs on the IÉ network, using the 'SPAD Risk Ranking Methodology Handbook' (to be referred to as the SRR Handbook for the remainder of this report), published in October 2008, which is currently still in draft format. This document was produced based on the UK's RSSB SRR model (Accident & Incident Investigation, GO/RT3119). The RSSB are the UK's rail industry body providing a range of knowledge, products and services to understand risk, guide standards, manage research, development and innovation and collaborate to improve.

60 In relation to the calculation of SRR, the SRR Handbook states that "the range for the total SPAD Risk Rankings is 0 to 28, where the difference between two consecutive risk ranking numbers represents approximately a factor of two change in risk". As with OPS-SMS-2.0, the SRR Handbook does not give a clear explanation of meaning for SPADs with an SRR of 0. In relation to a SPAD with an SRR of 28, the SRR Handbook states "On this basis the highest overall risk ranking of 28 would relate approximately to a Group 1[2] SPAD at a signal with a distance to the

[1] The RSSB define an SRR of 0 as a 'zero risk event', where the train would have had to pass another signal at danger to reach the first potential conflict point.

[2] Errors occur due to ineffective communication between persons directly contributing to the passing of a signal at danger.

potential accident point < 10 m with the potential for a high speed head-on collision, involving heavily loaded Mark 1 multiple unit rolling stock potentially resulting in 200 fatalities and weighted injuries".

61 The trend in SRR severity is discussed in paragraph 64. The method of calculating the SRR is discussed further in 'Part 9 – SPAD Management'.

Frequency, severity & types of SPADs of the IÉ Network

Category A SPAD numbers

62 Since 2009 there have been eighty-five Category A SPADs on the IÉ network. There were 21, 22, 6, 8, 18 and 10 Category A SPADs from 2009 to 2014, respectively, see Figure 3. These figures show that there was a sharp decrease in Category A SPADs in 2011-2012 from the peak of 22 SPADs in 2010. However there was also a sharp increase in Category A SPADs in 2013 (18), and a decrease again in 2014. At the time of publication of this report, the number of Category A SPADs in the first half of 2015 is 11, meaning that there will be an increase in the number of Category A SPADs in 2015.

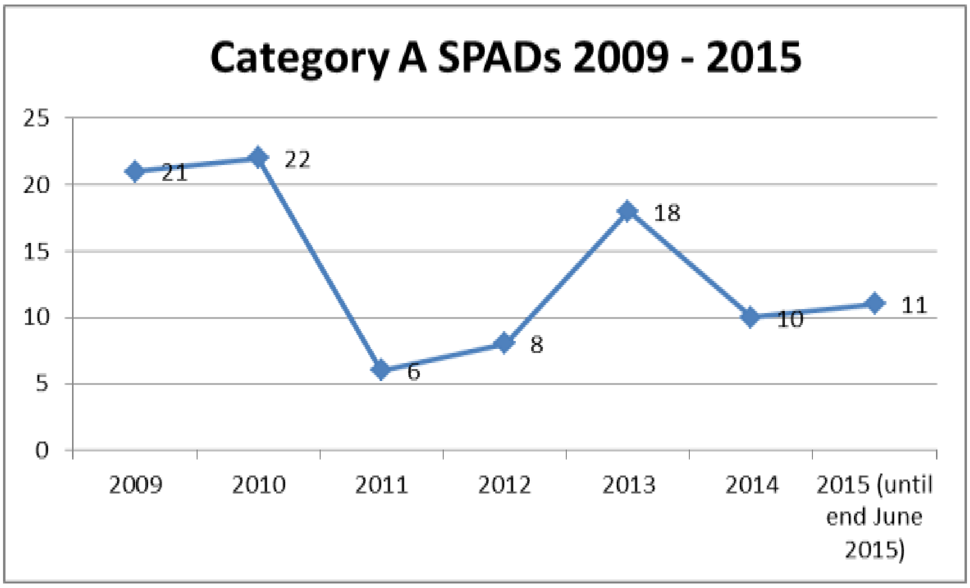


Figure 3 – Number of Category A SPADs from 2009 – 2015

63 These figures indicate that there is no clear trend (upwards or downwards) in the overall annual number of SPADs on the IÉ network, although latest figures provided indicate that there will has been another increase in SPADs from 2014 (10) to 2015 (11 as of end of June 2015).

Category A SPAD severity

64 In relation to the severity of SPADs in IÉ since 2009, it is difficult to determine any accurate trends in relation to SPAD severity; this is due to the fact that some SPADs being assigned an SRR of 0 (the average SRR values are indicated by the red line on Figure 4). When including the SPADs with an SRR of 0, the linear average of the SRR severity indicates a slight increase in the average SRR, from an SRR value of 12 (2009) to 13 (2015), approximately, see Figure 4.

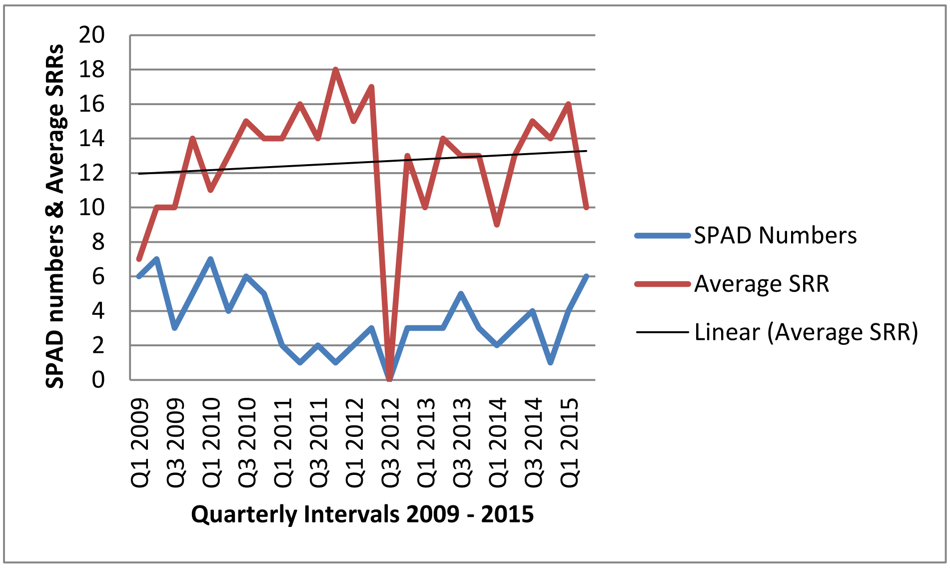


Figure 4 – SPAD numbers, average SRRs and linear average of SRR trend (including SRR values of 0)

65 If the zero risk events (SPADs with an SRR of 0) are removed, the average SRR linear trend increases from an average SRR of 11 (2009) to 16 (2015), approximately, see Figure 5.

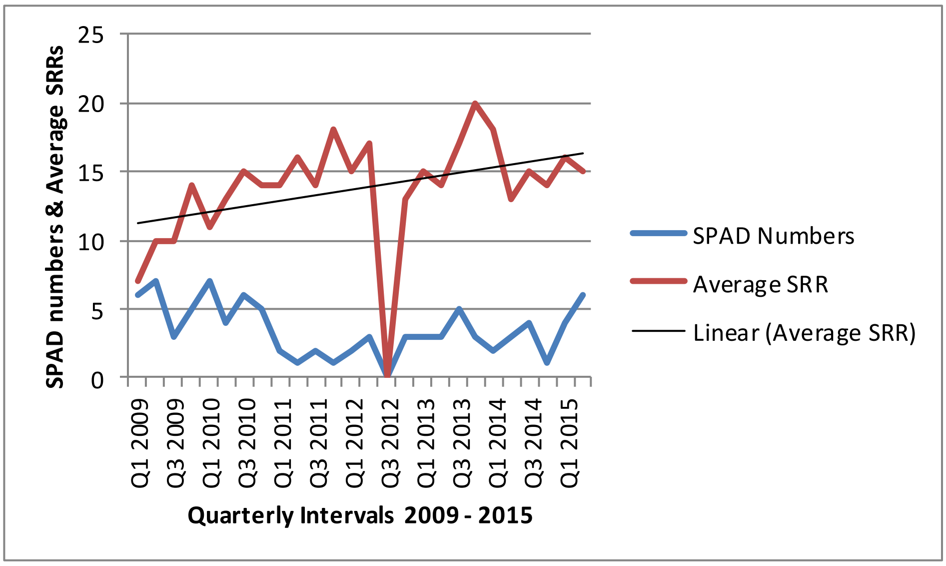


Figure 5 – SPAD numbers, average SRRs and linear average of SRR trend (excluding SRR values of 0)

66 The trend in SRR severity is further discussed in Part 9 – SPAD Management.

Category A SPAD event types

67 In relation to the event types (SAS/SOY SPADs, SPADs during normal/degraded train operations), the percentages for the number of SPADs between January 2012 and June 2015 are as follows (see Figure 6):

- 38% of SPADs are SAS SPADs occurring during normal train operations;
- 29% of SPADs are SPADs occurring during normal train operations (excluding SAS/SOY SPADs);
- 16% of SPADs are SOY SPADs occurring during normal train operations;
- 11% of SPADs are SPADs occurring during degraded train operations (excluding SAS/SOY SPADs);
- 4% of SPADs are SAS SPADs occurring during degraded train operations;
- 2% of SPADs are SOY SPADs occurring during degraded train operations.

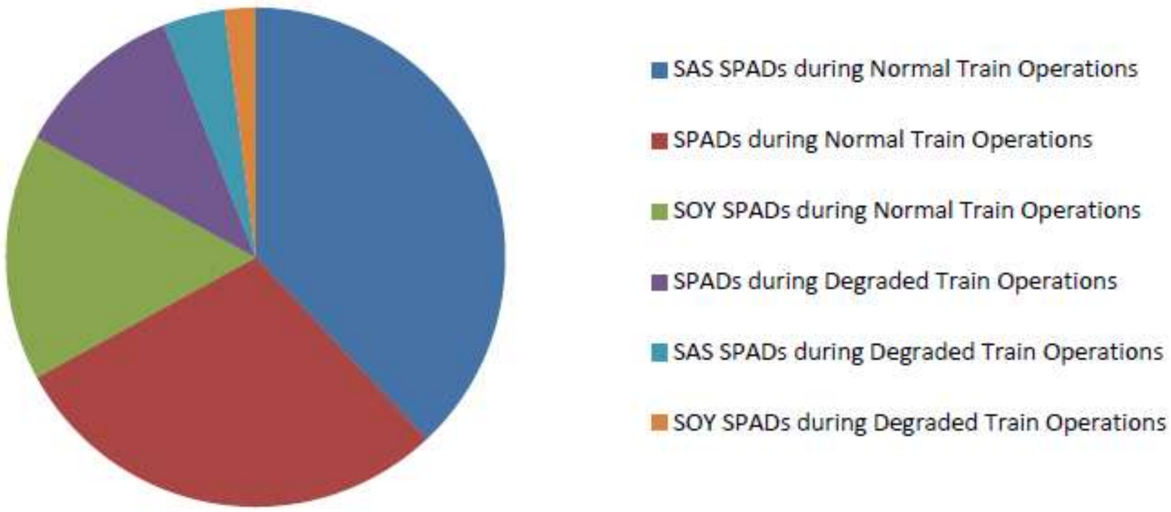


Figure 6 – SPADs by event type

Management of SPADs

General description

68 Although, the management of SPADs, post SPAD incident, does not directly contribute to the occurrences of SPADs on the IÉ network; the RAIU made significant findings in relation to the management of SPADs, as part of the investigation which warrant further investigation.

69 As a result this part of the RAIU Report reviews the documentation, such as OPS-SMS-2.0 in relation to the management of SPADs post incident. Part 8 of this report will review OPS-SMS-3.2 in relation to how drivers are managed directly after the incident and in the weeks and years following the incident.

70 This part of the RAIU Report outlines the key roles, responsibilities and actions taken by managerial staff in managing the SPAD incident. It includes the actions to be taken as a direct response to the incident and what evidence should be taken and how the investigation should be undertaken; these are outlined in OPS-SMS-2.0 and includes details on:

- Roles, responsibilities and duties of key personnel;
- Key principle, which is that "where a signal is passed at danger without authority or other serious operational incident occurs, they must be reported, investigated and analysed to establish the cause so that appropriate corrective /mitigation actions can be put in place.";
- SPAD Categorisation and SRR;
- Response to SPAD incidents;
- Requirements for relieving employees from duty;
- Investigation and further investigation following a SPAD incident.

71 This part of the report will also review the proactive management for the prevention of SPADs through IÉ's near-miss reporting system for SPADs.

Roles, responsibilities and response to SPADs

72 In accordance with OPS-SMS-2.0, the RU Safety Manager is responsible for the following:

- Maintaining a database of SPADs and multi-SPAD signals and ensure relevant managers are advised of trends/relevant information on changes in risk;
- Liaising with the external regulatory bodies, IMs and relevant managers and departments to ensure SPADs are investigated;
- Reviewing all incident reports to assess transferrable lessons and effectiveness of operational safety standards, rules, procedures and competence standards for managing risk;
- Attend IÉ IM Operational Risk and SPAD Focus Group.

73 In accordance with OPS-SMS-2.0, the CTE is responsible for the following:

- Preparing, maintaining and developing of OPS-SMS-2.0;
- Ensuring compliance with OPS-SMS-2.0 by the use of safety checks;
- Providing support and training to DTEs on the application of OPS-SMS-2.0;
- Communicating lessons learnt following a SPAD;
- SRR of SPADs;
- Monitoring the effectiveness of OPS-SMS-2.0 through incident analysis;
- Attending IÉ IM Operational Risk and SPAD Focus Group.

74 In accordance with OPS-SMS-2.0, the District Manager is responsible for:

- Carrying out a five day panel review for all SPADs or other operational incidents;
- Determining the fitness for drivers to continue following a SPAD;
- Investigating SPADs in accordance with the remit issued by the IM;
- Ensuring that local SPAD and Operations Risk Focus Groups meet regularly and that actions arising are closed out.

75 In accordance with OPS-SMS-2.0, the District Traction /Traffic Executive is responsible for:

- Gathering the required information following a SPAD or other serious operational incident and forward to their District Manager and the Operations Safety Department for analysis;
- Interviewing relevant parties and assist with the investigation of SPADs;
- Assisting with the signal sighting process following a SPAD;
- Implementing additional support to employees who have been involved in incidents;
- Attending local SPAD and IÉ's IM's Operational Risk and SPAD Focus Groups, as required.

Response to SPAD incidents

General requirements

76 Included in this section of IÉ-RU's OPS-SMS-2.0 are additional duties for the District Manager, which include, arranging for:

- The employee to be interviewed by a competent person;
- The employee involved to be relieved from duty at a suitable time;
- The employee to undergo drugs and alcohol screening at the earliest possible opportunity;
- OTDR, CCTV and SET downloads and analysis;
- Assessments of weather, atmospheric and railhead conditions to be taken (in the case of suspected LRA SPADs),
- The copying of any voice recordings taking at the time of the incident.

77 The response also includes for the examination of the rolling stock involved.

Requirements for relieving employees from duty after a SPAD

78 Section 9.1.2 of OPS-SMS-2.0, 'Employees to be immediately relieved from duty' provides further details on when an employee should be relieved from duty and states that employees must be relieved from duty immediately at the location if it is established that any of the following circumstances apply:

- The employee may be under the influence of drugs or alcohol;
- The employee claims to be medically unfit or suffering from fatigue;
- The employee is shocked to an extent which could significantly impair their judgement;
- It is apparent that the incident is very serious or it is evident there has been a significant violation of the rules or regulations without due regard to the consequences.

79 The RAIU investigation found that in some instances drivers were allowed to carry out train movements after the occurrence of a SPAD, despite occurring in locations where there was a suitable driver replacement e.g. the SPAD at Millstreet Station, which was a SPAD with a high severity SRR and this driver was allowed carry out a number of train movements, despite another driver being available.

80 After the drivers involved in SPADs have moved their trains (where required), drivers are relieved of driving duties. However, the RAIU investigation found that other operational staff, such as signalmen and LCCOs, were not stood down. Of note is the SPAD at Gortavogher, where the Signalman or LCCO were not stood down, despite their actions directly contributing to the SPAD.

Investigation and further action following a SPAD incident

Investigation Remits

81 The responsibility of reporting on, issuing of remit, and finalisation of investigation reports, rests with the IM, in accordance with IM-SMS-007, Reporting and Investigation of Accidents and Incidents, published in March 2013; these remits may be issued from the IM to the RU. The investigation into SPADs is conducted through the Five Day Review Panel Process/ OOR or through the conduct of a full investigation, these will be discussed below.

82 SPADs are investigated in accordance with their SRR. Category A SPADs, in accordance with OPS-SMS-2.0, are further ranked in the following manner for the purposes of investigation:

- High Risk – SRR of 20 to 28 are investigated under a category A remit;
- Medium Risk – SRR of 16 to 19 are investigated under a category B remit;
- Low Risk – SRR of 0 to 15 are investigated under a category C remit.

83 Category B, C and D SPADs, which are not ranked, are investigated under a Category B or C Remits, the types of incidents, that warrant investigation remit types, are as set out in Figure 7.

Category A	Category B	Category C
Actual or potential consequences.	Actual or potential consequences.	Actual or potential consequences.
•Loss of life (except evident suicide) •Serious injury (an injury that requires hospitalisation for more than 24 hours) or illness to several people. •Extensive loss of equipment material or environment in excess of €1 million. •Fires smoke or explosions on rolling stock requiring the evacuation of passengers from a train or from a station. •The release or combustion of dangerous goods being carried on rolling stock. •Wrong side failures of safety critical equipment that led to an unsafe condition requiring withdrawal from service. •Unintentional divisions of rolling stock where passengers had access to a gangway. •Incidents/Accidents under slightly different conditions may have led to a fatality, serious injury or extensive damage. •Occurrence that is investigated by the RAIU.	•Serious injury or illness (14 days or more days lost time). •Loss of equipment material or environment between €10000 and €1 million. •Collision, other than on a running line. •Derailment other than on or affecting a running line. •Severe fire other than on train. •Fatalities (apparent self-harm within station). •Incidents of over speeding	•Incidents involving superficial/ minor injuries. •Loss of equipment or material or environment damage less than €10000 •Road accident without injury •Any minor fire on train or within building. •Injury not requiring medical attention. •Injury to person resulting in loss time accident.

Figure 7 – Remit categories for types of incidents and accidents.

Five Day Review Panel

84 Since 2008 all SPAD incidents, irrespective of SPAD Category or remit category, are required to undergo a five day review panel process in accordance with the IM's IM-SMS-007 and RU's OPS-SMS-2.0. This review must be held within five days of the SPAD incident to consider the preliminary evidence. The primary purpose of this review is to identify any immediate actions that are necessary to control the risk such as changes required to the infrastructure or issues associated with the employee's management. Additionally, the process must be aimed at ensuring any formal/ subsequent investigation is correctly focused on areas of risk. The five day review report must be provided to the RU Safety Manager summarising the findings of the five day review which may form part of any of these subsequent investigations. A key output of this process is that the panel gives consideration to points such as whether the employee can return to their duties, and if so, any areas of additional support, monitoring and coaching that may be necessary (this will be discussed in 'Part 10 – Management of drivers post SPAD incident').

Operational Occurrence Report

85 In December 2013, the five day panel review process was replaced with the OOR for the investigation of SPADs. According to IÉ-RU, the primary purpose of the OOR is to report on the investigation from the RU perspective and specifically deal with the risks that the RU has to manage and has limited scope in dealing with infrastructure or train control issues. It should be noted, that although introduced in December 2013, there is no supporting standards or procedures for the OOR, apart from the template itself.

86 In the case of more serious SPADs (SRR greater than 20) a Category A remit investigation is required, whereby a full investigation is conducted. This is a more thorough investigation, and carried out in accordance with Operations SMS, OPS-SMS-2.4, 'Accident Investigation' (which will be referred to as OPS-SMS-2.4 for the remainder of this report). It should be noted, that IÉ consider that the OOR has limited scope for dealing with infrastructure or train control issues and as a result full investigations may be required in some SPAD incidents with SRR of less than 20.

87 The OOR is a template, which includes headings such as:

- Description and location of the signal and other infrastructure (e.g. station, level crossings) and rolling stock involved;
- Environment conditions;
- SRR;
- Details from evidence gathered (such as OTDR and CCTV);
- Details of the staff involved, such as medical history, training and working hours;
- Financial implications;
- Immediate cause, contributory factors and underlying causes which resulted in the SPAD;

- Actions taken since the SPAD;
- Recommendations;
- Management of the staff involved (e.g. DD&SS requirements).

88 It should be noted, that although IÉ have been using this template since 2013, it appears to remain in draft format and it is not referred to in any of the standards outlined above (i.e. RU-SMS-007, IM-SMS-007, OPS-SMS-2.0, OPS-SMS-2.4).

SPAD Reports of Investigation

89 Where a full investigation of a SPAD is to be conducted, OPS-SMS-2.4 sets out the responsibilities in terms of the investigation and outlines how the investigation should be conducted. It also outlines how the findings are presented to the RU Safety Review Group for consideration and adoption of recommendations; and that the recommendations will be monitored by the RU's Safety Compliance Manager.

90 OPS-SMS-2.4 states that the person in charge of the investigation is referred to as the Investigating Manager. The SPAD Investigation Report must establish the full facts, determine the immediate cause, contributory factors, underlying cause(s) and root causes; and address any specific issues identified in the remit. The Investigating Manager must arrange for:

- Written reports and interviews from personnel involved in the SPAD to be obtained;
- Site visits, photographic evidence (including CCTV footage) and signal sighting reports;
- The downloading of OTDRs, SET equipment and voice communications;
- The SPAD data collection form to be completed.

RAIU Review

91 As part of this investigation, the RAIU reviewed Five Day Review Panel investigation, OORs and Reports of Investigation. These will be discussed further in 'Part 9 – SPAD Management' of this report.

Driver Development and Support System

92 Part of the requirements for a driver to be returned to driving duties after a SPAD is to develop, in conjunction with the District Manager, a Driver Development & Support System (DD&SS) which is set out in OPS-SMS-3.2. The DD&SS process will be discussed further in 'Part 10 – Management of Drivers Post SPAD Incident' of this report.

PART 4 – Driver Training, CMS and DD&SS

Introduction

93 Driver training and the Competency Management System (CMS) are a factor in the majority of SPAD incidents. For clarity, this report gives a detailed account of the training for drivers and the CMS in IÉ with a particular focus on EPTs. Where particular deficiencies were identified by the RAIU during the individual investigation into the SPAD incident, these deficiencies are discussed in the evidence sections of the relevant SPAD.

94 Firstly, this part of the report outlines the RU operations SMS documents, which are management level documents, which set out the roles and responsibilities of management staff in terms of driving activities and key criteria in terms of requirements for training and assessment, these documents are identified with the reference OPS-SMS and include:

- OPS-SMS-3.0, 'Driver Training', Version 2.01 published 25th March 2013;
- OPS-SMS-3.1, 'Competence Management Drivers', Issue 1, published 25th March 2013;
- OPS-SMS-3.3, 'Route Knowledge Drivers', Issue 1, published 25th March 2013;
- OPS-SMS-3.5, 'Safety Briefing Train Drivers', Issue 1, published 25th March 2013.

95 It should be noted, that since the commencement of the RAIU investigation, IÉ introduced a programme for the assessment of drivers in the use of EPTs in early 2015. This programme of assessment should have resulted in all the drivers on the IÉ network being subject to the new assessment programme by mid-2015 as it operates on a six-month cycle. This in turn would mean that not all /limited number of drivers involved in the SPADs from 2012 – 2015 (end of June) would have been subject to this new assessment process. As a result, this new CMS will be discussed in Part 13 – Relevant actions taken or in progress.

96 Also included in the RU operations SMS suite of documents is OPS-SMS-3.2, 'Driver Development & Support', published 25th March 2015. This document outlines the development and support systems for drivers involved in incidents and to monitor the performance of these drivers for the prevention of future incidents.

97 In terms of the day-to-day documents for used by driver, in terms of technical skills and non-technical skills, the following documents are to be used by drivers:

- IÉ-Rule Book;
- The 'Professional Driving Handbook', Issue 3, issued April 2010;
- 'Train Driving Competence Standards', Issue 1, issued April 2010.

98 As mentioned previously BBRI OTMDOs are trained in the IÉ training school, however, OTMDOs competency management is managed by BBRI, discussed in paragraph 157.

RU Operations Safety Management System Documents

Driver Training

General description

99 The IÉ-RU Operations driver training SMS, OPS-SMS-3.0, includes details on:

- Roles and responsibilities of those involved in the training;
- Preparation for initial training;
- Core principles for driver training;
- Delivery of training by the training centre;
- Delivery of practical train handling and route driving.

Roles and responsibilities

100 Section 5 of OPS-SMS-3.0 sets out the roles and responsibilities for staff, such as the:

- CTE – Responsible for the preparation, maintenance and development of the SMS documentation; development and issuing of competence standards and associated examination criteria for training material; ensuring, by safety checks that the standard is being complied with; monitoring the effectiveness of the SMS documentation through incident analysis;
- District Manager (DM) – Who is responsible for the selection of candidates, allocation of DTEs and verifying initial certificates of competence.

Preparation for initial training

101 Section 6, ‘Preparation for initial training’, of OPS-SMS-3.0 requires DMs to ensure that applicants for the position of trainee driver have met the medical requirements and that their psychometric test shows they have reached an acceptable level before any training is undertaken. Individuals failing to reach an acceptable level on the psychometric test must not be permitted to go forward for driver training. The results of selection assessments must be recorded in the training portfolio to allow those involved in driver training/examination to develop/monitor the trainee’s performance against assessment results.

Core principles for driver training

102 Section 7, 'Core principles for driver training', of OPS-SMS-3.0 requires that all applicants to the role of trainee driver must undergo an approved IÉ-RU driver training programme to ensure competence is achieved and the risk of driver inexperience is minimised. In summary, the training equates to twenty-six weeks for the training of DART drivers and thirty-two weeks for the training of DMU drivers (the reduced time for DART programme reflects the fitment of ATP and reduced route mileage).

103 The training programme, is set out in detail in an appendix to OPS-SMS-3.0 and includes:

- Core induction/foundation training prior to developing skills and knowledge for normal operation, degraded and emergency working;
- Specific training according to the core traction type e.g. DART or DMU;
- Simulation to allow the trainee to practice degraded and emergency working, plus decision making skills;
- Specific training in human factors training, SPAD and operational risk, risk avoidance and error management techniques;
- Practical train handling experience under the instruction of a lead driver or other competent person to ensure the trainee develops train handling skills and core route knowledge.

Delivery of training by the training centre

104 Section 8, 'Delivery of training by the training centre' of OPS-SMS-3.0 outlines the requirements of the training centre in terms of operating safely and requirements for recording the trainee's progress.

Delivery of practical train handling and route driving

105 Section 9, 'Delivery of practical train handling and route driving' of OPS-SMS-3.0 requires the DM to deliver sufficient practical train handling and route driving modules, such as rostering with lead drivers/competent persons for the development of route knowledge; as well as ensuring the minimum level of practical train handling and route driving experience for a trainee driver is met (i.e. 150 hours in not less than 8 weeks for the operation of DART and 250 hours in not less than 14 weeks for DMU training, including 40 hours in darkness for DMU training and 25 hours for DART). The trainee driver will be assessed at least twice by the DTE during this training period.

Competence Management for Drivers

General description

106 The competence management for drivers operations SMS, OPS-SMS-3.1, is the management level standard which sets out the requirements for the *competence management system* for drivers. Section 7, 'Overview', of OPS-SMS-3.1 sets out the CMS for driver in four stages:

- Stage 1 – Initial assessment of competence;
- Stage 2 – Post Qualification Assessment (PQA);
- Stage 3 – Continuous assessment and monitoring of competence of driver performance;
- Stage 4 – Performance monitoring of competence and fitness.

107 Section 7.2 states that all assessments undertaken to establish the competence of drivers must be monitored against the relevant standards, policies and manuals and should include "monitoring the attention levels and actions of drivers when running under cautionary aspects, during train despatch, and on any other occasions where low levels of attention have the potential to increase risk".

Initial assessment of competence and training (Stage 1)

108 Section 8.1, OPS-SMS-3.1, 'Initial Assessment' requires an initial assessment of competence by the DTE to judge whether the candidate has crossed the dividing line between trainee and newly qualified (though not yet experienced) train driver. In order to qualify as a train driver, the trainee must be assessed on all the performance criteria and underpinning knowledge requirements, relevant to the work the trainee will be required to perform when qualified as a driver.

109 This initial assessment is generally carried out over 5 days, and must:

- Be carried out over the route(s) which the trainee is conversant;
- Consist of a minimum of 9 hours;
- Consist of stopping, non-stopping trains and empty coaching stock trains;
- Include train preparation and disposal, coupling and uncoupling, relevant shunting moves;
- Verify that the trainee has the required decision making skills, knowledge of rule and regulations, procedural knowledge, emergency procedures and safety critical communication requirements;
- Include confirmation that professional driving principles are clearly understood and demonstrated e.g. by use of commentary driving;
- Include monitoring of the trainee's attention and alertness levels, particularly whilst running under cautionary aspects.

110 If the trainee driver is deemed competent by the DTE, the CTE, the responsible manager, the Passenger Manager and the Director RU, the trainee driver becomes a PQA Driver.

<u>Post Qualification Assessment (Stage 2)</u>

111 The objectives of PQAs are to ensure the compliance with the standards delivered during training and ensure the newly qualified driver gains additional confidence and experience in train driving duties. Newly qualified drivers must complete a minimum of a two-year post-training period, to the required standard before issue of a first full Certificate of Competence. PQAs are summarised as follows:

- 4 *planned personal contacts*;
- 8 *Formal Driving Assessments* (FDA);
- 1 OTDR downloads or instances of unannounced monitoring;
- 4 Safety Critical Communication assessments;
- 2 Summary Assessments (SUM);
- 4 Safety Briefing and Update Days (SBUDs).

<u>Continuous Assessment and Monitoring (Stage 3)</u>

112 The objective of the continuous assessment process is to ensure that drivers remain competent to drive trains at all times. Special emphasis must be placed on:

- Practical handling skills, including professional driving techniques;
- Communications skills and procedures;
- Emergency procedures;
- Essential knowledge underpinning competent performance;
- Human factors as they pertain to the drivers role;
- Route knowledge;
- Application of the rules to practical situations, including all abnormal driving situations permitted by the rules;
- Any unique knowledge or skills to the traction or routes being assessed regardless of the experience of the driver concerned.

113 Continuous Assessments are summarised as follows, and must be completed within the timescales, where this is not achieved, the driver is removed from duty:

- 4 FDAs;
- 2 OTDR Downloads;
- 4 Safety Critical Communication assessment;
- 1 Interim review (INT);
- 1 SUM;
- 4 SBUDs.

Performance monitoring of competence and fitness (Stage 4)

114 The competence management system is designed to ensure proactive monitoring is fully integrated into the ongoing assessment process of driver's competence. As part of this process checks must be carried out on a number of areas, ranging from fitness to work and uniform requirements to train despatch requirements and excess speed checks. The monitoring techniques also vary from observation in the driving cab to simulation of degraded conditions and emergency situations.

Route Knowledge for Drivers

General description

115 IÉ-RU sets out the requirements for driver route knowledge in operations SMS, OPS-SMS-3.3. This document details the arrangements for the training, assessment and retention of route knowledge for train drivers. It includes requirements in relation to:

- Route Characteristics and Route Risk;
- Initial Training of Trainee Drivers;
- Route Learning;
- Competence Assessment of Route Knowledge;
- Route Retention and Refreshing.

Route Characteristics and Route Risk

116 All routes must be assessed to establish the route characteristics and the route risks against the criteria outlined in Appendix A and B of OPS-SMS-3.3. The assessment shall be carried out by a DTE and submitted to the Chief DTE for review; this assessment is carried out against the criteria outlines in Table 1 of OPS-SMS-3.3, see Figure 8.

Table 1		
Route Risk	**Criteria**	**Route learning time**
High Risk	Major station with complex layout, reversible lines, complex gantry signals, short signal distances, several multiple SPAD signals, high risk signals, signal where consequences of a SPAD is severe, large maintenance depot with 24 hours working, very complex shunting movements etc. (normally major locations such as Connolly and Hueston) .	No more than 1 mile per day.
Medium Risk	Routes that have several route risks, predominately semaphore signalling, complex shunting movements.	2 to 3 route miles per day.
Low Risk	Routes that are colour light with few junctions, predominately plain track and low route risks and easy shunting movements etc.	4 to 5 route miles per day.

Figure 8 – Route risk criteria

Initial Training of Trainee Drivers

117 All trainees undertaking basic driver training must receive training and be assessed in the principles of route learning. This will provide the trainee with the necessary competence to:

- Identify and understand the route risks and characteristics;
- Interpret information for route knowledge such as signalling maps, track layout diagrams, gradient charts, SPAD awareness information;
- Interpret and if necessary draw a comprehensive map of a designated route showing signals, permanent speed restrictions, stations, landmarks and lineside features relevant to a driver.

118 A ‘core route’ must be determined for the newly qualified driver where they must undertake a minimum of 20 days driving over their core route, which will enable them to practice their newly acquired skills before undertaking any further route learning. After twenty days the driver can now commence learning additional routes whilst continuing to drive trains over the routes where he is judged currently competent. A frequency at which the newly qualified Driver will be programmed to drive trains will be calculated using a risk based route knowledge retention ratio with additional factors built in to enable driving experience retention.

Route Learning

119 Drivers must be provided with an information pack and briefed on the relevant information on route characteristics and route risks as identified in paragraph 116. There are a variety of route learning methods, such as group learning, on the route learning train, accompanied/unaccompanied learning and interactive learning. The DTE and supervisors must monitor all drivers undertaking route learning and to establish any deficiencies which may require additional coaching and support; and record all findings.

Competence Assessment of Route Knowledge

120 There are two stages involved in the competence assessment in terms of route knowledge, these include both initial and ongoing assessment of route competence. Prior to certifying a driver for a route for the first time, in the initial assessment, the person's route competency must be assessed by a practical assessment supported by a test of underpinning knowledge against a set of pre-defined questions, set by the DTE. The questions should include, for example, reasons why a particular signal presents a risk and the action to take to prevent an incident occurring. During the course of an assessment, if practicable, the driver must provide a running commentary of route characteristics and route risks. The assessment should be documented as set out in OPS-SMS-3.1 and OPS-SMS-3.3.

121 In terms of ongoing assessment, drivers are not assessed over every route. A risk based approach is adopted and formal rides and assessment of underpinning knowledge must be carried out over routes where:

- The driver may have experienced difficulty;
- There have been significant changes to signalling / layout;
- There have been a number of incidents over the route where route knowledge has been a factor.

Route Retention and Refreshing

122 A Driver must work over a route in both directions, as a minimum, once in every six months. More restrictive criteria will be mandated for routes with a great degree of complexity or those with a high risk rating. The preferred means of retaining route knowledge is to work regularly over the route in the course of normal turns of duty evenly spread through the links that contain the work. If this is not practicable, other methods must be used to ensure that the criteria for retention are met. This may consist of travelling over the route in the driving cab, use of videos, slides / simulators etc. Supervisors whose duties involve rostering drivers must ensure that a person who has not operated over a route within the specified period within the minimum frequency contained in the route risk assessment or has requested a route refresher does not work over the route without a route refresher being provided. Drivers must also be made aware of their individual responsibilities at Safety Briefings to ensure they do not operate over a route unless competent.

Safety Briefing for Drivers

General description

123 Operations SMS, OPS-SMS-3.5, ‘Safety Briefing Train Drivers’, Issue 1 was issued on the 25th March 2013. It defines the timescales, content and methods for delivering the SBUDs for train drivers. OPS-SMS-3.1 requires that each driver attends 4 SBUDs every 2 years. SBUDs contain a mixture of classroom and working environment activities; and are structured into four distinct sections:

- Company specific issues;
- Regional or Local Depot / Route issues;
- Rules refreshing and update;
- Assessment to measure understanding.

124 Section 11.1 provides a table on how the core items should be covered during each safety cycle (4 SBUDs), see Figure 9.

No	Item	Additional Information	Briefing 1	Briefing 2	Briefing 3 &4
1	National / Company issues.	SPADs, Operating incidents, Safety critical communications, Customer service, Significant staff accidents, Rules updates. Safety and general newsletter, Seasonal factors, Traction updates, Professional Driving policy, Human factor techniques, Policy updates.	✓	✓	✓
2	Local issues.	Local SPADs, Local operating incidents, infrastructure updates, significant local staff accidents, Route risks, safety plans.	✓	✓	
3	Refresher in rules and emergency procedures and traction.	Focus on rules and emergency procedures infrequently applied.			✓
4	Simulator Training and Assessment.				✓
5	Assessment to support the briefing.		✓	✓	✓

Figure 9 – SBUD core structure

Driver Development and Support System

General description

125 Part of the requirements for a driver to be returned to driving duties after a SPAD is to develop, in conjunction with the District Manager, a Driver Development & Support System (DD&SS) which is set out in OPS-SMS-3.2.

Purpose of Driver Development and Support System

126 OPS-SMS-3.2 is designed to:

- Proactively identify individuals who may be more likely to be involved in future safety incidents, either from past safety performance or by identifying human factors issues prior to an incident occurring;
- Provide a system that presents drivers with advice, support and development to improve and develop an individual's competence and fitness;
- Provide a system to monitor performance of individuals;
- Provide 'on call' managers with the necessary information on individual drivers post incident so that an informed decision can be made on whether the driver must be relieved immediately or allowed to continue with normal duties.

Driver Profiles

127 As part of this process, a profile is determined for each individual against the performance indicators outlined in OPS-SMS-3.2. Drivers in the Category A to D profiles require controls in the form of development plans to mitigate against specific identified risks (with Category A requiring the most support), see Figure 10. Unclassified drivers, who do not need additional support, are referred to as Unclassified Drivers.

Table A – Profiles of Drivers receiving additional support:

Driver profile	Description
A	Very high level of additional support / monitoring required Additional support for a minimum of four years
B	High level of additional support and monitoring Additional support for a minimum of two years
C	Medium level of additional support and monitoring Additional support for a minimum of one year
D	Lowest level of additional support and monitoring Additional support for a minimum of 6 months

Figure 10 – Driver profiles

128 Drivers with less than two years driving experience are already subject to higher levels of additional monitoring through the competence management system; and as a result if such a driver is involved in a SPAD, the DTE/ District Manager would have to determine whether there is a need to place the driver into a higher category than normal to further increase and extend the level of support and monitoring. For example: a newly qualified driver involved in a SPAD must not be automatically placed on a 4 year Category A DD&SS if there is sufficient evidence to indicate the risk can be controlled within the normal Category B plan (for two year).

Incident requiring change of Driver Profile

129 The drivers are placed in certain categories dependent on the type of safety critical operational occurrence as set out in the appendix of OPS-SMS-3.2, see Figure 11. From the appendix, the first instance of a SPAD require a driver to be placed in Category B, the second instance of a SPAD requires a driver to be categorised as a Category A driver, requiring the most additional support; or in the case of a serious SPAD the driver maybe placed in the Category A profile.

Incident	Comments
Category A incidents	**Highest level of additional support and monitoring (4 years minimum)** a) Second serious operating incident such as a SPAD derailment, collision or excessive speeding incident involving a 11+ mph excess within a 4 year period b) Fourth incident of the type listed in Category D within 4 year period. c) Where a driver remains on driving duties following a very serious operating incident and the driver is to be managed through the Driver Development System. d) A significant SPAD or operating incident
Category B	**High level of additional support and monitoring (2 years minimum)** a) First serious operating incident such as a SPAD, derailment, collision, excessive speeding incident involving a 11+ mph excess or unauthorised use of a mobile phone while driving b) Second incident of excessive speed between 6 to 10 mph inclusive c) *Third incident of the type listed under Category D within 2 year period d) A combination of incidents where a Category B development plan is still appropriate – see clause 5.4 for further guidance.
Category C	**Medium level of additional support and monitoring (1 year minimum)** a) First incident of excessive speed between 4 -10 mph. b) *Second incident of the type listed under Category D within a 2 year period. c) Unauthorised driving from other than the leading cab.
Category D incidents	**Low level of additional support and monitoring (6 months minimum)** First incident of: A Station overrun. A Failure to call at a station. An excess speed incident less than 5 mph. Having an unauthorised mobile phone switched on in the cab. Unauthorised use of radio, CD player etc whilst driving. Permitting unauthorised persons in driving cab whilst moving. Wrong side power door release. Driving technique not in accordance with Train Driving Policy. A failure to comply with performance criteria.

Figure 11 – Minimum number of additional assessments based on Driver Category

Minimum number of additional assessments

130 The minimum number of additional assessments required of drivers in Categories A to D is set out in Section 7 of OPS-SMS-3.2, whereby Category A drivers require a minimum of four additional assessments and Category U drivers require no additional assessments, see Figure 12.

Category	Minimum number of additional assessments per annum			
	Year 1	Year 2	Year 3	Year 4
A	4	3	3	2
B	3	2	0	0
C	2	0	0	0
D	1 (6 months)	0	0	0
U				

Figure 12 – Minimum number of additional assessments based on Driver Category

Driver Development & Support System Document

131 OPS-SMS-3.2 states that "A key objective of OPS-SMS-3.2 is to develop and support the driver allowing a reduction in the control measures applied and removal of the driver from the Driver Development and Support System (DD&SS). Development plans must therefore be specific and relate to an individual's shortfalls, with the objective of improving safety performance. The level of additional support and monitoring must also be in relation to the category /profile of the driver".

132 A DD&SS must be initiated where a driver is found fully or partially responsible for the occurrence of a safety critical incident. Only one DD&SS is initiated per incident, although more than one immediate or underlying cause may be addressed by the plan. If a subsequent incident occurs prior to the expiry date of the DD&SS, if necessary, allocation of a revised category / profile for the driver must be agreed between the DM and DTE and a new development plan created. The template for the DD&SS is provided in Appendix C of OPS-SMS-3.2, see Figure 13.

Section 1 – Details of Driver and Responsible Manager

Name of Driver	Location	Grade	Staff No

Responsible Manager	Location	Date

Category		**Start date**		**Proposed End Date**	

Section 2 – Reason for the plan

2a Summary of the most recent incident This summary should briefly capture what happened and any identified cause.		
Date:	Incident and location:	Brief Summary and Causes

2b Summary of previous relevant history and any traits identified This summary should be sufficient in detail to provide a basic understanding of any relevant history that will also be addressed within the development plan.		
Date:	Incident and location:	Brief Summary, Causes and how any development plan has monitored this cause (whether successful or not)

The plan shall be based around ALL considerations identified in sections 2a and 2b

Section 3 – Objective and Scope of the Plan

3.1 Purpose - what is the objective of the plan?
Example text : • To provide an opportunity for employee XX to regain confidence and competence to perform duties consistently to the required standard. This to focus on addressed underlying behavioural issues which are leading to lapses in concentration • To enable Company XX the opportunity to regain confidence in employee XX to perform all duties consistently to the required standard.
3.2 Measures of Success Elements, Competence, Procedures, Attitudes and Techniques to demonstrate the success of the plan?

3.3 Planned Instructional Activities All Briefing, Training, Time with Instructor, Simulation, CBA, Route Refresher etc. For each activity there must be dates and what is required to be seen. E.g. Additional 50 hours with an Instructor over the core route to monitor braking technique and alertness especially on night shifts. **All planned dates must be written into section 4, in date order, at the start of the plan.**
1)
3.4 Planned Assessment Activities All Practical, OTDR, Rules, CBA, Psychological (OPC), Special Medical, etc... E.g. Additional driving assessments in January 2008 and March 2008 to monitor the driver's ability to multi task in relation to operation of the door controls. **All planned dates must be written into section 4, in date order, at the start of the plan.**
1)

3.5 Initial Briefing Briefing given on the correct rules, regulations and procedures applicable to the requirements of this development plan. The member of staff should be left with no doubt as to the correct course of action. In addition, the member of staff may require briefing on any traits or behaviours that are current and the actions required to bring about a positive change.

3.6 Responsibility of employee **This section must document the member of staff's commitment to the development plan 'in their own words'. It should detail their responsibilities throughout the plan, actions they commit to undertake and what they hope to gain from the experience. Without this commitment to improvement, it is unlikely the plan will achieve its objectives.**

By signing here, both parties agree to the aims and objectives of this plan and agree to their responsibilities and actions documented within.

Member of staff Signature	Date	DTE Signature	Date
Senior Managers Signature (only required for cat A/long term plan drivers)	**Date**		

Figure 13 – Example of a development plan

Suite of driving documents for use by drivers

Introduction

133 As mentioned at the introduction of this part of the report, the operations SMS suite of documents are management level documents for the management of driver training and competency management, and although available to the drivers for perusal, are not the day-to-day documents accessed by drivers.

134 The documents available for drivers, for their day-to-day driving activities, include the:

- IÉ-Rule Book;
- The 'Professional Driving Handbook';
- 'Train Driving Competence Standards'.

135 The above documents set out the requirements for drivers and the standards under which they are required to operate. This section of the report focuses on the technical driving skills (e.g. the 15 x 20 Rule) and the non-technical skills (e.g. EPTs) sometimes associated with the occurrence of SPADs. As a result, this part focuses on the Professional Driving Handbook and the Train Driving Competence Standard; the Rule Book was addressed in Part 2 in terms of the observance of signals (paragraph 27) and will be addressed in the relevant investigations, as required.

Professional Driving Handbook

General introduction

136 This section of the report sets out some of the professional driving techniques set out in IÉ's Professional Driving Handbook. The Professional Driving Handbook is set out in three sections:

- Section 1: Professional Driving Policy – which sets out key principles in relation to driving, including principles such as reducing the risk of error;
- Section 2: Guidance and Supporting Information – which includes topics such as human factors, errors and violations, hazards and causes of accidents and techniques to reduce the risk of error;
- Section 3: General Operating Instructions – which includes topics such as DRA and TPWS for trains operating into Northern Ireland.

137 Section 1 of the Professional Driver Policy is mandatory, Section 2 provides guidance and Section 3 provides additional information, see Figure 14.

The instructions within this manual prescribe the standards of professionalism and driving techniques to be applied by all Iarnród Éireann drivers. They have been developed with input from Drivers, Lead Drivers and District Traction Executives using examples of best practice in train driving techniques.

Application of these instructions will enable you to apply the highest standards of professionalism in terms of your approach to work and will additionally enable you to drive trains safely, punctually and with a high level of passenger comfort.

This manual comprises of three sections

Section One

Prescribes key principles and supporting instructions to be applied by all Iarnród Éireann train drivers. These are mandatory and form part of normal assessment and monitoring.

Section Two

Provides supporting guidance on useful techniques which can assist you to reduce the likelihood of error.

Section Three

Contains additional information to support the Rule Book and other operating instructions.

Should you need support or guidance on how to apply the techniques in this manual, or you would like a demonstration of the techniques expected, please contact your Lead Driver or DTE.

Figure 14 – Introduction to the Professional Driving Policy

Section 1: Professional Driving Policy

Introduction

Section 1 contains seven "key principles", namely:

- Key Principle 1 – Always have the right attitude and act professionally at all times;
- Key Principle 2 – Prepare yourself by taking personal responsibility for managing lifestyle, fatigue and external problems;
- Key Principle 3 – Maintaining a professional working environment and controlling distractions;
- Key Principle 4 – Being fully aware of hazards within the driving environment and the actions and techniques that can be used to minimise the risk of error;
- Key Principle 5 – Applying defensive driving and safe working techniques consistently in all situations;
- Key Principle 6 – Apply effective communication protocol at all times;
- Key Principle 7 – Remember: 'If you can't do it safely – don't do it at all'.

Stopping at red signals

138 Included in Key Principle 5 of Section 1 of Professional Driving Policy is relation to IÉ's adopted the "15 x 20 Rule" which must be used on the final approach to a signal at danger. The Professional Driving Handbook sets out the principle of this rule which is that the driver should aim to be driving at no more than 15 mph (24 km/h) at the CAWS downgrade and where applicable, stop 20 m from the signal. The Professional Driving Handbook illustrates by showing poor and good braking technique, see Figure 15.

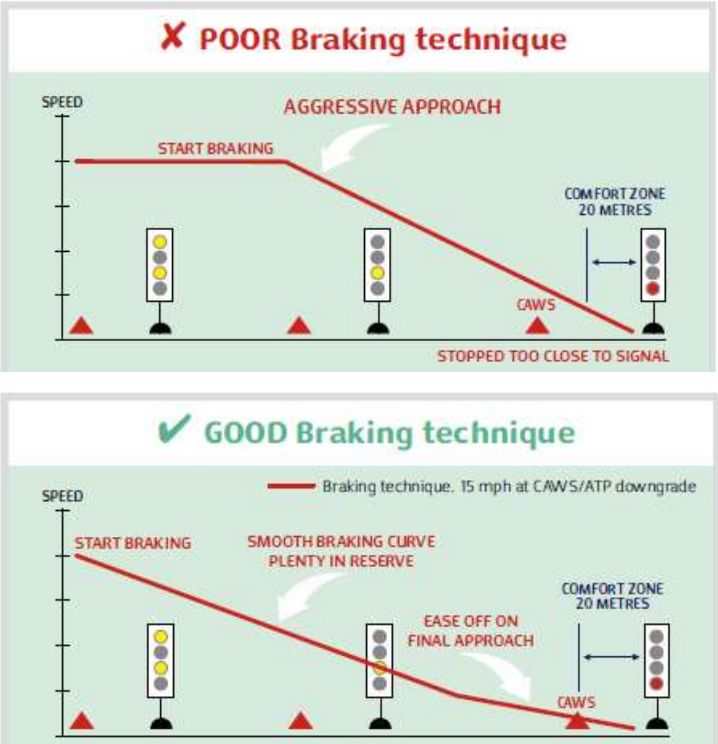


Figure 15 – 15 x 20 Rule, poor and good braking technique

<u>Section 2: Professional Driving Policy</u>

General description

139 Section 2, sets out the error prevention techniques (EPTs). EPTs is a term used by IÉ in relation to techniques to be used by drivers to manage distraction, refocus their attention and become aware of their surroundings and situation. IÉ outline a number of different techniques, such as *risk triggered commentary* (RTC).

Managing distraction & refocusing

140 Section 2, Techniques to reduce the risk of error includes a section on "managing *distraction* & refocusing". The document acknowledges that on a journey, a driver will "encounter many potential distractions at stations or on the move" which may consist of "passengers, staff, other trains/drivers, encountering speed restrictions in relation to signals, etc".

141 The document continues "if you become distracted and need to bring your attention back to the core task, or if you have been running on mental autopilot for a period, and want to come back into a state of conscious control, there are some simple strategies which can be used to 'refocus' thoughts on the task in hand".

142 It provides a list of questions that the driver can ask themselves:

- What colour was the last signal?
- Where precisely am I on the route?
- Where is the next signal?
- When should I be reducing speed?
- Am I travelling at an appropriate speed regarding speed restrictions and external conditions?

143 The document also provides a list of instructions on what to do "if you find yourself distracted by a thought or an event", stating:

- Tell yourself to focus on driving;
- To help 'clear your head', talk aloud, commentate on what you are seeing, thinking and anticipating as this can help re-focus;
- Tell yourself to 'park the thought' until the end of the journey;
- Decide to tell someone later on – having a plan is important.

Situational awareness

144 Section 2, Techniques to reduce the risk of error includes a section on '*Situational Awareness*[3]. IÉ state that situational awareness is a key human factor in the train driving task and comprises of:

- Perception (noticing) of the elements/hazards in the driving environment;
- The comprehension of their meaning taking into account rules, traction, route knowledge, professional driving techniques;
- The projection of their status in the near future (anticipating future events).

145 In simpler terms IÉ state that situational awareness is "knowing what is going on around you and minimising the risk of error" and that "having a high level of situational awareness can turn a good driver into a great driver".

146 According to the Professional Driving Handbook, drivers can remain alert to their surroundings by:

- Switching attention – by switching attention between the route ahead and checking in cab indications;
- Information filtrations – by disregarding the irrelevant and paying attention to the relevant;
- Attention distribution – by allocating your attention to all the relevant information to avoid focusing too much or too little on any one task;
- Task fixation – by not focusing entirely on a single task.

[3] Situation awareness is the perception of elements in the environment, within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future (Endsley, 1995). There are three defines three levels of situation awareness:

- Perception – Operators perceive the important information. This means first, that the needed information is available and second, that attention is directed to its important pieces. Without attention to the right information, operators have no chance to understand and control a system;
- Comprehension – This level describes ability to understand the perceived information. It is the process of interpreting information towards one's goals and to remember relevant parts of information;
- Projection – If the important information is perceived and comprehended, it is possible to understand the dynamics of a system. This will allow projecting future states and supports decision –making in order to influence and control the state of the system (Endsley, 2000).

147 The Professional Driving Handbook states that's these techniques must be applied at all times when driving, higher levels of situational awareness should be applied when:

- Approaching a major terminal and complex signalling layouts under cautionary signals where other trains are running on parallel lines;
- Approaching junction where the risk of error could be significant, being especially alert and effectively managing internal and external distractions;
- Dealing with changes in speed restrictions at the same time as running under cautionary signals.

Risk Triggered Commentary (RTC)

148 The Professional Driving Handbook defines RTC for drivers as a "technique used to help you stay focused when you are carrying out a movement or a task that carries a high level of risk. It uses the process of verbal commentary and repeating back the risk and action to take, and is aimed at ensuring that essential information remains in your working memory". Drivers can use RTC to increase awareness of risk, improve concentration levels and manage potential distractions.

149 The Professional Driving Handbook states that "very little information is retained in the short term memory beyond a time of between "8 to 18 seconds. Using this information, IÉ provide an example of when and how to use RTC on receiving a caution or preliminary caution aspect, this is set out as follows:

- Call out the aspect i.e. "Two yellows or Single Yellow – Target Red at XYZ Location";
- Repeat this every 8 to 18 seconds until the red aspect comes into view or aspects are stepped-up;
- Call out the red aspect as soon as it comes into view. If it steps up, start the process again;
- RED AHEAD, keep RED AHEAD as a priority in your short term memory.

150 The Professional Driving Handbook also gives examples where RTC should be used, which include when starting a train to prevent a SAS or SOY SPAD; and on approach to cautionary/red signals.

Train Driving Competence Standards

151 The above Operations SMS documents were set out for the management of the train and competency management of drivers. Supporting the above, for the use of drivers, in conjunction with the IÉ Rule Book and the IÉ Professional Driving Policy, is the 'Train Driving Competence Standards', Issue 1, issued in April 2010 (which will be referred to as the Competence Standards for the remainder of the report). The Competence Standards set out what is expected of IÉ train drivers to demonstrate their training and competence.

152 The Competence Standards focuses on the key activities and tasks that train drivers undertake as part of their role, including the specific risks associated with the operation of IÉ services. They also provide a benchmark against which current abilities, skills and knowledge can be measured. It aims to provide the foundation by which DTEs assess driver competence, it also provides a useful reference guide to train drivers on the standards expected of them. Such standards define what drivers are expected to:

- Demonstrate – through driver's actions prove practical competence in relation to the activity;
- Explain – through driver's ability to link theory to practice verifying understanding as part of underpinning knowledge.

153 In relation to demonstrations and explanation in relation to 'Mobilise and start trains', the Competence Standards sets out a number of requirements of assessment, see Figure 16. For example, the driver must demonstrate the following:

- Demonstrate – Confirming the signal is showing a proceed aspect and correct route indication prior to starting;
- Demonstrate – Ensuring extra vigilance when starting on a cautionary aspect or position light signals;
- Explain – Locations and signals with SAS and SOY SPAD potential and appropriate driver action.

Element 4.1: Mobilise and start trains

DEMONSTRATE

Mobilise

A. Entering train in safe manner.

B. Setting up cab in accordance with train instructions.

C. Setting up cab radio and PIS.

D. Applying sufficient brakes to ensure train will not move.

Start trains

E. Confirming train stopping patterns using the approved method.

F. Clarifying and confirming details before moving in regard to special instructions or unusual moves.

G. Making PIS announcements prior to starting train where necessary.

H. Closing doors in response to approved hand signals at staffed stations and checking interlock.

I. Closing doors after observing it is safe to do so at non staffed DOO stations and checking interlock.

J. Ensuring correct procedures are followed to dispatch conventionally manned trains including the repeating of bell/ buzzer codes.

K. Confirming the signal is showing a proceed aspect and correct route indication prior to starting.

L. Accelerating smoothly and consistently in line with gradient, railhead conditions and train type.

M. Ensuring extra vigilance when starting on a cautionary aspect or position light signal.

N. Routinely monitoring and operating cab instruments, controls, gauges and indicators.

EXPLAIN

Mobilise

1. Mobilisation procedure for the different train types.
2. Cab radio and PIS set up procedure for different train types.

Start trains

3. How to identify train stopping patterns and use of reminder techniques.
4. Action if "Train Ready to Start" signal is received before signal is showing a proceed aspect or doors are fully closed.
5. Typical distractions when starting the train.
6. Train dispatch procedure when Driver Only Operation equipment fails.
7. Approved "Train Ready to Start" signals at staffed stations.
8. Train dispatch procedure if staffed station is unmanned.
9. Locations and signals with 'start against' (SAS) and 'start on yellow' (SOY) SPAD potential and appropriate driver action.
10. Action required if starting signal cannot be viewed clearly through the front windscreen.
11. Procedure and authority for starting on a position light shunt signal.
12. Locations where low adhesion can affect train starting.
13. Actions to be taken when low adhesion is experienced.
14. Techniques required for starting on gradient according to train type.
15. Operation of sanders in manual mode during poor rail conditions.
16. Action to be taken if the incorrect route is signalled.

Figure 16 – Competence Standards 'Mobilise and start trains'

154 In relation to demonstrations and explanation for drivers in relation to 'Stop trains at signals', the Competence Standards include a number of assessment requirements, see Figure 17.

Element 4.2: Stop trains at signals

DEMONSTRATE	EXPLAIN
A. Avoiding unnecessary actions that may cause distraction during braking.	1. Action if a radio call is received during braking.
B. Actively responding to first cautionary signal.	2. Typical distractions that can occur during braking.
C. Cautiously approaching any signal, which is not normally stopped at.	3. The importance of smooth braking in relation to passenger comfort and safety.
D. Allowing twice the normal braking distance during periods of low adhesion.	4. Known locations of low adhesion and how driving technique is altered when low adhesion is anticipated.
E. Actively Responding to the single yellow and Target Fixing the location of the stop signal.	5. Actions required if exceptional, sudden or low adhesion is experienced; and reporting procedures.
F. Ensuring maximum speed 15 mph, 200 metres on the approach to the stop signal.	6. Signals that have an increased risk of SPADs explain the circumstances and action to be taken to mitigate the risk.
G. Ensuring maximum speed 10 mph, 200 metres on the approach to the stop signal during periods of low adhesion.	7. Locations and reasons why you may be required to stop closer than 20 metres from a stop signal.
H. Stopping smoothly 20 metres before reaching the stop signal. (Unless local route knowledge requires you to stop closer).	8. The train driving policy for stopping at signals.
I. Positioning the train so that the signal can be clearly viewed through the cab windscreen whenever possible.	
J. Applying sufficient brakes when at a stand and when leaving the cab.	9. Possible different signalling sequence of cautionary signals at locations applicable to the driver.
K. Reducing the train speed as necessary during times of poor visibility.	10. Actions that can be taken after stopping at a platform with a red signal displayed.
L. On trains fitted with ATP, when a Zero Speed Command is received ensuring the appropriate action is taken.	11. The risks associated with the operation of the ATP running release.

Figure 17 – Competence Standard 'Stop trains at Signals'

155 Of relevance, drivers must be assessed demonstrating and explaining the following:

- Demonstrate – Actively responding to first cautionary signal;
- Demonstrate – Cautiously approaching any signal, which is not normally stopped at;
- Demonstrate – Actively responding to the single yellow and 'Target Fixing' the location of the stop signal;
- Explain – Signals that have an increased risk of SPADs explain the circumstances and action to be taken to mitigate risk;
- Explain – The train driving policy for stopping at signals;
- Explain – Possible different signalling sequence of cautionary signals at locations applicable to the driver.

156 Target fixing requires the driver to fix in their minds the required stopping point/location and then making constant assessment with regard to train speed, distance to travel to the stopping point and current braking capability and performance of the train.

Competency Management of BBRI OTMDOs

157 As mentioned previously BBRI OTMDOs are trained in the IÉ training school, as set out above. In relation to BBRI's SMS and OTMDO CMS, BBRI have designed and developed thirty-eight 'Route Knowledge Packs'; included in these packs are the SPAD notices which are received from IÉ after every SPAD occurrence, which are added to each route pack and emailed out to every driver. BBRI carries out OTMDOs assessments and Rule Book refresher training every two years, which includes a SPAD awareness course; it also carries out a Professional Drivers refresher course which covers the following areas:

- Key principles of being a professional driver;
- Typical errors & factors which can lead to incidents;
- Techniques to reduce the likelihood or error;
- Maintaining a professional work environment;
- Driving cab protocol;
- Defensive driving techniques;
- Avoiding SPADs training;
- Route knowledge;
- Communications;
- Mobile telephone use;
- Fatigue management;
- Managing distraction and refocusing training;
- Situational awareness training.

Section 2

Part 5 – SPAD at Millstreet on the 8th December 2013

Part 6 – SPAD at Gortavogher on the 19th December 2013

Part 7 – SAS SPAD at Muine Bheag on the 9th April 2013

RAIU
Railway Accident Investigation Unit

PART 5 – SPAD at Millstreet, Cork, on the 8th December 2013

Introduction

158 This part of the report will investigate the SPAD at Millstreet on the 8th December 2013. Category A SPAD events similar to the SPAD at Millstreet, such as SPADs under normal train operations, will be discussed in 'Part 8 – A Review of All Category A SPADs (January 2012 – June 2015)' of this report. This part will outline the evidence found as part of the investigation, the analysis of this evidence, and the conclusions found as part of the investigation. Any additional observations made as part of this investigation will be outlined in 'Part 11 – Additional Observations'. Actions taken, by IÉ, as a result of the SPAD at Millstreet and similar SPADs will be outlined in 'Part 13 – Relevant Actions Taken or In Progress'. RAIU safety recommendations, related to this incident and similar occurrences; or related to additional observations, are made in 'Part 14 – Safety Recommendations' of this report.

The incident

Summary of the incident

159 At approximately 13:12 hrs on Sunday 8th December 2013, the 11:50 hrs Tralee to Heuston passenger service (Train A303), departed Killarney Station eighteen minutes late following delays at both Killarney and the previous stop at Farranfore Station, see Figure 18 for scheduled route of Train A303 (red line, Figure 18). The line between Killarney Junction and Mallow is single line with crossing loops.

160 As a result of the delay and in an effort to minimise delays to the 12:10 hrs Cork to Tralee passenger service (Train A304) travelling in the opposite direction (blue line, Figure 18), the CTC Signalman and the Traffic Regulator switched the crossing point from Banteer Station (the normal crossing point) to Millstreet Station, see Figure 18 for crossing points.

161 It was expected (by the Traffic Regulator and the CTC Signalman) that Train A304 would arrive at Millstreet Station first. As there is only one platform at Millstreet Station, Train A304 would arrive at Millstreet Station Platform, disembark passengers and then carry out a signalled shunt movement into the adjoining crossing loop and wait there until Train A303 arrived at Millstreet Station Platform.

162 To facilitate this movement, Signal TL223 would display a red aspect, holding Train A303 outside the station until Train A304's manoeuvre was completed.

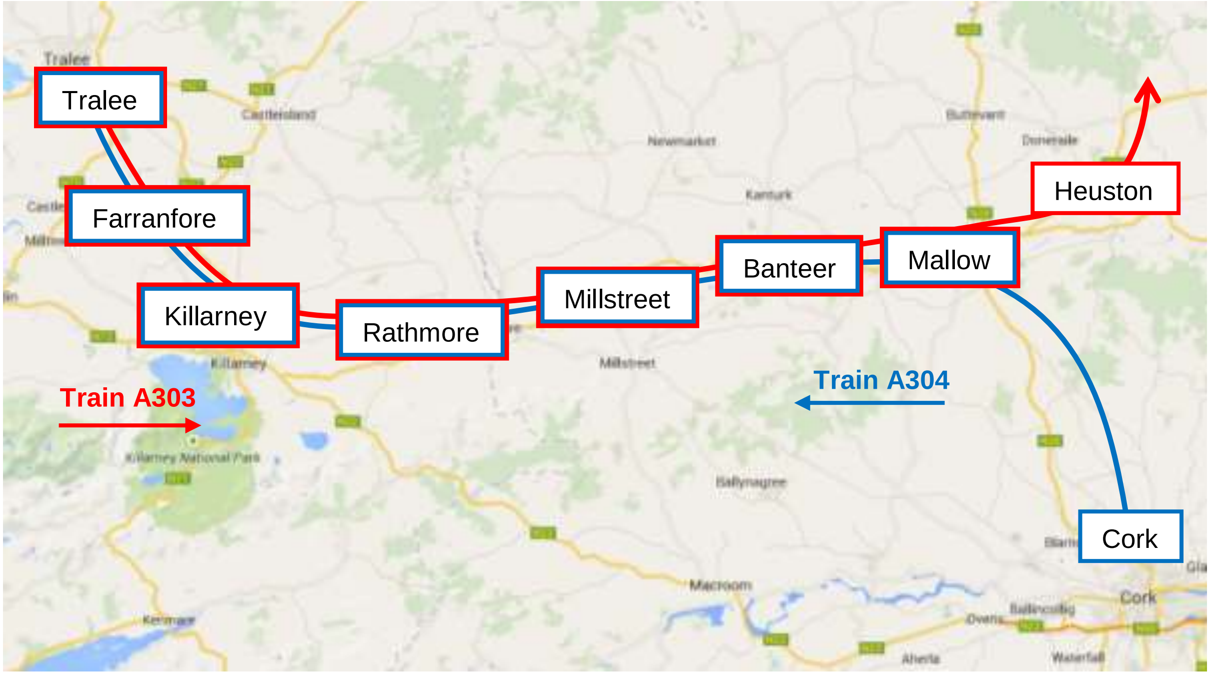


Figure 18 – Location of the incident and scheduled routes of Train A303 and Train A304

163 However, Train A304 did not arrive at Millstreet Station first (as expected by the Traffic Regulator and CTC Signalman). Instead, both Train A303 and Train A304 approached Millstreet Station at the same time. As Train A304 had not yet carried out its manoeuvre, it was signalled into Millstreet Station Platform and continued towards Millstreet Station Platform. This meant that, Signal TL223 was displaying a red aspect to hold Train A303 outside Millstreet Station. However, Train A303 did not stop at Signal TL223 and passed it at danger without authority and continued towards Millstreet Station Platform.

164 The critical alarm for Millstreet interlocking was activated when Train A303 occupied the track circuit ahead of Signal TL223. The CTC Signalman immediately responded to the alarm by making a general call to stop trains through the train radio system.

165 The drivers of Train A303 and Train A304 both responded with brake applications with the trains coming to a stop 175m apart, facing one another, on Millstreet Station Platform. Train A303 had passed Signal TL223 by 384m and was 56m along the length of Millstreet Station Platform, see Figure 19.

Figure 19 – Train A303 & Train A304 stopped 175 m apart on Millstreet Station Platform after the SPAD

General description of the railway

Infrastructure

166 The line between Killarney Junction and Mallow, is single track which is worked *bi-directionally* with crossing loops, there are additional platforms located on the crossing loops at Banteer, Rathmore and Farranfore Stations.

167 Millstreet Station is located at the 19 Milepost (MP) on the Mallow to Tralee line. There is one platform at Millstreet Station; and a crossing loop, without a platform. Therefore, when two trains are required to allow passengers to disembark and pass each other at Millstreet Station, a shunt movement is required.

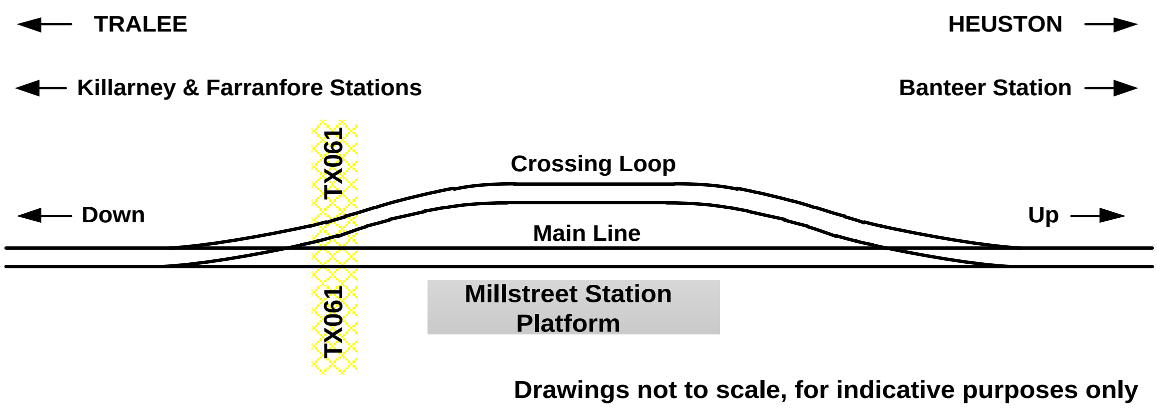


Figure 20 – Millstreet Station Layout

168 A closed circuit television (CCTV) level crossing, Level Crossing XT061, is located 109 m west of Millstreet Station, en route to Rathmore Station, see Figure 20; it is located a short distance from the end of Millstreet Station platform). This type of level crossing prevents access by means of two full barriers that block the flow of road traffic. The level crossing is protected by traffic light signals, audible warning devices and the full barriers. The operation of the lights and sirens followed by the lowering of the barriers is initiated automatically as the train approaches the level crossing. The barriers rise automatically once the train has passed. The level crossing equipment is supervised by a Signalman in CTC; see Figure 21 for a photograph of Level Crossing XT061 with the barriers raised.

169 No factors in relation to the operation of the level crossing were founds to have contributed to the incident.

Figure 21 – Level Crossing XT061

Rolling stock

170 The trains involved in the incident were the 11:50 hrs Tralee to Heuston passenger service (Train A303) and the 12:10 hrs Cork to Tralee passenger service (Train A304).

171 Train A303 was a four-carriage Diesel Multiple Unit (DMU) Intercity railcar consisting of carriages 22227, 22544, 22427, 22327, unit 22227 was the leading carriage at the time of the incident. This train consist is 164 metres (m) in length with a combined weight of 277 tonnes.

172 Train A304 was also a four car DMU.

173 Both trains were fitted with On Train Data Recorders (OTDR), a device fitted to trains to store key train parameters and driver actions; this includes speeds of trains and brake applications. On the day of the SPAD there were approximately ten instances of over-speeding (paragraph 229), by speeds up to 11 mph (17.6 km/h), these instances of speeding were for short periods of time and are likely as a result of the number of speed and gradient changes.

174 No factors associated with the condition of the rolling stock were found to have contributed to the incident.

Signalling and communications

175 The Tralee Line was re-signalled as part of a larger Mini-CTC project in 2004/05 which involved: updating the signalling from semaphore signalling to colour light signalling using *solid-state interlocking (SSI);* installing *axle counter* train detection equipment between stations; removing local signal cabins with control being transferred to CTC; and the upgrading of level crossings.

176 As a result, the single track route from Killarney Junction to Tralee is signalled using two and three aspect *colour light signals*, controlled by the Waterford/Tralee Line Signalman based in CTC in Dublin. *Track Circuit Block* regulations apply to this route.

177 The means of communication between train drivers and the CTC Signalman on this route is via train radio. Lineside signal telephones are also available.

178 The signalling and communications systems operated as designed.

Operations

179 The upgrading work, outlined in paragraph 175, did not included the installation of a CAWS or ATP as IÉ determined there was no change in the perceived risk, due to the fitment not being

included prior to the upgrade (replacing like-for-like). As a result the level of train protection on the line was through the use of basic overrun protection, as set out in IÉ I-SIG-2062 (see paragraphs 48 - 50).

180 DRA was not provided in the driving cab of Train A303.

181 The maximum permitted line speed is 70 mph (112 km/h). There is a permanent *speed restriction* (PSR) of 60 mph (96 km/h) between the 19 ¼ MP and 18 ½ MP (between TLR223 and TL223); and a temporary speed restriction (TSR) of 25 mph (40 km/h) in the down direction approaching Millstreet Station. The speed through Millstreet Station Platform is 40 mph (64 km/h).

182 Both train drivers involved in the incident were competent to perform driving duties as per the IÉ suite of training and competence. The competence of the drivers will be discussed in detail in a later part of the report.

Fatalities, injuries and material damage

Fatalities and injuries

183 There were no fatalities or injuries as a result of this incident.

Material damage

184 There was no material damage to the infrastructure, rolling stock or signalling system as a result of this incident.

Roles involved in the incident

Roles directly involved in the incident

185 There are a number of roles involved in the incident, the IÉ-RU roles are as follows:

- Driver A303 – The train driver who was driving Train A303 from Tralee to Heuston, who proceeded through Signal TL223 without authority as he approached Millstreet Station Platform;
- Driver A304 – The train driver who was driving Train A304 from Cork to Tralee and was approaching Millstreet Station Platform as Train A303 approached. He was qualified and competent to drive trains;
- DM Cork – The DM and line manager for Driver A303;

- PIC Killarney – Person in charge of platform at Killarney Station platform, who despatched the Train A303 from Killarney. The PIC Killarney was trained and competent in the procedures for the despatch of trains;
- PIC Millstreet – Person in charge of platform at Millstreet Station. The PIC Millstreet was trained and competent in the procedures for the despatch of trains.

186 The IÉ-IM roles associated with the incident are as follow:

- CTC Signalman – The Waterford/Tralee Line Signalman based in CTC, Dublin, who is responsible controlling the route and for the operation of level crossings, such as Level Crossing XT061. The CTC Signalman was competent to perform his duties;
- Traffic Regulator – The person, based in CTC, responsible for delivering a punctual train service in accordance with the timetable and to deal with any service recovery situations; the Traffic Regulator was competent to perform his duties.

Roles not directly involved in the incident

187 The roles not directly involved in the incident, include the following role, as follows:

- District Traction Executive (DTE) – In relation to driver, the DTE assists in the selection of drivers, ensures the CMS is set up and maintained, assesses and monitors drivers, manages issues surrounding the competence of drivers, certifies newly qualified drivers, and manages the PQA process.

External circumstances

188 The weather at the time of the incident was recorded by Met Éireann as bright and dry with a temperature of 10.5°C.

189 No factors associated with the weather, such as visibility, were associated with incident.

Evidence

The Signalling System

<u>General description of the Signals</u>

190 Signal TL223 is a three aspect signal mounted on a standard height pole situated on the left hand side of the track close to 19 ¼ MP. It is capable of displaying single yellow, green and red aspects; and has a *route indicator*, see Figure 22. TL223 clears to a green aspect on request from the CTC Signalman after the barriers of Level Crossing XT061 are lowered; the level crossing is not *approach released.* There is a 40 mph (64 km/h) speed board located behind the signal.

Figure 22 – Signal TL223 with route indicator and adjacent speed board

191 On the driver's approach of Signal TL223, the signal comes into view, across a curve, from a distance of 435 m, Figure 23. There is then a clear view of Signal TL223 on the straight line from a distance of 370 m, The minimum required sighting distance for a line speed of 80 mph (128 km/h), as set out in I-SIG-2043 (discussed in paragraphs 30 - 34), is 286 m; therefore the actual sighting distance of 370 m exceeds the requirements set out in the standard.

Figure 23 – View of Signal TL223 on curve

192 Signal TLR223 is the *repeater signal* for Signal TL223. It is a two aspect signal mounted on a standard height pole situated on the left hand side of the track, see Figure 24. It is capable of displaying single yellow and green aspects. It is located 2,016 m before Signal TL223. It has a recorded sighting distance of greater than 1000 m as it is located on a straight section of track; therefore this signal also meets the requirement of 286 m sighting distance set out in I-SIG-2043.

Figure 24 – Signal TLR223

193 The aspects displayed on the day of the incident, as outlined in the sequence of events, was confirmed by forward facing CCTV on board Train A303 i.e. that Signal TLR223 was displaying a yellow aspect (see Figure 25), and Signal TL223 was displaying a red aspect as Train A303 approached the signals (see Figure 26).

Figure 25 – Train A303 CCTV download, showing Signal TLR223 displaying a yellow aspect

Figure 26 – Train A303 CCTV download, showing Signal TL223 displaying a red aspect and speed board

General description of the Signalling Route Settings

194 As mentioned previously, Millstreet Station is a one platform station with a single line and crossing loop. To facilitate the movement of trains onto Millstreet Station Platform, the points are set on the approach to Millstreet Station Platform, to provide the overlap for the train that will allow the signal in rear, Signal TL213, to display a green aspect. In addition, when the initial route is made by the CTC Signalman, the points exiting Millstreet Station (see pink area in Figure 27) are also set so that the train can exit the section i.e. the points are not conflicting. The setting of the exiting points for the entire movement is to mitigate the risk of derailment, due to conflicting points, where a train inadvertently overruns Millstreet Station Platform, see Figure 27 A, B, C &D.

195 This system of working means that trains travelling in the opposite direction, towards Millstreet Station, cannot be set for the opposing train to travel directly onto the crossing loop. However, it should be noted that the signals (such as TL223) would be at danger meaning that drivers would not have authority to enter the section.

196 This system of working is similar for all stations on single lines with crossing loops.

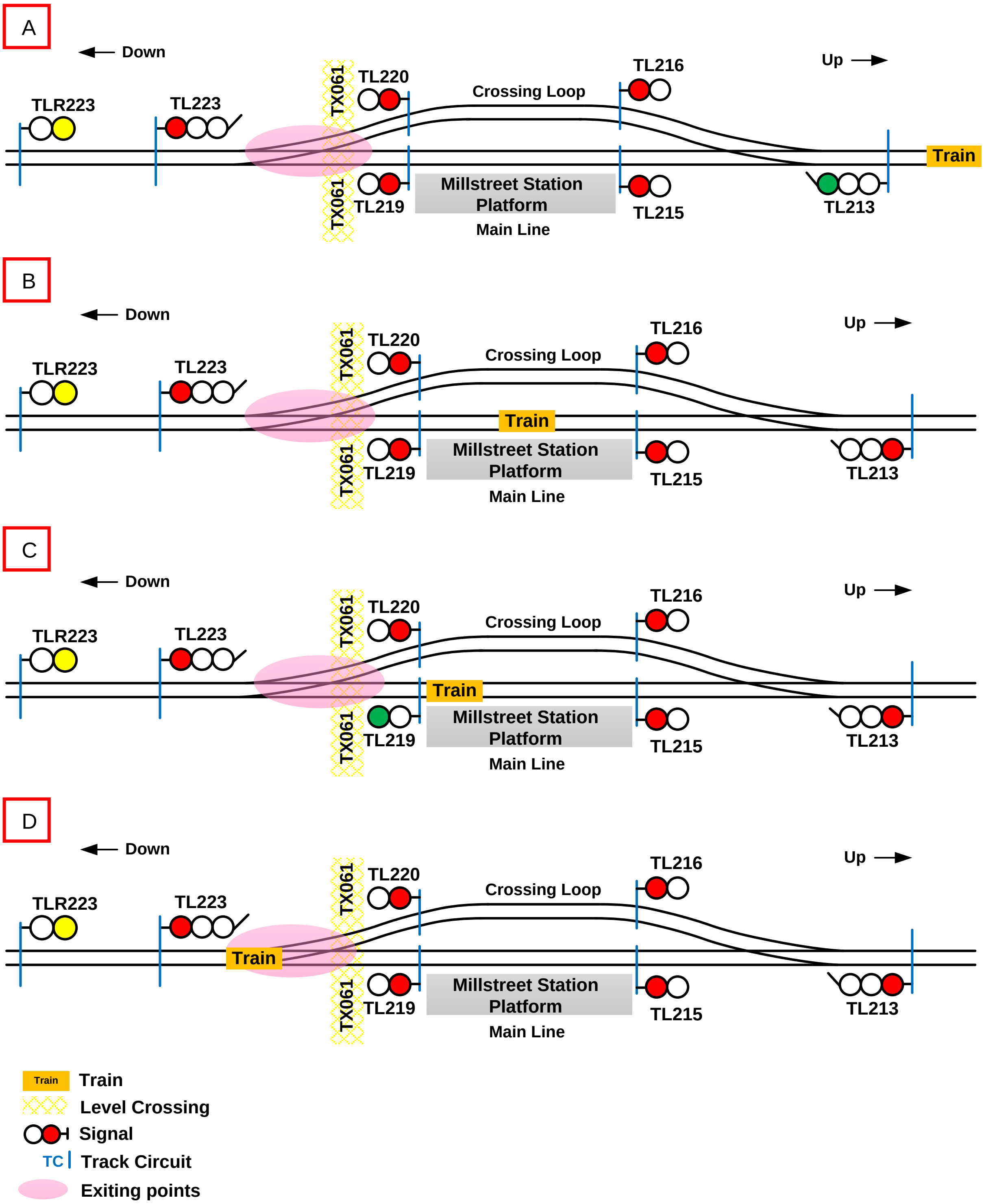


Figure 27 – Signal routing at Millstreet Station

Driver selection, training and competency management

Driver A303 Selection & Training

197 On the 8th February 2011, Driver A303 underwent a psychometric assessment as part of the initial process for selection as a train driver, which includes a concentration test. Driver A303 received a high score in this test, the scoring indicated that he placed a lot of emphasis on completing a task with accuracy, rather than completing it on time. This scoring was given to Driver A303 as feedback and advice given on how to further develop skills in this area during initial training.

198 From the 28th February 2011 until the 22nd July 2011, Driver A303 undertook the driver basic training module. He achieved good exam results, with the training instructors noting that Driver A303 had worked hard. Observations from the initial driving training indicated that Driver A303 reacted proactively to speed restrictions, cautionary and stop signals, and was effective at managing cab distractions.

199 From the 14th August 2011 to the 19th February 2012, Driver A303 undertook his train handling training, which consisted of 339 hrs train handling experience. All feedback from the mentors throughout the training programme was very positive on the overall technique and professionalism of the driver.

200 On the 21st March 2012, Driver A303 qualified as a driver, with the DTE recording a high standard of driving was achieved, with no areas of concern highlighted. The driver was then required to go through the CMS for drivers.

Driver A303 Competency Management

201 In March 2012 Driver A303 commenced a two year PQA period where additional monitoring and assessments are provided, including a full re-assessment every 12 months. In the first few weeks post initial qualifying, the driver obtained thirty day workplace experience over his core route - Cork to Dublin, prior to learning additional routes.

202 In August 2012, Driver A303 while working was involved in an incident which resulted in an individual being fatality injured when the individual put themselves in front of the train (suspected self-harm). Driver A303 was subject to post-occurrence counselling and support, including a DTE accompanying Driver A303 over route on returning to work.

203 In September 2012, Driver A303 attended a one day training workshop for newly qualified drivers focusing on SPAD prevention techniques and human factors. Driver A303, in responding to questions within the task book, correctly indicating that RTC could be used as a control after passing a caution signal.

204 In the twenty months since qualifying as a driver, Driver A303 was subject to, and met, all the requirements set out in the four stage process outlined in OPS-SMS-3.1 (paragraphs 106–114).

205 A review of all the above assessments indicated no areas of concern with Driver A303's competence or the driver's approach in professional driving techniques. None of the assessments appear to record whether the driver was systematically using any form of EPTs.

206 As mentioned previously, the OTDR recorded instances of over speeding when Train A303 was travelling to Tralee (paragraph 170). However, on review of previous assessments of the Driver A303, this was not identified as an area for development. The DTE responsible for the Driver A303, indicated to IÉ management, that if slight over-speeding had been noticed he would have given a verbal warning but this would not have been recorded within the assessment file.

Route Knowledge for Driver A303 (Mallow to Tralee Line)

207 Driver A303 commenced route learning on the Tralee Line on 17th May 2012. He completed route learning on the 7th June, travelling over the route on eighteen occasions. Driver A303 was briefed and assessed on route and SPAD risk but the process does not require the driver to be specifically briefed on the risks associated with passing signals at danger on a single line crossing loop, where the consequences of a SPAD are potentially significant.

208 Driver A303's route knowledge competence over the Tralee line was initially assessed on the 8th June 2012. This included a practical assessment over the route and assessment of underpinning knowledge. Assessment comments by the DTE indicated that the driver obeyed all PSRs and TSRs, maintained line speed and used *defensive driving* techniques when approaching signals displaying a caution aspect. A further practical assessment was conducted over the Tralee route on the 8th July 2013 and a similar standard of competence was established.

209 The rosters at Cork only have seven instances of work within a fifty-three week period. Despite the rosters generally being spread throughout the fifty-three weeks rather than grouped together; there is a chance whereby a driver would only be programmed to go over the route once in a thirteen week period, which could be further extended if a driver went on leave or changeovers duty, if robust controls are not in place.

SBUDs for Driver A303

210 Driver A303 had met the required of OPS-SMS-3.1 and OPS-SMS-3.5 in relation to SBUDs.

Traffic Regulation

Traffic Regulators' Manual

211 The Traffic Regulators' Manual, OPC-SMS-028, Version 1.1 (which will be referred to as OPC-SMS-028 for the remainder of this report), operative since the 25th March 2013, provides work instructions and supporting guidance to Traffic Regulators in the performance of their duties. Part of its scope is to "proactively monitor real time operations with a view to effective service recovery as required". It contains thirty-three instructions related to traffic regulation, such as instructions in the event of emergency situations such as derailments, collision, flooding, SPADs, fires, structural failures and accidents to members of the public.

212 The policy in Section 32, 'Train Regulating' states that "Safe efficient and timely train regulation is a critical element in helping to ensure the delivery of a punctual and reliable service. Managing and ensuring rapid recovery from delays and incidents is a fundamental aspect of train regulation. It is essential that every possible endeavour is made to help ensure that train services arrive at important junctions and regulating points on time". OPC-SMS-028 sets out the performance measurement targets (delay thresholds), as well as setting the three principles for train regulation, which need to be balanced, as follows:

- The available margins derived from the margins table;
- The opportunity to apply positive regulation to allow trains to meet its performance threshold;
- The Traffic Regulator seeking the guidance of the CTC Duty Manager who may direct the priorities for the regulation of the specific trains.

213 Section 32.5, 'Priority in Train Regulations' sets out four requirements in relation to prioritising trains:

- The priority where possible is for all trains to arrive at their destination within their delay threshold. Services which are running late should be given every opportunity to recover, including, where possible, preference over other services which are less late, so that they may arrive at their destinations on time;
- Any train may be held back for a short period at the Traffic Regulators discretion to allow late running, non-stop services to have preference, so that both services have a chance of meeting their targets;
- Traffic Regulators must be aware of specific load factors and any passenger congestion at stations and take account of these factors when making any decision related to train regulation;
- The Duty Manager CTC will issue a 'train regulation statement' to advise the Traffic Regulator as situations arise.

214 There are no other details in OPC-SMS-028 in relation to the specifics in the management of delays e.g. how to manage delays through the alteration of passing points. Nor are there any details in relation to the risks associated with the crossing of trains on single lines.

215 There is no requirement on the Traffic Regulator to carry out any form of dynamic risk assessment in relation to any changes to the normal running of trains.

<u>Adopted methods of working</u>

216 As mentioned above, OPC-SMS-028 does not have any specific details in relation to the alternation of the routing of trains during delays to meet performance measurement targets. However, an informal system has been developed whereby if a train is delayed by twice the section timing, then the crossing point should be changed.

<u>Actions of the Traffic Regulator & CTC Signalman</u>

217 The section times for Banteer Station to Millstreet Station is ten minutes, and the section timing from Millstreet Station to Rathmore Station is seven minutes, see Figure 28.

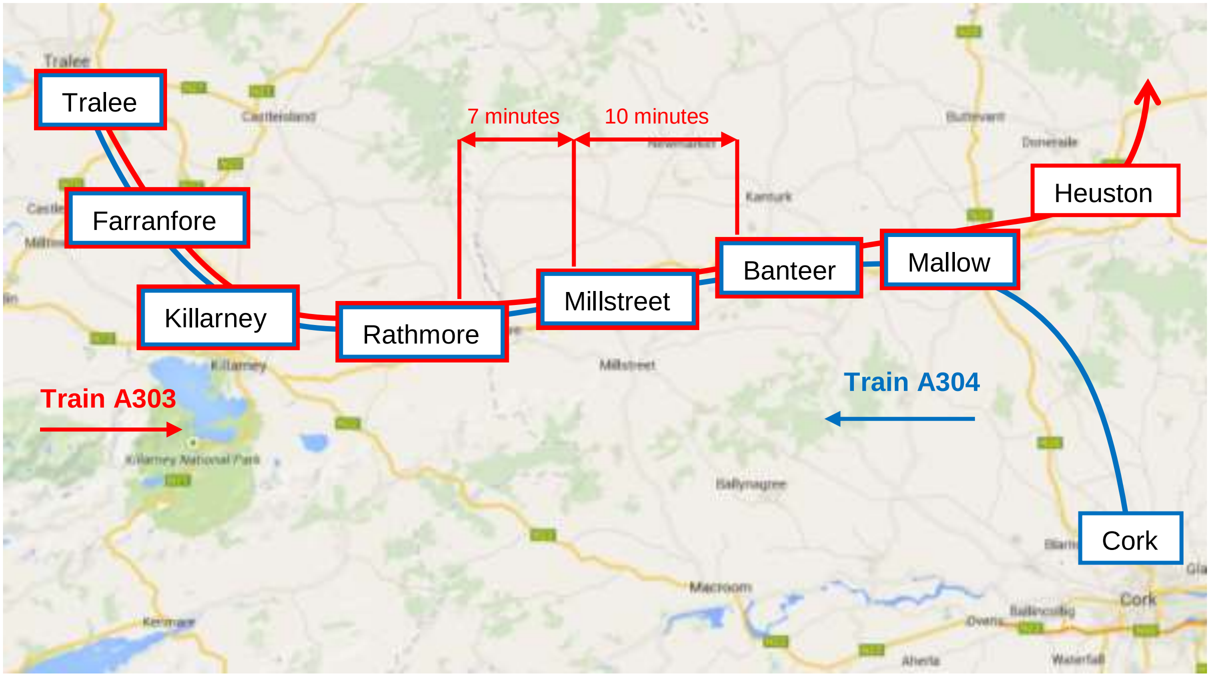


Figure 28 – Section times for Rathmore – Millstreet & Millstreet - Banteer

218 On the day of the incident Train A303 was running eighteen minutes late. With the section time of Rathmore to Millstreet at seven minutes, twice this is fourteen minutes; and with eighteen minutes being greater than fourteen minutes an alternative crossing point should be considered using the above adopted method.

219 As a result, the Traffic Regulator and the CTC Signalman decided not to leave Train A304 waiting in Banteer Station for Train A303. Instead, they decided that they would send and accept Train A304 into Millstreet Station Platform, disembark passengers (Figure 29A) and then shunt the train into the crossing loop (Figure 29B) to wait for Train A303.

220 Train A303 would then be accepted into Millstreet Station Platform (Figure 29C&D), where it would disembarked passengers and continue towards Heuston; and Train A304 would then continue towards Tralee.

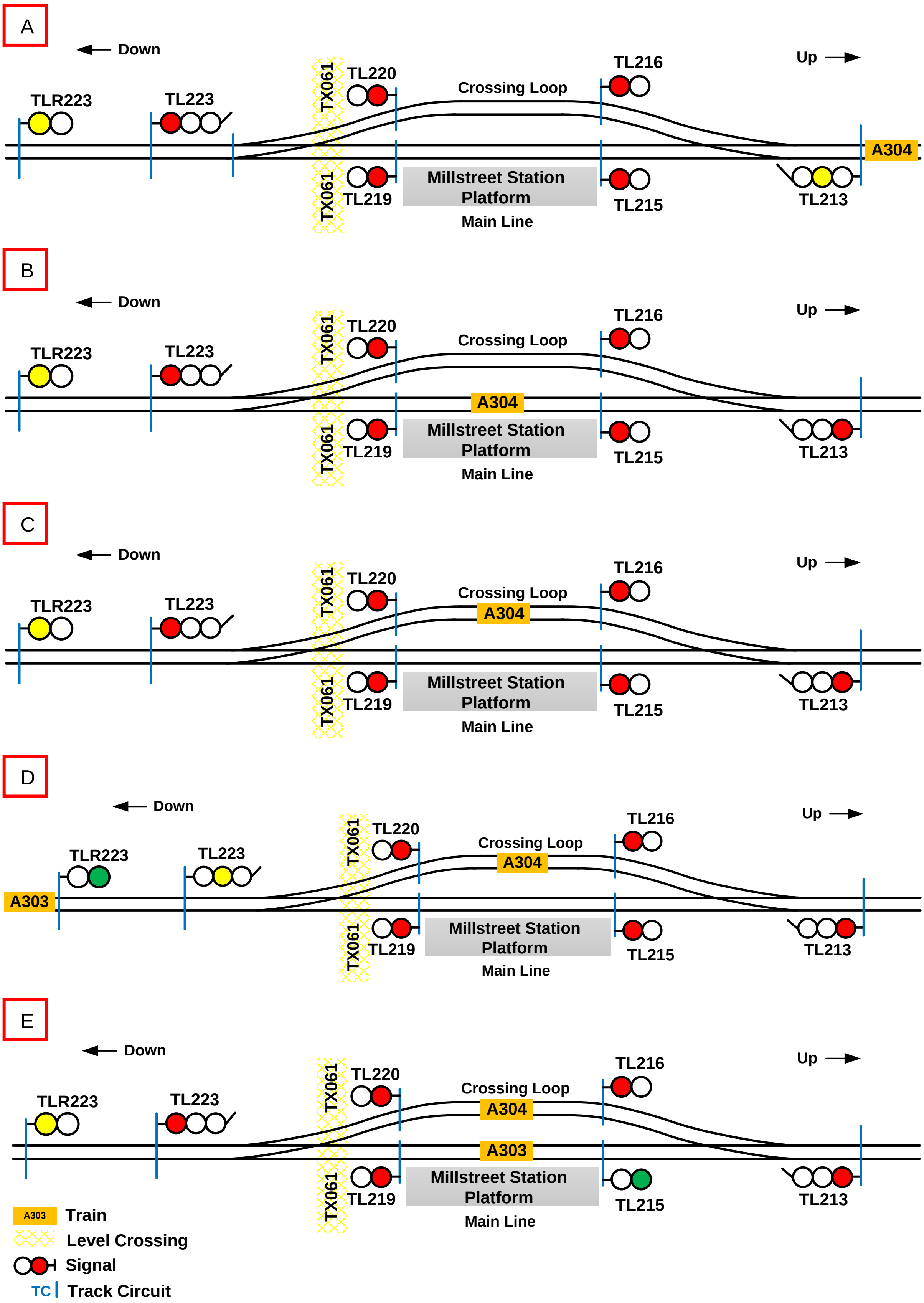


Figure 29 – Traffic Regulator's planned sequence of movements for Train A303 and Train A304

221 IÉ have calculated that this method of working occurs approximately three times a week when trains are delayed and adds about ten to twelve minutes to normal station duties; with potential time savings limited five to nine minutes.

222 IÉ calculated, given the timings on the day of the incident, that the delay to Train A304 would have been reduced if Train A304 had been held at Signal TL213 (see Figure 30 A) the signal protecting the platform; to wait for the arrival of Train A303.

223 On the arrival of Train A303, it would be given the route directly into the crossing loop, while still holding Train A304 at Signal TL213 (see Figure 30 B&C). Once on the crossing loop, Train A304 could be routed onto Millstreet Station Platform and continue towards Tralee; Train A303 could carry out a shunt movement onto Millstreet Station Platform and continue towards Heuston.

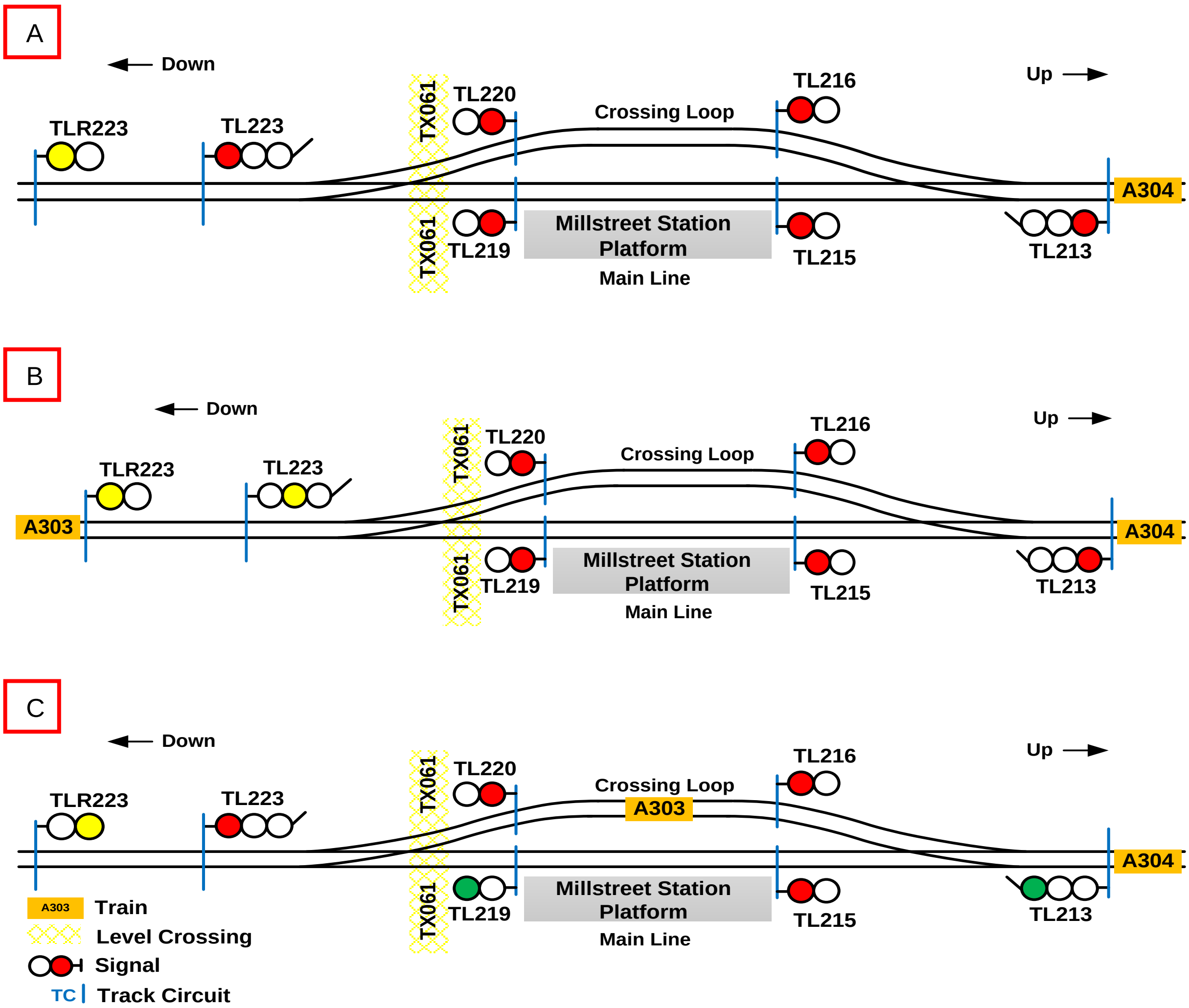


Figure 30 – Alternative sequence

224 However, it should be noted that the CTC Signalman and the Traffic Regulator do not have access to the live timings of trains on the Personal Computer Emergency Control Panel (PCECP) signalled lines, therefore they are limited to observing train movements; in addition, the Train IDs are not displayed on the PCECP screen.

Despatch of Trains – The role of the PIC

225 PICs are provided with a ‘Platform Train Interface & Despatch Procedure Prompt Card’ issued in 2011 (which will be referred to as the Prompt Card for the remainder of the report) which should be used in conjunction with Section H of IÉ’s Rule Book. This Prompt Card sets out the correct procedure for despatching trains, see Figure 31. The role of the PIC in despatching trains will be further discussed in the investigation into the SAS SPAD at Muine Bheag on the 8th April 2013 in Part 6 of this report.


CORRECT DESPATCH PROCEDURE

TO BE USED IN CONJUCTION WITH SECTION H OF THE RULE BOOK

- Position yourself at an optimum point on the Platform and check (where possible) that the starting signal is off.
- When satisfied that boarding is completed and there are no visible hazards give the station work complete signal to the driver.
- The Station work complete signal is one arm raised above the head in daylight or a white light held above the head at night or poor visibility.
- When satisfied that the doors are closed properly and there are no visible hazards give the driver the ready to start signal.
- The ready to start signal is a green flag waved above the head or a green light held steadily during darkness or poor visibility.
- Monitor the train as it departs the platform, look for signs of hazards and do not leave the platform until the whole train has safely departed the platform.

FOCUS ON THE CORRECT PROCEDURE FOR EVERY TRAIN DESPATCH!

Figure 31 – Platform Train Interface & Despatch Procedure Prompt Card

226 Of note to this investigation are the following, as set out above, that the PIC should give the ‘Station Works Complete’ signal only when satisfied that boarding is complete and there are no hazards. Also the PIC should monitor the train as it departs, and not to leave the platform until the whole train has safely departed the station (this is normally through the checking of the tail lights of the train).

Sequence of events

General description

227 This section outlines the key events, leading before, during and after the incident.

Events before the incident

228 Prior to the time of the incident, Driver A303 had:

- Worked seven of the twelve days before the day of the incident;
- Worked the four days immediate prior to the incident, working an early turn of duty (commencing between 04:45 hrs and 05:30 hrs, and finishing between 12:00 hrs and 13:30 hrs); with an average daily driving time of 3 hrs 24 minutes;
- A rest period of 18 hrs and 45 minutes his last turn of duty before signing on duty on the day of the incident (this exceeds the required 12 hrs rest period before duty). Driver A303 stated he was well rested with a good, unbroken night of sleep.

229 On Sunday 8th December, Driver A303 had a journey time of approximately fifteen minutes to work. He booked on duty, on-time, at Kent Station, Cork, at 07:55 hrs on a normal turn of duty. After booking on duty, Driver A303 collected and read his notices, and he went to his train twenty-five minutes before the departure time to ensure all checks were carried out. He then operated the 08:55 hrs passenger service from Cork to Tralee.

230 During this service the OTDR download indicated that Train A303 exceeded the maximum line speed approximately ten times, by speed of up to 11 mph (17.6 km/h); in all instances Driver A303 uses the train brake to bring the train speed back within the permitted speed limits. The IÉ Investigation Report into this incident, Report No. R0401-2014-018, published in March 2014 noted that "The number of speed and gradient changes means that driver route knowledge is important to ensure performance timings are maintained and line speed is not exceeded". The IÉ Investigation Report also indicated that Driver A303 used "a heavy brake application when coming to a stand in some platforms".

231 On arriving at Tralee at 10:50 hrs, Driver A303 took time to have a personal needs break prior to conducting pre-departure checks for Train A303, the 11:50 hrs passenger service from Tralee to Heuston. While in Tralee he was informed that there was an additional driving shift to be covered on the 13:20 hrs passenger service from Mallow to Cork as the scheduled driver had reported unfit for duty earlier in the morning.

232 Driver A303 departed Tralee at approximately 11:50 hrs. He was delayed at the next station, Farranfore Station, as he had to wait for the 08:30 hrs passenger service from Heuston to Tralee

(Train A302) to use the crossing loop (Farranfore, Millstreet and Banteer Stations are the stations with crossing loops on this section of single line). This delay resulted in Train A303 arriving at Killarney Station at 12:26 hrs, five minutes after its scheduled time.

233 When the train was stationary at the platform in Killarney two adults boarded the train with a teenage child, it was not their intention to travel but only to ensure the child was comfortable for the journey. The adults left two other small children (aged approximately 3-4 years old) sitting on a bench behind the station kiosk, away from the despatch area of the platform while they took the teenager on board.

234 The PIC Killarney was unaware of the children waiting out of view and gave Train A303 the 'Platform Works Complete' and 'Ready to Start' signals.

235 As the adults were about to disembark the train the doors closed in front of them and the train started to leave the platform. Both adults made became hysterical and started shouting loudly while banging on the driver's cab door and trying to open it.

236 Driver A303 became immediately aware of the two adults banging on the driver's door, stopped the train, opened the driver's cab door and attempted to communicate with the adults, which was difficult as English was not their main language, however he realised there was a problem regarding young children.

237 Driver A303 looked back towards the platform, but could not see the two children mentioned by the adults. Driver A303 became very stressed by the situation, as he thought the train may have stuck the children on departure, and they may be under the train; this was as a result of the two adults remaining extremely hysterical and appearing to be very distressed. The stress suffered by Driver A303, at this time, was exacerbated by the fact that he had previously been a driver who was in control of a train that struck a person involved in a suspected self-harm incident, where the victim was fatally injured; and he thought that his train may have struck the young children. However, after further communications, Driver A303 began to realise that the children were on the platform, but out of view.

238 Driver A303 then spoke with the CTC Signalman, who authorised to proceed clear of Signal TL240, allowing Driver A303 to change train cab ends to return to Killarney Station. On return to Killarney Station, Driver A303 disembarked the train to open the passenger compartment door for the passengers, who were having difficulty opening the door. Driver A303 calmed the situation with the distressed adults, reuniting them with the two children. Driver A303 asked the PIC Killarney how he did not see the children as he considered this to be the role of the PIC. Driver A303 then updated the CTC Signalman on the events.

239 Driver A303 had to change driving cab ends again and departed Killarney Station at 12:37 hrs, thirteen minutes late. Driver A303 began thinking about whether he needed to write a report on the incident as it was an abnormal occurrence.

240 During this time, the CTC Signalman and Traffic Regulator decided to change the next crossing point from Banteer Station to Millstreet Station. As Millstreet Station was closer to Killarney Station, this would allow Train A304 to continue further into the section, without further delaying Train A303, by having it wait in Banteer Station (as discussed in paragraph 219).

241 The CTC Signalman informed Train Driver A304, by train radio, that the crossing point was changed from Banteer Station to Millstreet Station, and Train A304 departed Banteer Station at 13:57 hrs.

242 Driver A303 was not advised of this change of crossing points and was still expecting to pass Train A304 at Banteer Station, as normal.

243 At Rathmore Station, Driver A303 contacted the Traffic Regulator to inform him that he could not provide additional driving duties for the 13:20 hrs passenger service from Mallow to Tralee as he was running late and would not make it to Mallow on time.

<u>Events during the incident</u>

244 Driver A303 continued to think about the delays, the events at Killarney Station and the additional driving duties. He did not apply any form of EPT to try and refocus on driving duties.

245 At 13:03:57 hrs, Train A304 enters track circuit TC3116 after departing Banteer Station in the down direction, see Figure 32. On entering TC3116, Train A304 initiates the level crossing barriers of XT061 to lower.

246 At approximately 13:11 hrs, Train A303 approaches Signal TLR223 in the up direction at the permitted line speed. Signal TLR223 is displaying a single yellow aspect (this is a cautionary proceed aspect, meaning the driver should be prepared to stop at the next signal, Signal TL223, which is displaying a red aspect). Train A303 was travelling at 68 mph (108 km/h) as it approached Signal TLR223. Signal TLR223 and TL223 are displaying yellow and red aspects, respectively, as Signal TL213 is displaying a yellow aspect, to allow Train A304 proceed into Millstreet Station Platform, see Figure 32.

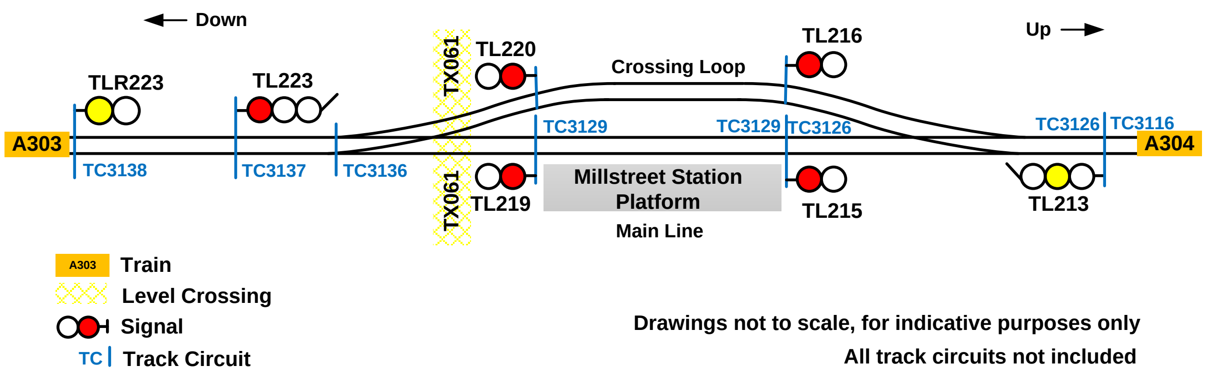


Figure 32 – TLR223 displaying a cautionary aspect & TL213 displaying a cautionary aspect

247 Driver A303 did not have CAWS in cab and did not use any form EPT, such as RTC, to remind himself that the next signal, Signal TL223, would be displaying a red aspect.

248 As Driver A303 approaches the level crossing, he sees that the barriers lowered and also sees the passengers waiting on Millstreet Station Platform, see Figure 33 for a driver's view into Millstreet Station. (Driver A303 assumes the barriers are lowered for his train, however, it was Train A304 who had initiated the lowering of the barriers).

Figure 33 – Driver's view of approach into Millstreet Station

249 At 13:11:30 hrs Train A303, travels past Signal TLR223 displaying a single yellow aspect (cautionary), see Figure 34. An initial brake application is made by Driver A303 with the train reducing to 62 mph (99 km/h).

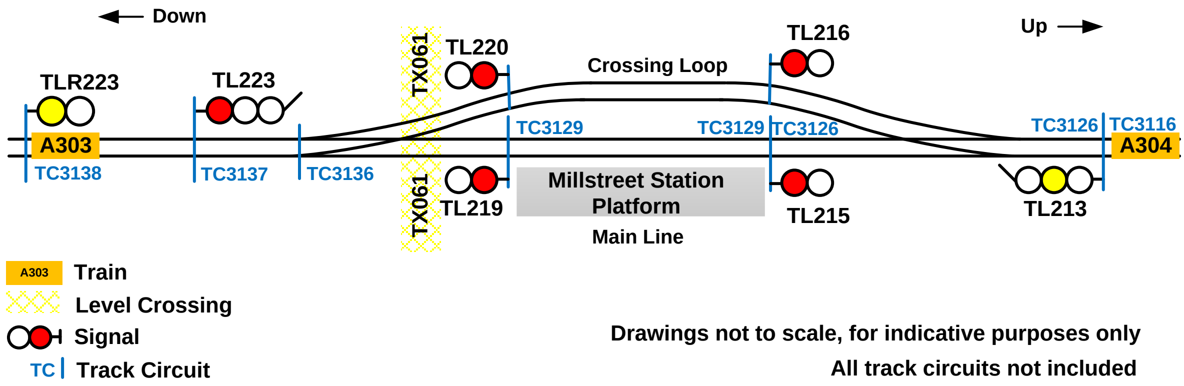


Figure 34 – Train A303 travelling past Signal TLR223 displaying a cautionary aspect

250 Seven seconds later, at 13:12:37 hrs the barriers of Level Crossing XT061 are fully lowered.

251 At the 60 mph (96 km/h) PSR between Signal TLR223 and Signal TL223 Driver A303 reduces the train speed to 47 mph (75 km/h) and further reduced the train speed to 39 mph (62 km/h) as he approaches the TSR of 40 mph (64 km/h) beyond TL223.

252 At 13:12:57 hrs Train A304 passes Signal TL213 displaying a green aspect and enters TC3126, see Figure 35.

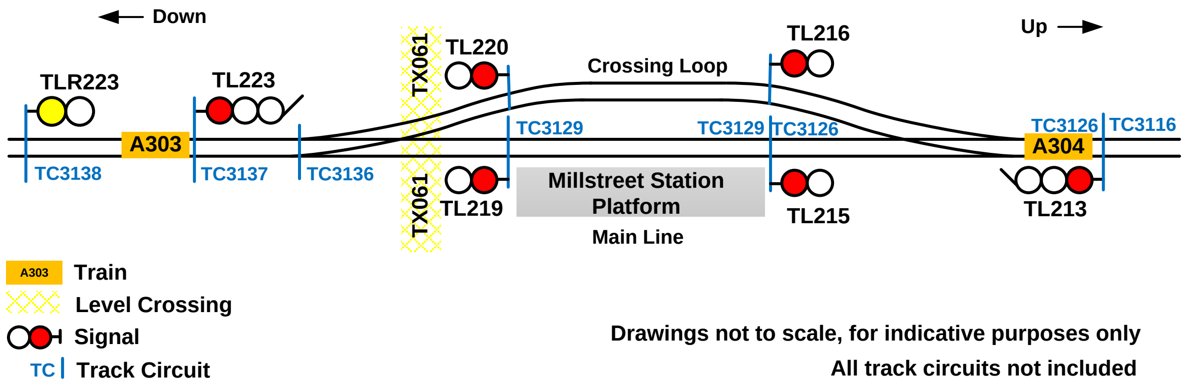


Figure 35 – Train A304 passes Signal TL213

253 Driver A303 applied the brake 12 m before Signal TL223, to adhere to the speed board located behind Signal TL223, see Figure 36.

Figure 36 – Signal TL223 & speed board

254 At 13:14 hrs Train A303 passes Signal TL223 at danger (red aspect); entering TC3137, see Figure 37. Train A303 is travelling at 39 mph (62 km/h) as it passes Signal TL223. Driver A303 reduces the speed to 26 mph (42 km/h) at the platform ramp.

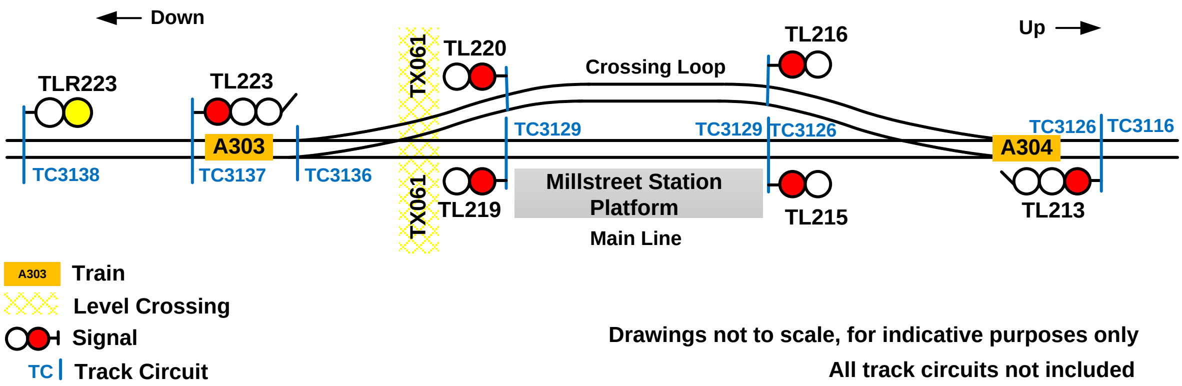


Figure 37 – Train A303 passing Signal TL223 displaying a red (danger) aspect

255 At 13:13:00 hrs, the SPAD alarm activated at CTC for Millstreet Station, and is acknowledged by the CTC Signalman at 13:13:05 hrs. At 13:13:12 hrs the CTC Signalman makes a general call for both trains to stop, However when he initiated the call, he used the instructions "General call to Up Tralee – stop your train immediately!" and "Down train also stop immediately!". As the call is being made Train A303 enters TC3136, see Figure 38.

256 The PIC Millstreet, who was on the Millstreet Station Platform sees both Train A303 and Train A304 approaching the platform and immediately hand signals Train A303 to stop. Driver A303 does not see that the PIC Millstreet is trying to stop the train, but thinks that he is waving him into the platform.

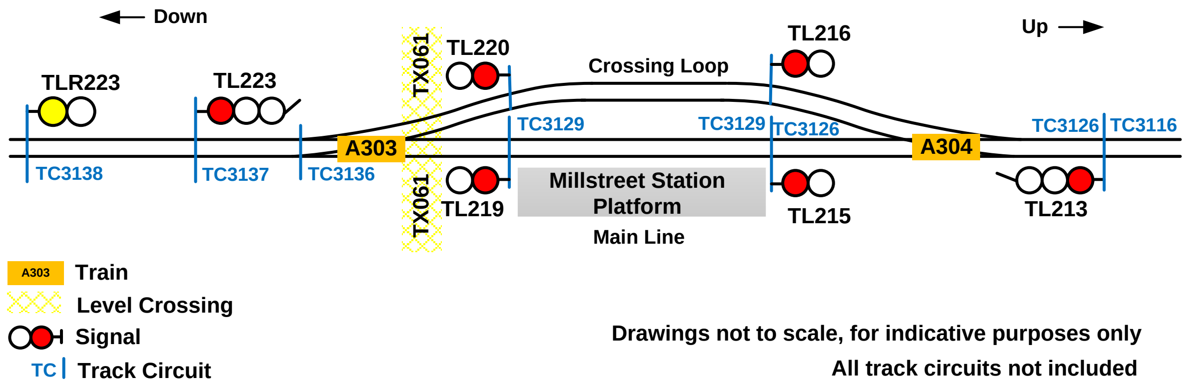


Figure 38 – Train A303 entering TC3136 section

257 Driver A303 and Driver A304 apply the emergency brakes and the trains begin to come to a stop while occupying TC3129. Train A304 comes to a stop three seconds before Train A303. Train A303 and Train A304 are positioned 175 m apart after both coming to a stop on Millstreet Station Platform, see Figure 39.

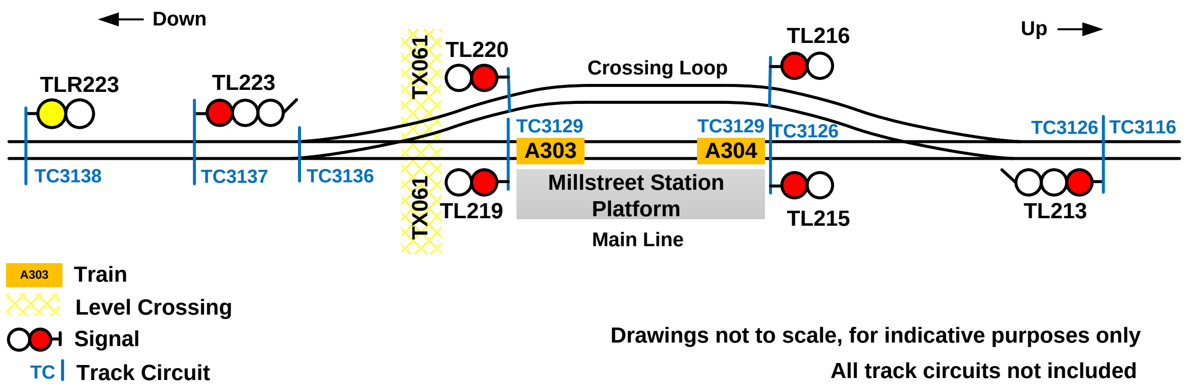


Figure 39 – Train A303 and Train A304 occupying TC3129 on Millstreet Station Platform

258 Driver A303 thinks that Driver A304 passed a signal at danger. He then thinks that he may have seen a yellow signal at TLR223 and realises he must have passed Signal TL223 at danger.

259 See Figure 40 for the diagrammatical summary of events.

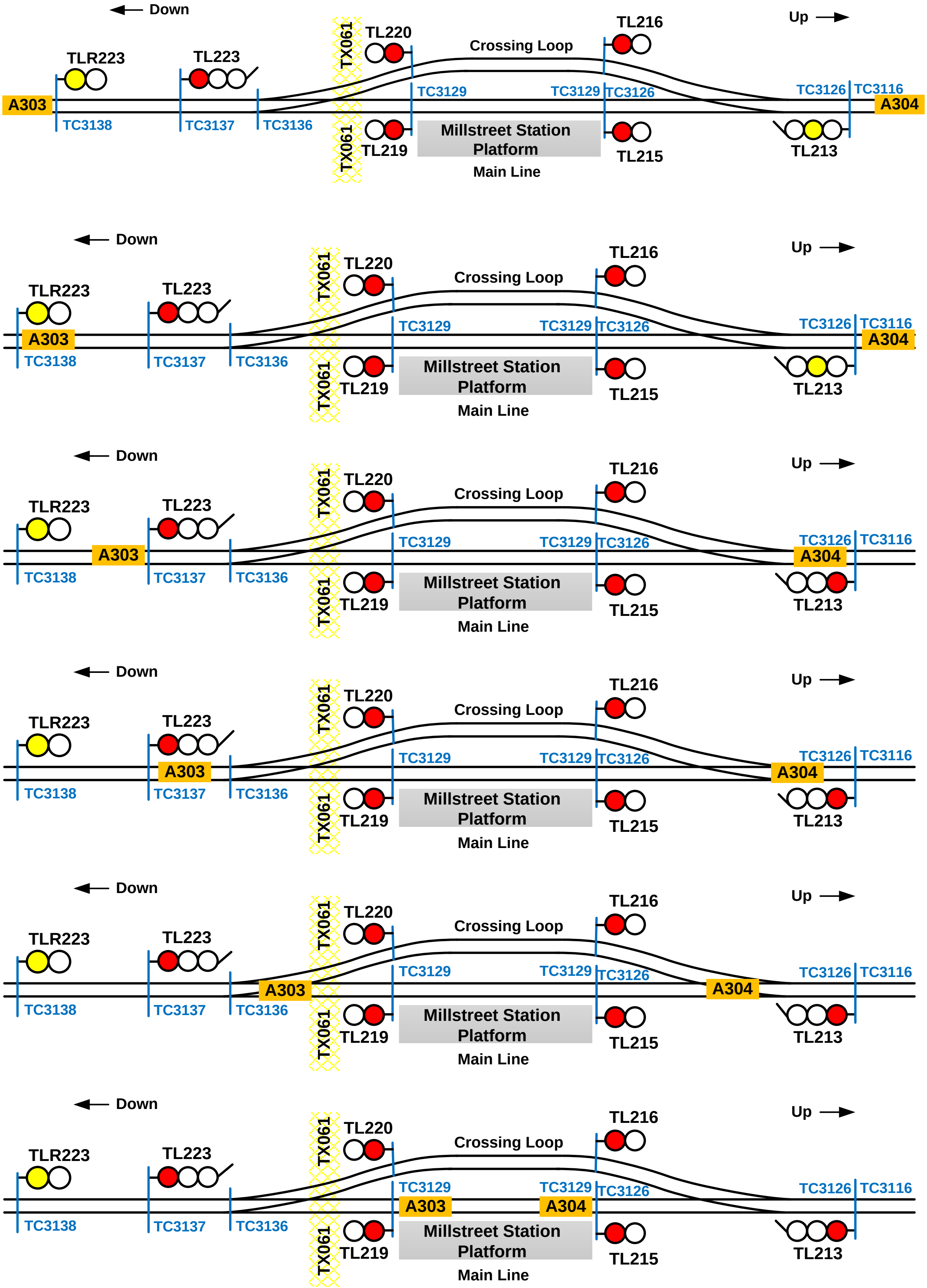


Figure 40 – Sequence of events during the incident

Events after the incident

260 Driver A303 talks to the PIC Millstreet and states that he was focussing on stopping the train at Millstreet Station.

261 After the SPAD the CTC Signalman:

- Switches Level Crossing TX061 to manual to prevent the barriers rising to road traffic;
- Contacts the Traffic Regulator to inform him of the SPAD;
- Contacts Driver A304 to ask whether his train has come to a stop; and informs him that Train A303 has had a SPAD incident, and requests him not to make any movements until requested (the communication is calm and direct but not in line with safety critical communications);
- Contacts Driver A303 to ask whether his train has come to a stop, informs him that he had a SPAD incident, and requests him not to make any movements until requested;
- Completes the appropriate signalman's form for a SPAD incident.

262 The DM Cork talks with Driver A303 to assess his fitness to make further train movements. Driver A303 is assessed to be fit to shunt the train to recover the situation. The DM Cork informed the CTC Signalman of this decision and Driver A303 was requested to make a shunt movement back behind Signal TL223 to clear the platform.

263 This movement allows Train A304 to travel to the normal stopping point on the platform. Train A304 then carries out a shunt movement into the crossing loop. (It is noted from CCTV footage that the PIC Millstreet did not fully monitor Train A304 leaving the platform).

264 Driver A303 then moves Train A303 onto Millstreet Station Platform and is then removed from driving duties in accordance with IE post incident procedures.

265 Driver A303 and Driver A304 were screened for alcohol and drugs with negative results.

266 As a result of the incident, Driver A303 is categorised as a Category B driver, and is assigned to a Driver Development & Support System (DD&SS) for a period of two years.

Similar occurrences

General description

267 In relation to the signal involved in the incident, Signal TL223, IÉ have not recorded any SPADs at this signal, previous to this incident.

268 The incident occurred on a single line, with crossing loops. Of the SPAD incidents reviewed from 2012 – 2014, IÉ have recorded six of these SPADs to have occurred on single lines with crossing loops (or areas with similar risk), these SPADs will be discussed in the relevant sections of the report. The relevant SPADs are as follows:

- SPAD at Signal WL131, Athy/Cherryville Junction, on the 12th March 2013;
- SAS SPAD at Signal SL719, Killucan, on the 21st June 2013;
- SOY SPAD at Signal GL353, Athenry, on the 10th July 2013;
- SAS SPAD at Signal TL241, Killarney, on the 10th August 2013;
- SAS SPAD at Signal TL226, Rathmore, on the 26th February 2014;
- SOY SPAD at Signal CE482, Glounthaune, on the 29th July 2014 (converging junction).

269 SPADs similar to the SPAD at Millstreet, including those identified above, include SPADs which occurred while the train was operating under normal train operations (driving or shunting). These SPADs, from January 2012 to June 2015, include:

- SPAD at Signal XE010DS, Longpavement Level Crossing (Limerick), 9th April 2012;
- SPAD at Signal XE061, Curravorrin Level Crossing, 2nd October 2012;
- SPAD at Signal GL336, Caherryon Level Crossing, 26th October 2012;
- SPAD at Signal HK152, Hazelhatch (Kildare), 15th February 2013;
- SPAD at Signal WL131, Athy/Cherryville Junction (Kildare), 12th March 2013;
- SPAD at Signal DD276, Dundalk (Louth), 9th May 2013;
- SPAD at Signal CY26, Connolly (Dublin), 3rd April 2014;
- SPAD at Signal CY33, Connolly (Dublin), 11th September 2014;
- SPAD at Signal PE34, Pearse (Dublin), 18th January 2015;
- SPAD at Signal GL391, Galway, 30th January 2015;
- SPAD at Signal PE18, Pearse (Dublin), 11th March 2015;
- SPAD at Signal CL102, Clonsilla (Dublin), 15th May 2015.

270 These SPADs will be described in detail in 'Part 8 – A Review of All Category A SPADs (January 2012 to June 2015)' of this report.

IÉ Investigation Report

271 IÉ engaged a consultant to carry out an investigation into the SPAD at Millstreet entitled 'A Report of Investigation into Train A303 passing Signal TL223 at Millstreet at Danger without authority 8th December 2013' (Report 0401-2014-18), published in March 2014. The report identified the immediate cause as Driver A303 "failed to locate and check the signal on approach".

272 The report identified the causal factors to Signal TL223 being passed at danger as: Driver A303 never stopping at Signal TL223 previous to the day of the incident; a lapse of concentration by Driver A303; the lack of EPTs applied by Driver A303; Driver A303's competency; the consequences of SPADs not being identified in the route risk assessment. The report further identified causal factors associated with the near-miss of Train A303 and Train A304 as: the control measures in place at the time associated with overrun protection; the robustness of calculating risks during the introduction of new signalling schemes (in reference to the signalling upgrade project in 2004).

273 The report identified underlying causes as: inadequate procedures for managing route knowledge and driver's EPTs; the lack of overrun protection and operational controls to manage the risk of SPADs.

274 The report made a number of additional observations, identified actions taken since the incident, and made twelve recommendations related to the incident and additional observations. The recommendations related to the incident, included recommendations related to route risk assessments, assessment, monitoring and competence managements of drivers in terms of non-technical skills, application of EPTs for drivers.

275 There are a few statements of note included in the report, which will be discussed in Part 9 of this report, where the RAIU reviewed the quality of the IÉ reports and their management of SPADs:

- "Following the SPAD, when the driver makes a shunt movement back behind TL223, the stopping of the train past the signal is a significant distance. Either the driver was not sure of the location of the signal or has difficulty judging the length of a 4 coach train[4]";
- "The investigation panel therefore consider that the driver's competence and confidence in route knowledge over the Tralee route is also a factor in the SPAD occurring[5]".

[4] This is discussed in 'Part 9 – SPAD Management' (paragraph 895) where the RAIU find that the driver was aware of the location of the signal and did not have difficulty in judging the length of the train.

Analysis

Signalling system

Signals TLR223 and TL223

276 The signalling system was in working order at the time of the incident; and it was confirmed, by forward facing CCTV on board Train A303, that Signal TLR223 was displaying a yellow aspect as Train A303 approached and Signal TL223 was displaying a red aspect (paragraph 192).

277 As Train A303 passed Signal TL223 at danger, SPAD activation alarm in CTC operated as designed, alerting the CTC Signalman to the SPAD (paragraph 254).

278 Both Signal TLR223 and Signal TL223 met the sighting requirements set out in I-SIG-2043 (paragraphs 190 - 192). However, it is noted, although I-SIG-2043 addresses PSR boards ahead of signals, it does not appear to address TSR boards or distractions positioned directly behind signals. As a result, it appears that the positioning of a speed board placed behind Signal TL223 is not regarded as a risk, in terms of I-SIG-2043, this will be further discussed in Part 12 of this report.

Train protection

279 The Tralee Line was upgraded in 2004 and 2005, however, the upgrading did not include the introduction of enhanced overrun protection. The risk assessment carried out by IÉ at the time of the upgrade works, identified “no change in perceived risk” by replacing like for like and as a result basic overrun protection remained on the Tralee Line (paragraph 179).

280 Had enhanced overrun protection been in place at the time of the incident, such as ATP, the driver would have been alerted that the speed of Train A303 was not consistent with stopping at Signal TL223; and had Driver A303 not reacted to this alert the ATP system would have made a brake application (paragraph 40).

281 Also of note in the instance of setting the routes at Millstreet Station Platform is that there is a signal overlap where the points for the crossing loop are set to allow trains to overrun the signal, without approaching conflicting points, which is to avoid the derailment of the train where trains overrun the signal. This in turn allows a train approaching from the opposite direction to also

[5] This is discussed in ‘Part 9 – SPAD Management’ (paragraph 896) where the RAIU query this statement, given that the driver was permitted to drive trains in the area within twelve days of this ‘serious incident’.

travel onto Millstreet Station Platform, as happened on the day of the SPAD which results in the potential for a head-on collision (paragraph 194).

282 There were six other SPADs which occurred between 2012 and 2015 on single lines with crossing loops (paragraph 268). These SPADs have a higher risk of collision where trains travel into the same section of track.

Driver selection, training and competency management

General overview

283 IÉ have a large suite of documents in relation to driver, selection, training, competency management, development and support systems such as OPS-SMS-3.0. OPS-SMS-3.1, OPS-SMS-3.2, OPS-SMS-3.3, OPS-SMS-3.5, Competence Standards and the Professional Driving Handbook (Part 3 – Driver Training & Competency Management). These documents are complete and appear to be effective at training and maintaining the basic competencies of drivers in relation to basic driving techniques.

284 As mentioned above, the driver training and competency management systems appear to be thorough at measuring basic competencies associated with the basic driving techniques and there appears to be adequate monitoring of these driving techniques through the use of FDAs, OTDR downloads and SUMs. In addition, INTs and safety critical communication assessments are carried out and refreshers are undertaken in the form of SBUDs, these SBUDs are updated regularly to address different risks to drivers, such as SPADs (Part 3 – Driver Training & Competency Management). All drivers met all the requirements in terms of the training and competency assessments.

285 Although EPTs are included in the suite of documents (paragraph 139), there appears to be no system for monitoring the non-technical skills of train drivers such as EPTs for: managing distraction and refocusing; situational awareness; or RTC.

286 As a result, these non-technical skills seem to be suggested techniques rather than mandatory techniques, and as a result drivers could potentially ‘opt-out’ of using these techniques, resulting in drivers not using any EPTs; as there is no requirements to carry out any form of EPT, drivers are not assessed to use these EPTs.

Training and competency management of Driver A303

287 In relation to the driving and competency management undertaken by Driver A303, the driver consistently achieved good results in the basic training module, train handling training and route knowledge, with the DTE noting that good defensive driving techniques were being used when approaching signals at caution (paragraphs 197 - 210).

288 Driver A303 received all the required monitoring, summary assessments and re-certifications. In total, in the twenty months since qualifying as a driver to the day of the incident, Driver A303 was subject to seven driving assessments, four OTDR downloads, three safety critical communication assessments and four post qualifying interviews and attended SBUDs (including one on SPADs and EPTs) (paragraph 203).

289 In relation to the prevention of SPADs, Driver A303 had undergone the normal training as set out in the suite of documents. No areas of concern being identified with Driver A303 However, Driver A303 did not use any form of EPTs as part of his normal driving duties and did not apply them on the day of the incident (paragraph 243). Reviews of Driver A303's assessments do not appear to record whether Driver A303 was systematically using EPTs (paragraph 205).

290 On the day of the SPAD there were approximately ten instances of over-speeding (paragraph 229), by speeds up to 11 mph (17.6 km/h), these instances of speeding were for short periods of time and are likely as a result of the number of speed and gradient changes. It should be noted that there is no record of over-speeding in Driver A303's file (paragraph 206), and the DTE responsible for Driver A303 indicated that over-speeding is managed through verbal warnings (paragraph 206) it is therefore unknown whether there was a systemic issue with Driver A303's driving technique.

291 Also of note in the driver's history, related to additional monitoring, is that he was involved in a fatal incident (suspected self-harm) where an individual was struck by a train; which resulted in post-occurrence counselling and support, including a DTE accompanying the driver over route on returning to work (paragraph 202). The management of these incidents is discussed in more detail in Part 10 of this report.

Driver A303 actions on the day of the incident

292 Driver A303 commenced duty at Cork Station at 07:55 hrs which is a normal turn of duty; he had over eighteen hours rest since his previous duty. He commenced driving on a Sunday timetable which has different timings than the normal weekday timetable, this was the first time he had worked a Sunday on this route (paragraphs 228 and 229).

293 During the 08:55 hrs passenger service from Cork to Tralee there were approximately ten instances of over-speeding, by speeds up to 11 mph (17.6 km/h), however, in each instance the train brakes were applied to bring the train speed within the permitted speed limits (paragraph 229), this instances of over-speeding are likely the result of the number of changes to speeds and gradients on the route.

294 During the 11:50 hrs service from Tralee to Heuston, there were a number of incidents of note:

- Driver A303 was informed at Tralee that he was required to carry out an additional driving shift for the 13:20 hrs passenger service from Mallow to Tralee (paragraph 231);
- Driver was delayed at Farranfore Station, the next station after Tralee by approximately five minutes (paragraph 232) as he had to wait for a train to pass.
- At the next station, Killarney Station, there was an incident whereby the train departed with two adults who were not passengers, and had left two young children on the platform. This resulted in Driver A303 having to stop the train, engage with the adults, return to Killarney Station and reunite the adults with their children (paragraph 233 - 239). Driver A303 became very stressed as a result of the incident as it reminded him of a fatal self-harm incident which he had experienced in 2012, and he became further distracted by this incident as he was unsure whether he should report it as an unusual occurrence (paragraph 239);
- At the next station, Rathmore Station, Driver A303 contacted the Traffic Regulator to inform him that he would not be able to provide additional driving duties for the 13:20 hrs passenger service from Mallow to Tralee (paragraph 243).

295 All the above events were in the thoughts of Driver A303 as he approached Signal TL223. In addition, on the approach to TL223, Driver A303 may have been further distracted by the flashing lights of the level crossing (paragraph 248) and by the speed board located behind the signal (paragraph 253).

296 The factors identified in the paragraphs above resulted in Driver A303 being distracted, preoccupied and losing situational awareness; and as a result of Driver A303 not applying any form of EPT he was unable to refocus on the primary task of driving (paragraph 244 and 247).

297 As a result of the loss of situation awareness, Driver A303 had an incorrect expectation[6] that Signal TL223 was displaying a proceed aspect as:

[6] A driver may sometimes have such high expectations of what a signal may be that he may fail to look at. If this inference is incorrect an erroneous response may be made and he may in fact unconsciously pass through a red light or not see it until it is too late. False expectations usually arise from past experience driving on that line.

- Driver A303 had always received a proceed aspect for Signal TL223;
- Driver A303 was not aware that the crossing point had changed to Millstreet Station;
- The barriers of Level Crossing XE061 were lowered, which he assumed were lowered for him (they were actually initiated by Train A304);
- There were passengers on the platform, which was normal on his approach to the station.

298 The brake application details taken from the OTDR download on the approach to Millstreet Station are consistent with a train preparing to stop at a station, as Driver A303 makes a brake application on:

- Passing TLR223, reducing the speed to 62 mph (99 km/h) – this is consistent with Driver A303 observing a cautionary aspect at Signal TLR223 (paragraph 249);
- Approaching the 60 mph (96 km/h) PSR between TLR223 and TL223 Train A303 is now travelling at 47 mph (75 km/h), 13 mph (21 km/h) under the PSR requirement (paragraph 251);
- Approaching Signal TL223 (paragraph 253). Train A303 was travelling at 39 mph (62 km/h) when Signal TL223 came into view 370 m ahead of Signal TL223 (paragraph 248);
- Twelve metres ahead of Signal TL223 to maintain the train speed at 39 mph (due to the falling gradient), paragraph 253. This would be consistent with Driver A303 maintaining the speed of the train at the PSR of 40 mph (64 km/h) which is just beyond Signal TL223;
- Passing Signal TL223 (between 148 – 328 m past Signal TL223) to reduce speed at the platform ramp, in preparation for stopping on the platform (paragraph 253);
- Receiving the general call from the CTC Signalman, whereby Driver A303 applies the emergency brake.

299 In addition, Driver A303, after stopping the train thinks that Train A304 passed a signal at danger; and tells the PIC Millstreet that he was focussing on stopping at the Millstreet Station (paragraph 260).

Regulating Trains – Actions of the Traffic Regulator & CTC Signalman

<u>General overview</u>

300 The Traffic Regulators Manual provides guidance on train regulation however it is not specific in how to manage delays and possible risks on crossing trains on single lines. In addition, there are no requirements on the Traffic Regulator to perform any form of risk assessment prior to alternating the routes of trains (paragraphs 211, 214 and 215).

301 In the place of specific requirements for the movement of trains, an informal approach has been adopted in relation to the movement of crossing points i.e. where the time delay is twice the section time, the movement of crossing points should be considered (paragraph 217).

Changing of the crossing point

302 As a result of this informal approach, the Traffic Regulator and the CTC Signalman made the decision to change the crossing point for Train A303 and Train A304, which would result in no further delays to Train A304 (paragraph 219).

303 Given the events on the day of the incident, Train A303 and Train A304 arrived at Millstreet Station at the same time (albeit as a result of the SPAD). And as Train A303 was running late and Train A304 was running on time, priority should have been given to Train A303 as set out in OPC-SMS-028 which states "the priority where possible is for all trains to arrive at their destination within their delay threshold. Services which are running late should be given every opportunity to recover, including, where possible, preference over other services which are less late, so that they may arrive at their destinations on time. Any train may be held back for a short period at the Traffic Regulators discretion to allow late running, non-stop services to have preference, so that both services have a chance of meeting their targets". This would result in allowing Train A303 onto Millstreet Station Platform ahead of Train A304, contrary to the CTC Signalman and Traffic Regulator's plan (paragraph 213).

304 In addition, the manoeuvre planned by the Traffic Regulator and the CTC Signalman provided limited time savings (paragraph 221) and the above outlined method would provide better time savings and better overrun protection (paragraph 222). Although it is noted that the Traffic Regulator and the CTC Signalman do not have access to the live timings of trains (paragraph 224) and therefore both operation under 'real-time' conditions, and required to make a number of 'real-time' decisions promptly to maintain a good service.

305 From a dynamic risk perspective, the training and competence management of signallers and traffic regulators does not provide specific training of the potential risks associated with train movements at crossing points on single line. From a signalling principle and interlocking perspective, under 'normal operation' of signalling, it has to be assumed that the protection and interlocking design provides sufficient protection to ensure the risks are reduced to as low as reasonably practicable (ALARP). Effectively meaning the CTC Signalman and Traffic Regulator, in this instance, are relying on the system to control any risks which they may introduce by changing the crossing point.

Advising the drivers of changes to scheduled working

306 When the Traffic Regulator and CTC Signalman changed the crossing point to Millstreet Station, Driver A304 was advised of the change as a result of having to explain he was not waiting at Banteer for Train A303. However, Driver A303 was not advised of the change. Had Driver A303 been advised of the change, this may have raised the driver's awareness to the potential of being stopped at Millstreet Station and may have taken different actions on the day. However, there is no requirement to inform the drivers of these changes and the train drivers are required to obey the signals.

Stopping the trains - Actions of the CTC Signalman

307 The communications of the CTC Signalman were calm and direct (paragraph 255), where he made a general call to both drivers to immediately stop the trains; and the drivers immediately applied the brakes. However, it was noted, that some of the communications were not in line with safety critical communication requirements, e.g. he identified the trains as up and down trains instead of using the required ID numbers (paragraph 255).

Platform duties - Actions of the PICs at Killarney and Millstreet

General description

308 The role of the PIC will be discussed further in Part 7 & Part 8 of this report, in relation to the investigation of a SPAD on the 9th April 2013, at Muine Bheag.

309 This section of the report will discuss the actions of the PIC at Killarney and the PIC at Millstreet in relation to the day of the incident.

Actions of the PIC Killarney

310 The PIC Killarney gave the 'Platform Works Complete' and the 'Ready to Start' signals while there were unattended children on the platform. However, there were still hazards on the platform (the presence of unattended young children – paragraph 237) which is not in line with the Prompt Card (Figure 31).

311 In addition, on arrival back to Killarney Station, it was Driver A303 who assisted the two adults in being reunited with the two young children; this resulted in Driver A303 being completely removed from the driving task for a period of time (paragraphs 233 - 237).

Actions of the PIC Millstreet

312 It is noted that the PIC Millstreet made efforts to stop Train A303 when he saw that the two trains were arriving on the same platform. However, he did not adequately monitor Train A304 after the SPAD as he left the platform while the whole train had not departed the station (paragraph 263), this is not in line with the Prompt Card (Figure 31).

Conclusions

Immediate cause, contributory factors, underlying causes and root causes

Immediate cause

313 The immediate cause of the SPAD was that Driver A303 did not see that Signal TL223 was displaying a stop aspect and continued driving towards Millstreet Station as if Signal TL223 was displaying a proceed aspect.

Contributory factors

314 Possible contributory factors to Train A303 arriving at Millstreet Station Platform were:

- CF-01 – The current basic overrun protection in the Millstreet area does not provide sufficient protection to trains on single lines with crossings loops;
- CF-02 – Driver A303 lost situational awareness, as he thought Signal TL223 was displaying a green aspect.
- CF-03 – Driver A303 had an incorrect expectation that Signal TL223 would be displaying a green aspect as he had never approached the signal displaying a red light; this incorrect expectation was reinforced by the fact that the barriers for Level Crossing XE061 were lowered on his approach and there were passengers waiting on the platform; and he was unaware that the crossing point for the trains had changed;
- CF-04 – Driver A303 did not apply any form of EPT on the approach to the yellow aspect of Signal TLR223 to remind him that Signal TL223 would be displaying a red aspect;
- CF-05 – Driver A303 did not apply any EPT to refocus on his driving duties after he had become stressed, distracted and preoccupied by the events at Killarney Station, where two young children were left unattended, which resulted in Driver A303 having to return to the station. Driver A303 had also become distracted by the fact that he was unable to provide relief duties for another service, due to the late running of the train. Driver A303 may have also become distracted by the speed board, located directly after Signal TL223; and the flashing lights of Level Crossing XE061;
- CF-06 – The CTC Signalman and the Traffic Regulator were unaware that they had inadvertently reduced the overrun protection for the trains, as they allowed Train A304 onto the platform instead of holding it outside the station.

Underlying causes

315 Underlying causes associated with the incident, include:

- UC-01 – The Traffic Regulator's Manual does not include specific instructions or any form of dynamic risk assessment in relation to the alteration of the scheduled movements of trains;
- UC-02 – IÉ's Lineside Signal Sighting & Spacing Signalling Standard (I-SIG-2043) does not adequately address the risks associated with distraction features in the vicinity of signals, in particular, the positioning of speed boards in the vicinity of signals.

Root causes

316 Root causes associated with the incident, include:

- RC-01 – Non-technical skills, such as EPT, are not adequately promoted, trained, assessed or monitored during driving training and driver competency management as outlined in IÉ-RU's suite of Operations SMS documents (namely OPS-SMS-3.0, OPS-SMS-3.1, OPS-SMS-3.2 & OPS-SMS-3.5).

Additional observations

317 The RAIU have made a number of additional observations related to actions after the incident, these include:

- AO-01 – There were a number of instances of Driver A303 over-speeding, indicating it may be a systematic issue for the driver, however, there are no previous instances of over-speeding recorded in Driver's A303 competency management file, indicating, that these may not be formally recorded by IÉ's driver competency management staff;
- AO-02 – Driver A303 was permitted to carry out train movements after the occurrence of a 'very serious' SPAD incident, before being relieved from driving duties (the permission to drive after SPAD events will be discussed further in Part 10 of this report);
- AO-03 – The PIC Killarney and PIC Millstreet did not carry out their duties in full as set out in the train despatch procedures (the role of the PIC will be discussed in more detail in Part 7 of this report – in relation to the SPAD at Muine Bheag on the 9th April 2013).

PART 6 – SPAD at Gortavogher, 19th December 2013

Introduction

318 This part of the report will investigate the SPAD at Gortavogher, 19th December 2013. Category A SPAD events similar to the SPAD at Gortavogher, such as SPADs under degraded train operations, will be discussed in ‘Part 8 – A Review of All Category A SPADs (January 2012 – June 2015)’ of this report. This part will outline the evidence found as part of the investigation, the analysis of this evidence, and the conclusions found as part of the investigation. Any additional observations made as part of this investigation will be outlined in ‘Part 11 – Additional Observations’. Actions taken, by IÉ, as a result of the SPAD at Gortavogher and similar occurrences will be outlined in ‘Part 13 – Relevant Actions Taken or In Progress’. RAIU safety recommendations, related to this incident and similar occurrences; or related to additional observations, are made in ‘Part 14 – Safety Recommendations’ of this report.

The incident

Summary of the incident

319 At approximately 04:45 hrs on the 19th December 2013 faults were detected at Mallow LCCC for three Closed Circuit Television (CCTV) level crossings in Chipfield (County Clare), Gortavogher (County Clare) and Kiltartan (County Galway). These faults were as a result of a lightning strikes in the area causing power outages, which in turn resulted in Mallow LCCC not having CCTV images or all the information on the status of the signalling associated with two of these CCTV level crossings (the status of the signalling in the down direction of Chipfield CCTV Level Crossing was operable). This effectively meant that Mallow LCCC did not have full control of the three CCTV level crossings. In addition, faults were recorded on the train radio systems in some areas, with three radio bases going offline.

320 The LCCO informed the Galway Line Signalman (GLS) of the degraded conditions, but did not tell the GLS not to allow trains into the section. The LCCO and GLS then made arrangement for Emergency Operators (EOs) to be despatched to the three level crossings.

321 The driver (Driver A780) of the 05:55 hrs passenger service from Limerick to Galway (Train A780) was informed, by the GLS, that there would be EOs present at the CCTV level crossings due to faults at the level crossings. The GLS then signalled Train A780 into the section of track with the degraded level crossings.

322 When Driver A780 approached stop signal for the first faulty level crossing at Chipfield, XE071, the signal was displaying a red aspect. Driver A780 contacted the GLS and was told that the EO (EO XE071) was on site and the signals would upgrade shortly. When the barriers were lowered the signals cleared to green and Train A780 travelled through the level crossing without incident.

323 The EO at Level Crossing XE098 (EO098) was in the process of taking manual control of Level Crossing XE098, see Figure 41.

Figure 41 – EO XE098 at Level Crossing XE098

324 Driver A780 assumed that a similar situation would occur at next level crossing at Gortavogher (Level Crossing XE098). However, Signals XE098DD and XE098DS were not displaying any aspect and Train A780 passed Signal XE098DD without seeing the signal and only became aware of the situation when he saw the reflection of the Signal XE098DS and saw the lights of the Level Crossing XE098, However, it was too late to stop the train.

325 Train A780 did not stop and continued over Level Crossing XE098, without authority, with the barriers raised, see Figure 42. There was no road traffic at the Level Crossing XE098 at the time of the incident and as a result there were no fatalities or injuries.

326 The SPAD was assigned an SRR of 18 by IE.

Figure 42 – Train travelling through Level Crossing XE098 with the barriers raised

327 At the LCCC the LCCO saw Train A780 travel through Level Crossing XE098 with the barriers raised and contacted the GLS. EO XE098 also contacted the LCCO.

328 Driver A780 or the GLS could not make contact with each other as the radios were not in operation as a result of lightning strikes. Driver A780 made the decision to continue driving, as a result Train A780 travelled a further 11 km before coming to a stop at the next signal which was displaying a red aspect at Gort Station and phoned the GLS from the lineside signal telephone, in accordance with the rules.

General description of the railway

Infrastructure

329 The line involved in the incident is the Limerick to Athenry line, see Figure 43. It is a single track which is worked *bi-directionally*.

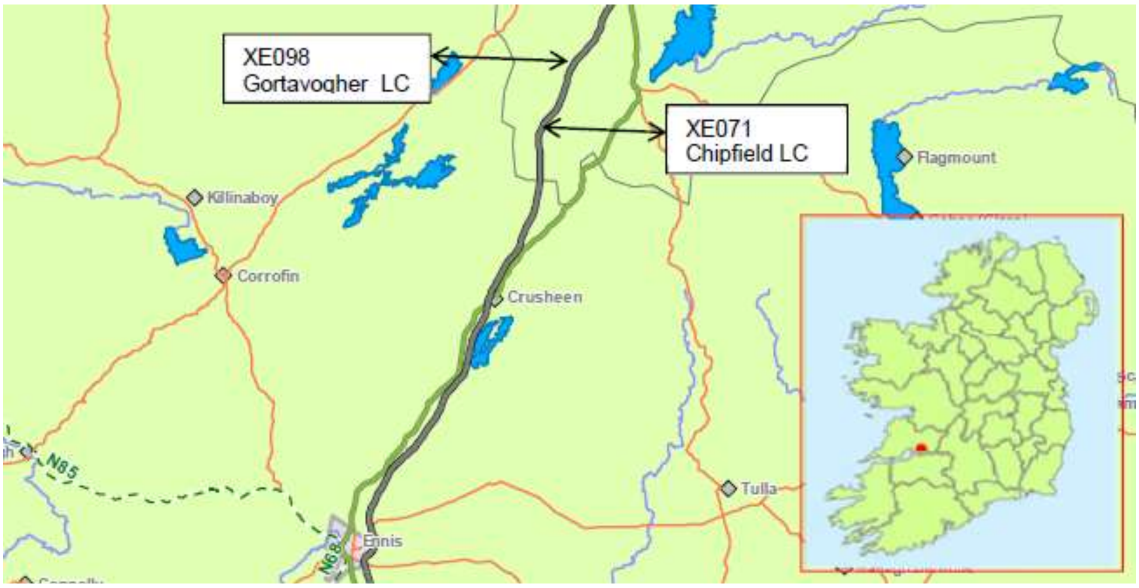


Figure 43 – Location of the SPAD, Gortavogher

330 Level Crossing XE071 at Chipfield is located approximately 49.76 km from Limerick Station in the Ennis to Gort section of the Limerick to Athenry line, see Figure 43. The level crossing is protected by traffic light signals, audible warning devices and full barriers. The level crossing is normally controlled by an LCCO at Mallow LCCC. There is a *local control* panel adjacent to the level crossing in the event of a failure at Mallow LCCC.

331 Level Crossing XE098 at Gortavogher is located approximately 58.41 km from Limerick Station in the Ennis to Gort section of the Limerick to Athenry line. The level crossing is protected by traffic light signals, audible warning devices and full barriers, see Figure 44. The level crossing is normally controlled by an Operator at Mallow LCCC. There is a local control panel adjacent to the level crossing in the event of a failure at Mallow LCCC.

Figure 44 – Level Crossing XE098, Gortavogher

332 Level Crossing XE136 at Kiltartan is located in the Gort to Galway section of the Limerick to Athenry line. The level crossing is protected by traffic light signals, audible warning devices and full barriers. The level crossing is normally controlled by an Operator at Mallow LCCC. There is a local control panel adjacent to the level crossing in the event of a failure at Mallow LCCC. Train A780 did not travel over this level crossing during or after the incident, but the level crossing was one of the level crossings affected by the lightning strikes.

Rolling stock

333 The train involved in the incident was the 05:55 hrs Limerick to Galway passenger service (Train A780). The train was a two-carriage DMU 2800 railcar consisting of carriages 2813 and 2814; unit 2814 was the leading carriage at the time of the incident. This train consist is 41.93 m in length and can travel at maximum speeds of 75 mph (120 km/h).

334 The train was fitted with an OTDR.

335 No factors associated with the rolling stock were found to have contributed to the incident.

Signalling and communications

336 The single track route from Ennis to Athenry is signalled using two and three aspect *colour light signals*, controlled by the GLS based in Athlone LCCC. Track Circuit Block regulations apply to this route.

337 The line from Ennis to Athenry is a single line throughout and is operated under the Rules and Regulation for trains signalled by Track Circuit Block with colour light signals. It is controlled by the Galway Line Signalman located in the Athlone Local Control Centre.

338 The means of communication between train drivers and the Signalman on this route is via train radio. Lineside signal telephones are also available.

Operations

339 The route is not fitted with a CAWS or ATP. Trains travelling towards Galway are travelling in the Down direction and trains travelling towards Limerick are travelling in the Up direction.

340 The maximum permitted line speeds, at the time of the incident, are 50 mph (80 km/h) between Limerick and Ennis and 80 mph (128 km/h). There were a number of permanent speed restrictions, and no temporary speed restrictions between Ennis and Athenry

341 The operation of the level crossings involved in the incident are managed by a LCCO at the LCCC in Mallow, these operations will be discussed further in paragraphs 356 - 363.

Fatalities, injuries and material damage

Fatalities and injuries

342 There were no fatalities or injuries as a result of this incident.

Material damage

343 Apart from the damage to the signalling system equipment as a result of the lightning strikes, there was no other material damage to the infrastructure, rolling stock or signalling system as a result of the SPAD.

Roles involved in the incident

Roles directly involved in the incident

344 IÉ-RU roles associated with the incident are as follows:

- Driver A780 – The train driver who was driving 05:55 hrs passenger service from Limerick to Galway, who proceeded through Signal XE098DS without authority;
- Limerick Station Controller – The person responsible for organising the EO for Level Crossing XE071 and Level Crossing XE098.

345 IÉ-IM roles associated with the incident are as follows:

- GLS – The Galway Line Signalman based in Athlone Local Control Centre, who is responsible for controlling the route;
- LCCO – The Level Crossing Control Operator located at Mallow LCCC who is responsible for the operation of level crossings and associated signalling, such as Level Crossing XE071 and XE098;
- EO XE071 – A Depot Person, based in Ennis, who was despatched to Level Crossing XE071 Chipfield, to act as an EO;
- EO XE098 – A Depot Person, based in Limerick, who was despatched to Level Crossing XE098, Gortavogher, to act as an EO.

Roles not directly involved in the incident

346 There are a number of roles not involved in the incident; the roles are as follows:

- District Traction Executive (DTE) – In relation to driver, the DTE assists in the selection of drivers, ensures the Competency Management System (CMS) is set up and maintained, assesses and monitors drivers, manages issues surrounding the competence of drivers, certifies newly qualified drivers, and manages the PQA process;
- District Manager – Responsible for the management of Driver A780, post SPAD incident.

External circumstances

347 The weather at the time of the incident as recorded by the Shannon Airport Met Éireann station, located approximately 37 km south of the incident, was raining sleet and windy with a temperature

of approximately 2.5° C. Met Éireann also recorded ten lightning strikes in County Clare on the 19th December 2013.

348 Driver A780 and EO XE098 stated that the weather conditions were extremely poor. EO XE098 stated that while he was en route to Level Crossing XE098 he considered returning to Ennis due to the poor visibility and dangerous road conditions.

349 The visibility in the vicinity of the site of the incident was poor as a result of the darkness and heavy rain. Driver A780 stated that it was difficult to orient his position on the track as there are no identifiable landmarks in the area, and therefore drivers are completely dependent on the signals at times of low visibility.

Evidence

The Signalling System

Signal XE098DS

350 Distant signal XE098DS, the signal that was passed at danger, is a two aspect signal mounted on a standard height pole situated on the left hand side of the track close to the 36 MP. It is capable of displaying single green and red aspects. It is not approach released and normally clears to a green aspect on request from the LCCO at Mallow after the barriers at Level Crossing XE098 are lowered and the crossing is observed to be clear by the LCCO, see Figure 45.

Figure 45 – Distant Signal XE098DS

Figure 46 – Signal XE098DD

Signal XE098DD

351 The signal in rear of Signal XE098DS is Signal XE098DD. It is a two aspect signal mounted on a standard height pole and situated on the left hand side of the line at 35 miles 461yds. It is capable of displaying single yellow and green aspects, see Figure 46. It is located 1,188 m before Signal XE098DS.

Signalling Layout

352 The signalling layout, including Signals XE098DD and XE098DS, associated with the level crossings is set out in Figure 47.

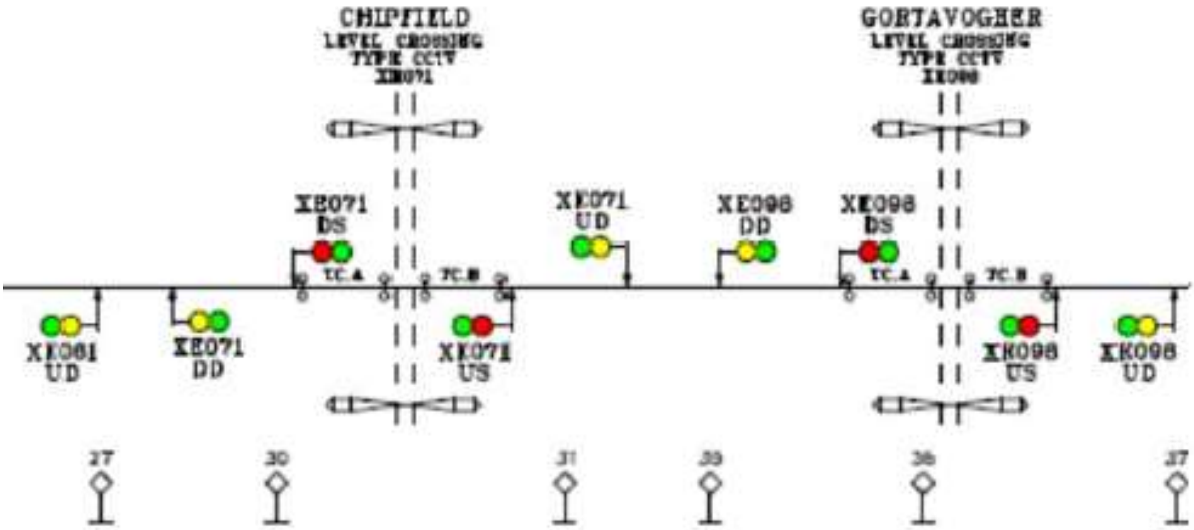


Figure 47 – Signalling layout associated in the vicinity of the level crossings

Level Crossing Control

__Signalman Instructions – SGIs & Rule Book__

353 Section 40, ‘Level Crossings – Cautioning of Trains’ of the SGIs, under Clause 40.2, ‘Instructions at the Supervising or Controlling Signal Box’ states that “before clearing protecting signal(s) the signalman must instruct the driver to approach the crossing cautiously and not pass over it without first ensuring it is safe to do so”. This instruction is not specific to CCTV Level Crossings.

354 Section 41, ‘Automatic Half-Barrier Level Crossings (AHB) and Lights and Bells Level Crossings (LB)’ states under Clause 41.8, ‘Failure of Crossing Equipment or Prolonged Occupation of Track Circuits’, that “a driver only train (DO) must not be allowed to proceed into the section until an EO has taken up duty or the driver is accompanied by a competent person who will take up the duties of the guard in accordance with rule book section H clause 4.6.5”. It further highlights in red that “during darkness or fog or falling snow, you must not permit a train to enter the section until the EO has taken local control of the crossing”. These clauses do not appear to be relevant to CCTV Level Crossing. However, there are no specific instructions in the case of the failure of CCTV Level Crossings.

355 It should be noted, although some of this information is included in the SGIs, only the Signalmen (i.e. not the LCCOs) are required to work under the instructions of the SGIs.

Level Crossing Control Centre

356 Mallow Level Crossing Control Centre (LCCC) has a number of touch screens available to monitor and operate the level crossings in the area. Figure 48 shows the touch screen for Gortavogher Level Crossing under normal operating conditions, with no train in the section; it is displaying information in relation to the Up Distant (UD), Up Signal (US), Down Signal (DS) and Down Distant (DD).

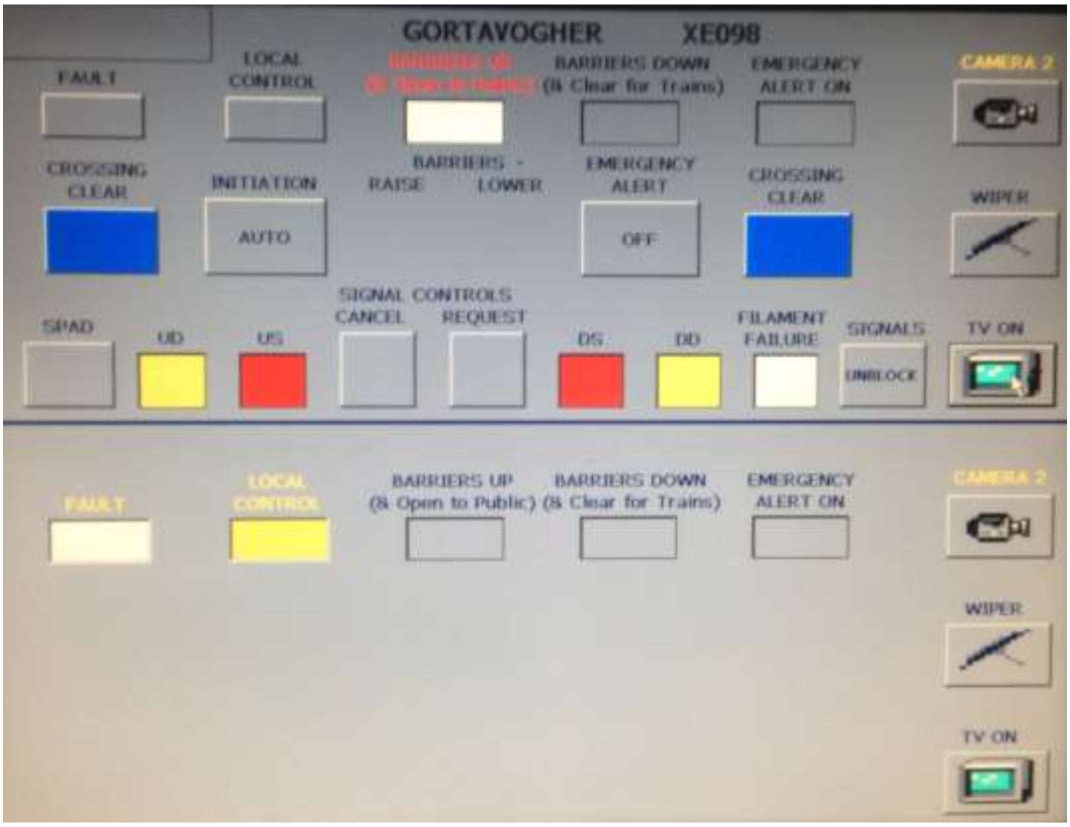


Figure 48 – Screen shot from Gortavogher Touch Screen under normal conditions

357 The LCCO is normally alerted of the approach of a train towards the CCTV level crossing by “auto initiation” where the passage of a train at a certain point activates an audible sound on the panel at the LCCC. The barriers are then lowered automatically after a time interval, the LCCO then checks that the level crossing is clear through the use of the CCTV, i.e. there are no objects or persons inside the lowered barriers and presses the crossing clear button and the signals associated with the level crossing are requested. The display to the LCCO is then extinguished.

Level Crossing Control Centre Operations – General

358 Mallow LCCOs are required to operate under the Rule Book and the ‘Athlone & Mallow Crossing Control Centres, Instructions for the Operation of Touch Screen Control Panels associated with CCTV Level Crossings’ (LCCC Instructions) issued on the 3rd July 2013 by the IM Safety Manager.

Level Crossing Control Centre Operations – LCCC Instructions

359 The LCCC Instructions is a fifty-nine page document. There is no index provided at the beginning of the document and the pages are primarily made up of black and red text, with a limited number of illustrations. See Figure 49 for the typical page layout in the LCCC Instructions.

Section 5.0 Emergencies - continued

5.3 Emergency with the Barriers in the Lowered Position

(b) Crossing Clear Control <u>has been</u> operated and the Signals are cleared

(v) The **EMERGENCY ALERT ON** normal grey indication will immediately turn to steady red.

A time delay of 240 seconds will commence to time down which indicates to the Crossing Controller that he/she is not allowed to operate the barriers.

The **BARRIERS DOWN** (& Clear for Trains) indication will change from white to grey but the **BARRIERS DOWN** (& Clear for Trains) label will remain green indicating that the barriers are fully lowered.

When the time delay of 240 seconds has elapsed, the red flashing **BARRIERS** label will stop flashing and return to dark blue thereby indicating to the Crossing Controller that it is safe to operate the barriers.

Note if the **EMERGENCY ALERT OFF/ON** button is placed to the **OFF** position before the 240 seconds time delay has elapsed then the red flashing **BARRIERS** label will <u>not</u> stop flashing and return to dark blue until the 240 seconds has elapsed.

The elapsed 'waiting time' will appear beside the **EMERGENCY ALERT ON** red indication.

(vi) When the time delay elapses the timer will disappear.

The **BARRIERS DOWN** (& Clear for Trains) label will remain coloured green.

The **EMERGENCY ALERT ON** red indication will continue to display a red indication.

The Crossing Controller may now raise the barriers if that is what is required.

Note: A time delay of 240 seconds applies to the line being occupied between the two stop signals and as described above, a time delay of 240 seconds also applies to a train which is approaching the stop signal which is displaying a proceed aspect. However, in the case of those level crossings (e.g. Ashfield and Minish) that have additional track circuits or axle counters which are capable of determining if a train is approaching then when the signals return to Danger and Caution and it is detected that there are no trains approaching, the barriers will be free to be raised immediately.

In this situation, the further actions of the Crossing Controller will be dependent on the precise nature of the emergency.

When the Crossing Controller places the **EMERGENCY ALERT OFF/ON** button to **OFF**:

The **EMERGENCY ALERT ON** indication will change colour from red to the normal grey indication.

With the **INITIATION** button already in **LOCAL**, the barriers will remain lowered.

However, depending on the circumstances:

1. To keep the barriers lowered; keep the **INITIATION** button in **LOCAL**.

2. To open the crossing before the train is allowed to proceed; placing the **INITIATION** button into **AUTO** will allow the barriers to be automatically raised.

3. If the train is required to proceed on its journey with the barriers already lowered; operate the **CROSSING CLEAR** controls and then if it is in order to do so operate again the Signal Controls to clear the signals

4. If the train is required to proceed on its journey and the barriers have already been raised; then carry out the normal procedures to close the crossing i.e. lower the barriers, operate the **CROSSING CLEAR** controls and then if it is in order to do so operate again the Signal Controls to clear the signals.

Section 6.0 Fault / Failure Situations / Remedial Procedures

This **Section 6.0** outlines the procedures to be followed by the Crossing Controller for fault and failure situations.

Clause **6.1 List of Faults and Remedial Procedures** deals with those fault situations as referred to in clause **2.1.2 Crossing Controls** sub-clause **(h2) Fault List**. Refer also to clause **2.1.3 Crossing Controls** clause **(h1) FAULT Button / Indication**.

Clause **6.2 Other Equipment Faults – not associated with the fault button / indication / fault list** – deals with faults not covered by clause **6.1 List of Faults and Remedial Procedures**.

The Crossing Controller must note that the severity of one of these faults presenting itself on its own may not be significant, however, a number of these faults being presented at the same time may be more significant and must be acted upon taking all the faults into consideration.

Advising the Technician of Faults & Failures

The Crossing Controller must advise the Technician immediately of **ALL** faults and failures.

Figure 49 – Typical page from LCCC Instructions

360 Section 6.0, ‘Fault/Failure Situations/Remedial Procedures’ outlines the procedures to be followed by the Crossing Controller for fault and failure situations. Section 6.1, ‘List of Faults and Remedial Procedures’ provides a table featuring faults and the associated remedial procedures.

361 However, the specific fault of a failure of controls and indications on the touch screen was not referred to in the table, this is the fault which occurred on the day of the incident, where the UD, US, DS and DD information was blank, see Figure 50.

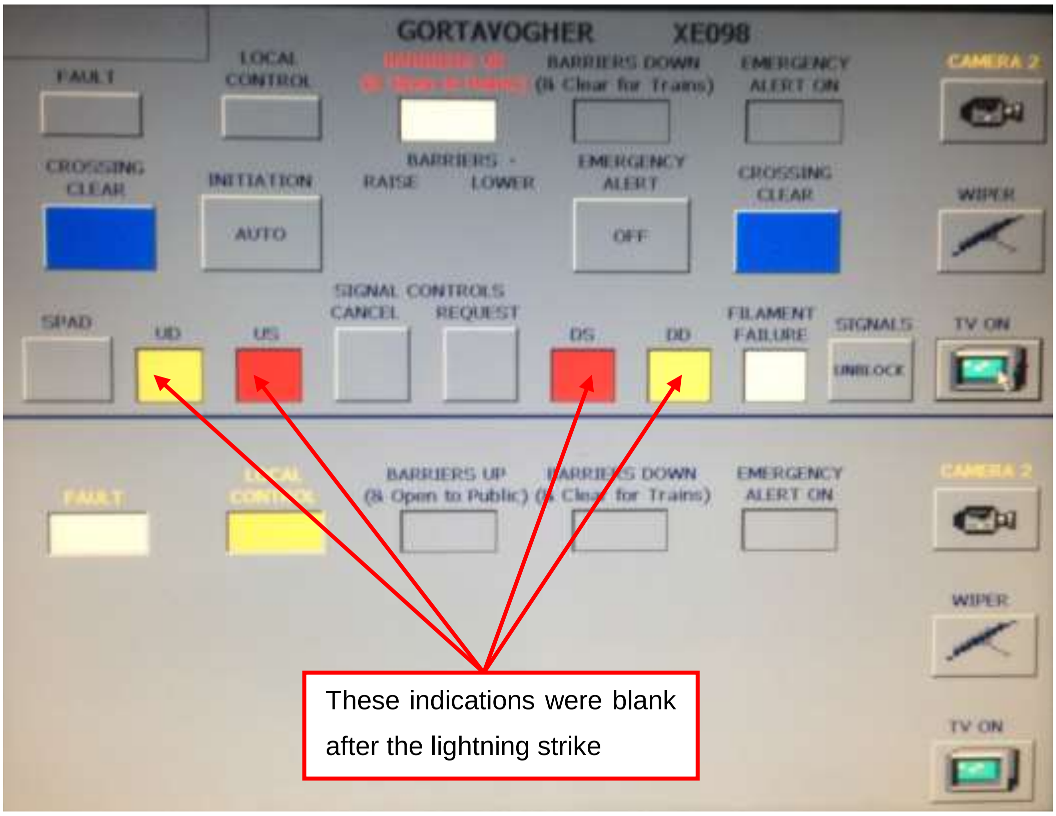


Figure 50 – The signal information was blank after the lightning strike

362 Although not included in the table in Section 6.1, the fault is provided for in Section 6.6, ‘Failure of Controls and Indications on the Touch Screen’; which states “The Signalman for the line must be IMMEDIATELY advised of the failure and told not to allow a train to enter the section in which the crossing is located until the Emergency Operator has arrived at the crossing and had verified that it is in order to allow a train approach the crossing. The Crossing Controller[7] must advise the Technician[8] IMMEDIATELY when such a fault occurs. An Emergency Operator must be despatched to the crossing before a train enters the Section in which the crossing is located or before a train has to pass a Station signal at Danger. When the Emergency Operator has arrived

[7] LCCO

[8] Signal Inspector, Signal Technician, Telecommunications Inspector or Telecommunications Technician

at the crossing and has taken the crossing out of REMOTE control and it subsequently becomes necessary for the Crossing Controller to instruct a Driver to pass one of the stop signals at Danger then this must only be carried out where the Crossing Controller has received an assurance from the Emergency Operator that the crossing is closed to the public and clear for the passage of the train. In this case also, the Driver of the train must be instructed by the Crossing Controller or Signalman as the case maybe, to pass the signal at Danger and to proceed cautiously over the crossing".

363 Section 8, 'Appointment of an Emergency Operator' sets out the circumstances where there is a requirement to send an EO to a level crossing, including "if the controls or indications on a touch screen fail".

Instructions to Drivers

General description

364 This section of the report reviews the standards, procedures and instructions for drivers during CCTV Level Crossing failure.

Instructions to Drivers

365 Section H, Clause 3.6, 'What you must do if an irregularity or exceptional incident occurs', of the Rule Book, sets out a number of instructions for drivers in relation to actions to be taken during irregular or exceptional circumstances.

366 Section H, Clause 3.6.7, 'If your train is to pass over a level crossing where there is a failure or incident' states, for drivers, that "if told by the Signalman that there is a failure or incident affecting a level crossing, you must approach the crossing cautiously and be prepared to stop short of it".

367 Section H, Clause 3.6.1, 'If you observe something which might endanger trains', states that if the train may be in danger, "you must stop immediately". This would include where a train travels through a level crossing with the barriers raised to road traffic.

Training & competence management of Driver A780

Driver A780

368 Part 3 discussed the selection, training and competency management of drivers, under the IÉ's RU Operations SMSs.

369 Driver A780 commenced driver basic training programme on 25th April 2000 and completed the training centre module of training on 8th October 2000. The driver qualified on 30th September 2001 and the DTE recorded that Driver A780 had a high standard of driving and did not identify

any areas of concern. Following on from the training, Driver A780, according to IÉ, had an "exemplary record of driving over a thirteen year period".

370 In relation to Driver A780's route knowledge of the Ennis to Athenry line, Driver A780 completed route learning for this line on the 15th April 2010, which included a briefing and assessment on route and the SPAD risks for the route. As part of this assessment, the DTE indicated on the assessment report that Driver A780 obeyed all PSRs and TSRs, maintained line speed and used defensive driving techniques when approaching signals displaying a caution aspect. Driver A780 underwent a further practical assessment over the Ennis to Athenry line on 17th November 2013, a month prior to the incident and a similar standard was achieved.

Training & competence management of the GLS

371 The GLS completed basic training and was passed competent as a Signalman in the Athlone PCECP on 29th June 2007. The GLS completed a TCB rules refresher from 7th - 9th January 2013 inclusive and received positive feedback from the trainer at the training school Inchicore.

372 The GLS completed advanced railway safety communications training on 18th February 2011 and was assessed for railway safety communications.

Training & competence management of the LCCO

373 The LCCO at Mallow was trained and passed competent as an LCCO on 9th March 2009. He did not have any medical or work restrictions. The LCCO was monitored on three occasions during 2012 and there were no follow up actions recorded or for review.

374 The LCCO commenced current twenty-four month assessment cycle on 1st May 2013 and had an assessment on the 5th November 2013 (the month before the incident) where no issues for review were noted.

Training & competence management of EO XE098

375 EO XE098 was trained and passed competent as an EO for CCTV level crossing on the 16th October 2012. A rules assessment was completed on 8th October 2013 and monitored on CCTV level crossing barrier operation on 10th October 2013 (two months before the incident).

Sequence of events

General description

376 This section outlines the key events, leading up to, during and after the incident.

Events before the incident

377 The LCCO booked on duty at 22:30 hrs on the 18th December, sufficiently rested and was carrying out his duties without incident.

378 At approximately 04:45 hrs on Thursday 19th December 2013 there were a number of lightning strikes in the vicinity of three CCTV Level Crossings: Level Crossing XE071 at Chipfield, Level Crossing XE098 at Gortavogher and Level Crossing XE136 at Kiltartan. The lightning damaged the Relocatable Equipment Building (REB), Location Cases LC1 and LC3 and axle counter trackside equipment, including fuses, converters, indications and cards which resulted in the following equipment not functioning:

- Signal XE098US – which was not displaying any aspect;
- Signal XE098DS – which was not displaying any aspect;
- Signal XE098DD – which was not displaying any aspect;
- Crossing Pedestal Controls – which failed to show any indications;
- Axles Counter Track A&B – which were showing as occupied;
- Road Traffic Lights – which were not illuminating.

379 In addition, faults were recorded on the train radio system from the 29 MP to the 53 MP, with the radio bases at Crusheen, Gort and Ardrahan going offline.

380 At approximately the same time (04:45 hrs) the LCCO received a fault indication on three CCTV Level Crossings: Level Crossing XE071 at Chipfield, Level Crossing XE098 at Gortavogher and Level Crossing XE136 at Kiltartan.

381 At 04:55 hrs Driver A780 booked on for duty, he was fit for duty and sufficiently rested. He was to travel on train A780 from Limerick to Ennis and then operate the train from Ennis to Galway.

382 At 05:00 hrs the GLS booked on duty, he was fit for duty and sufficiently rested.

383 At 05:24 hrs the MLS received the call from the LCCO. The MLS took this call for the GLS as the GLS was away from his console on a Personal Needs Break (PNB), the MLS left the details for the GLS in a note.

384 The GLS then contacted the Galway Station Controller to arrange an EO for Level Crossing XE136. As the LCCO felt that the faults were serious, he requested from the GLS, two other EOs for Level Crossing XE071 and Level Crossing XE098. As the GLS did not have the contact details for the Station Controller Limerick, the LCCO contacted the Limerick Station Controller to request two EOs for Level Crossing XE071 and Level Crossing XE098. Although the LCCO informed the GLS of the requirements for EOs at all three level crossings, he did not advise the GLS to prevent trains from entering the affected area until the EOs arrived on site. (Section 6.6 of the Athlone & Mallow Crossing Control Centres Instructions requires that the EO verify that a level crossing is in order prior to allowing a train to approach).

385 The Limerick Station Controller organised two EOs for Level Crossings XE071 and Level Crossing XE098.

386 Prior to leaving Limerick Station, to operate the 05:55 hrs passenger service from Limerick to Ennis, Driver A780 was informed, by the Limerick Station Controller, that there would be EOs present at Level Crossing XE071 and Level Crossing XE098 due to the level crossings being out of order.

387 At 06:20 hrs EO XE098 signed out the keys for Level Crossing XE098 and travelled by car to the level crossing. EO XE071 also signed out the keys for Level Crossing XE071 at around this time.

388 Train A780 arrived in Ennis at 06:35 hrs and Driver A780 carried out a number of station duties, such as dividing the train. While at the station, EO XE071 met Driver A780 and told him that he was going to Level Crossing XE071 to act as EO and that there would be another EO present at Level Crossing XE098. EO XE071 then signed out the keys for Level Crossing XE071 and travelled by car to Level Crossing XE071.

389 At 06:47 hrs the GLS contacted Driver A780 prior to setting the route for Train A780 to allow travel from Ennis to Gort. The GLS advised Driver A780 that there were problems at Level Crossing XE071 and XE098 which were in the section that GLS was going to set the route (i.e. to allow Train A780 to enter the Ennis to Gort section), and that EOs were enroute. The GLS also stated that he would contact him when he arrived in Gort in relation to Level Crossing XE136.

<u>Events during the incident</u>

390 The GLS then contacted the LCCO is relation to the EOs. The LCCO informed the GLS that the EO XE071 and EO XE098 were not in place. The GLS then set the route (i.e. to allow Train A780 enter and travel from Ennis to Gort).

391 The EO XE071 arrived at Level Crossing XE071. Using the local control panel, he set the level crossing to local operation.

392 Train A780 was cleared to enter the section and departed Ennis at 06:50:45 hrs. On the approach to Level Crossing XE071, Driver A780 observed Signal XE071DD displaying a yellow aspect, see Figure 51.

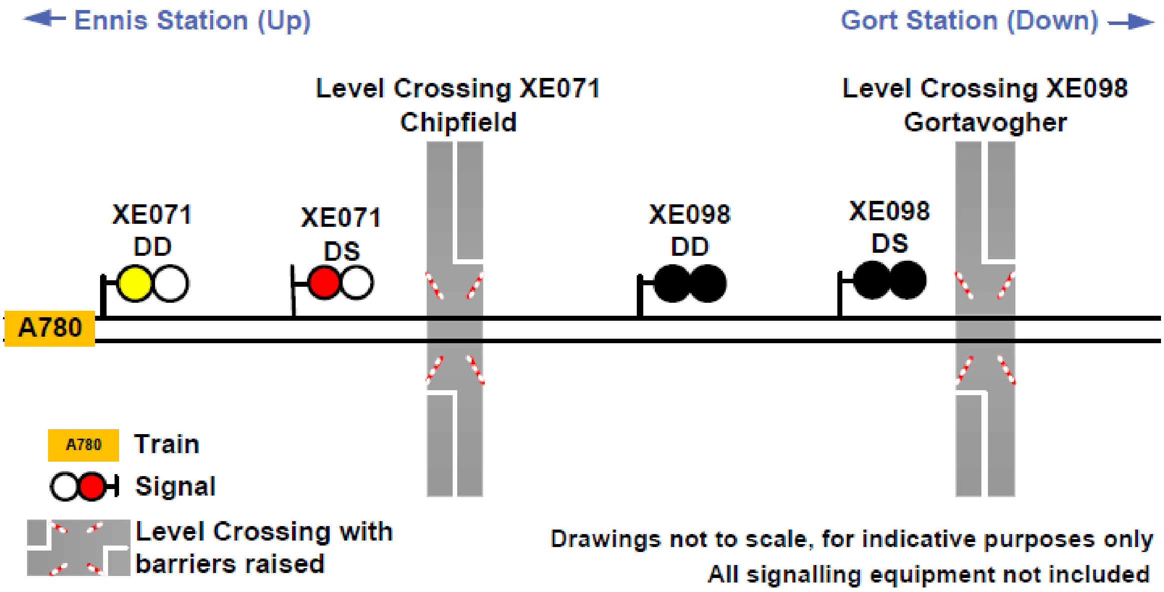


Figure 51 – Train A780 approaching XE071DD at caution

393 Driver A780 reduced the speed of the train and stopped at Signal XE071DS which was displaying a red aspect, see Figure 52. Driver A780 contacted the LCCC by lineside telephone who advised him that EO XE071 was in place at Level Crossing XE071 and the signal should upgrade shortly.

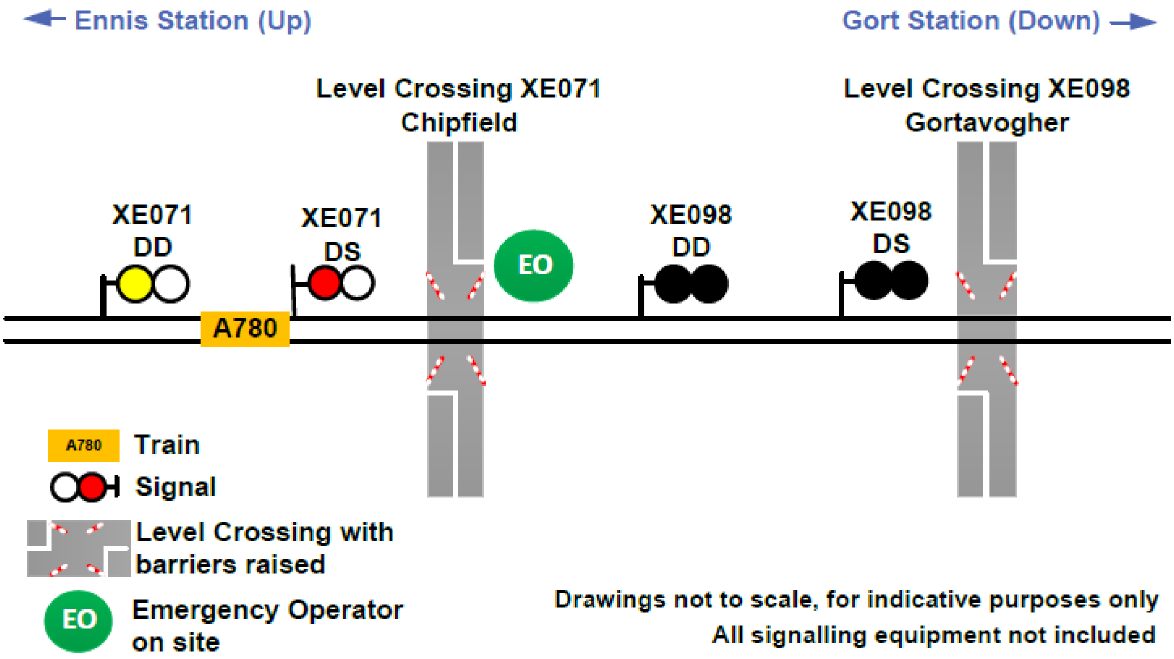


Figure 52 – Train A780 stopped at Signal XE071 with the EO onsite taking local control of Level Crossing XE071

394 Soon afterwards EO XE071 received the initiation for Train A780. He lowered the barriers (against road traffic) and contacted the LCCO to inform him that Level Crossing XE071 was safe for the passage of Train A780. Train A780 travelled through the level crossing without incident.

395 At approximately 07:00 hrs EO XE098 arrived at Level Crossing XE098 and contacted LCCO to tell him that there was no power and the barriers would have to be worked manually. The LCCO requested that EO XE098 open the cases at each barrier (four cases in total), to allow the barriers to be worked manually, and then contact the LCCO.

396 At Level Crossing XE071, at 07:01:31 hrs Signal XE071DS cleared to display a green aspect and Train A780 continued and travelled over Level Crossing XE071 without incident, see Figure 53.

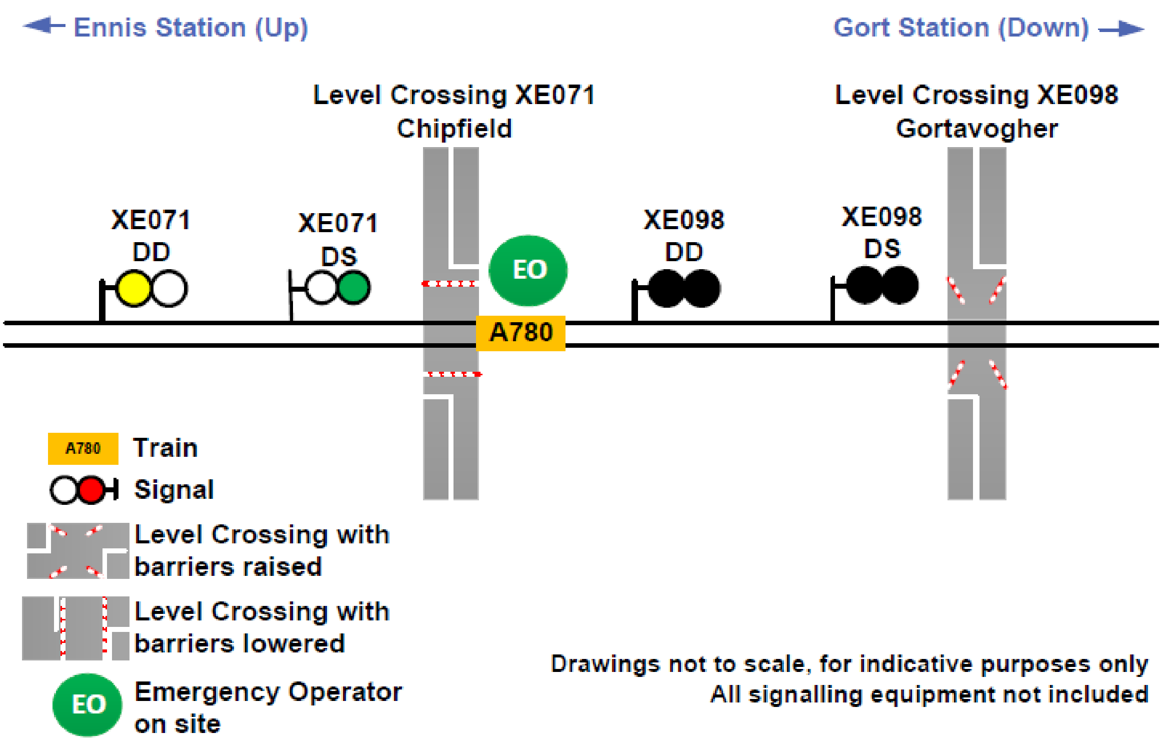


Figure 53 – Train A780 travelling through Level Crossing XE071 with the barriers lowered

397 EO XE071 observed the tail lights of Train A780 and contacted LCCO to advise that the barriers had returned to the raised position and that Level Crossing XE071 was clear for road traffic, see Figure 54.

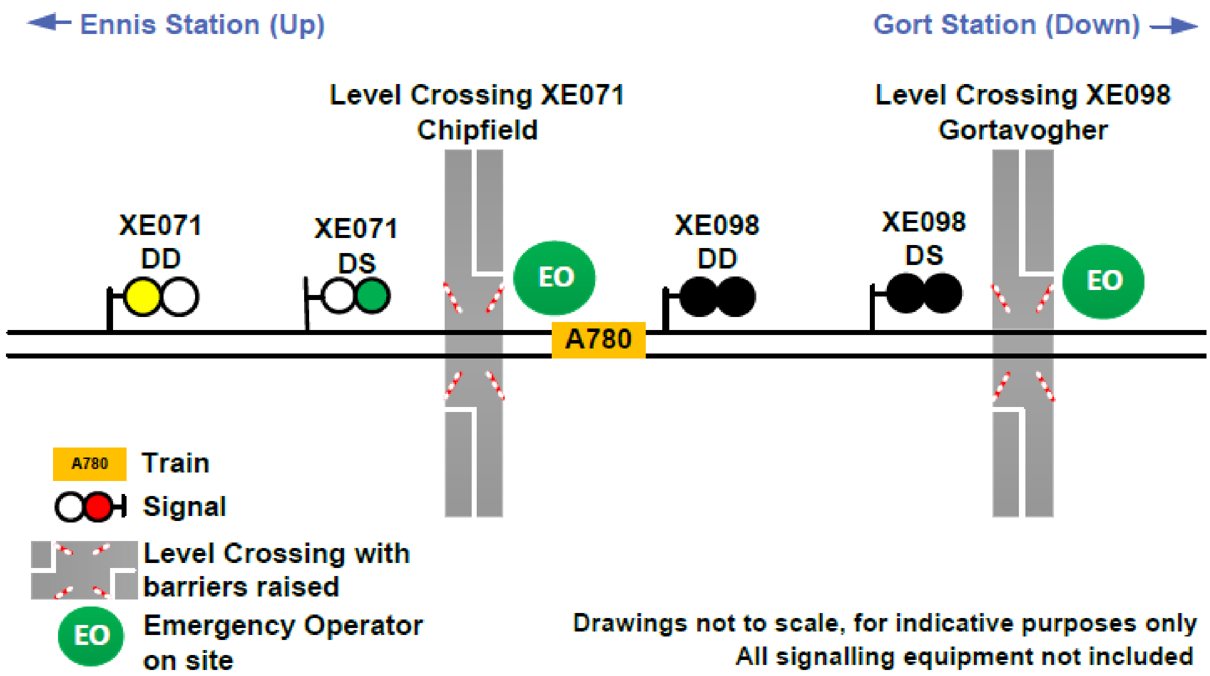


Figure 54 – EO XE071 raises the barriers after Train A780 has past and Train A780 continues towards Level Crossing XE098

398 After Train A780 passed over Level Crossing XE071 it accelerated to a maximum speed of 69 mph (112 km/h) which was below the maximum line speed. However, Driver A780 did not observe the 60 mph (96 km/h) PSR between 33 ¾ to 34 MPs where the train speed was approximately 5 mph (8 km/h) in excess of the PSR, after the 34 MP Driver A780 did comply with the PSR.

399 As Train A780 approached Level Crossing XE098, Distant Signal XE098DD was not displaying any aspect. Due to the poor weather Driver A780 did not see the signal and as a result did not slow down; and continued past the signal 'at Danger', see Figure 55.

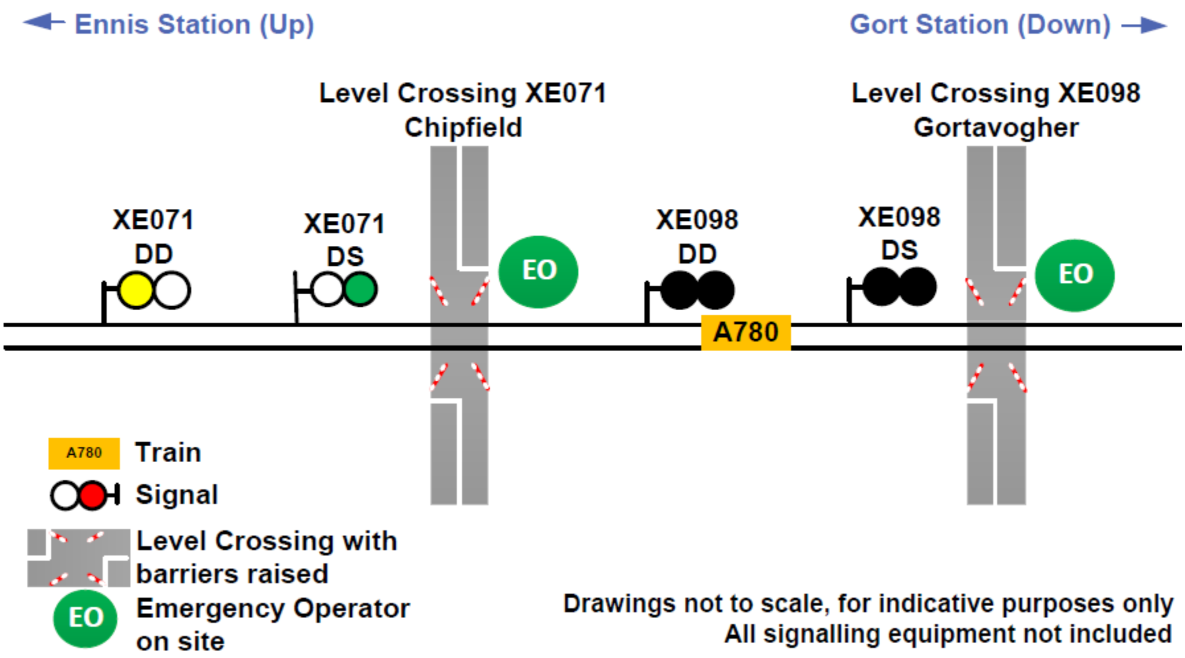


Figure 55 – Train A780 travels past Signal XE098DD (which is not showing any aspect) without authority

400 As Driver A780 continued towards Level Crossing XE098 he saw the street lights and he saw that Stop Signal XE098DS was not displaying any aspect. Train A780 is travelling at 67 mph (106 km/h). On seeing the Signal XE098DS Driver A780 applies the emergency brakes and sounded the train horn.

401 EO XE098, who is in the process of opening the final case at one of the barriers, hears the train horn and looks up to see the headlight of Train A780.

402 Train A780 travels past Signal XE098DS without authority and through Level Crossing XE098 with the barriers raised to road traffic. There is no road traffic using the crossing at the time of the incident. Train A780 is travelling at 58 mph (98 km/h), see Figure 56.

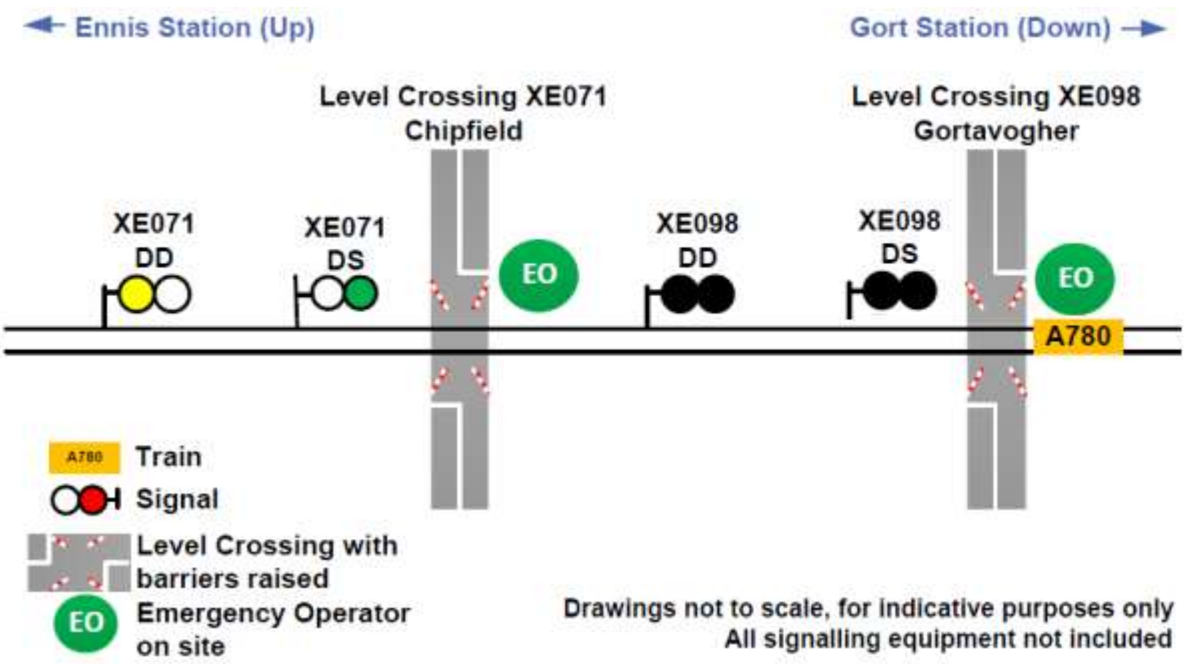


Figure 56 – Train A780 passes Signal XE098 DS without authority and through Level Crossing XE098 with the barriers raised to road traffic.

Events after the incident

403 The LCCO sees Train A780 travelling through Level Crossing XE098 with the barriers raised. EO XE078 immediately contacts the LCCO, who in turn transfers him to his Supervisor, and the LCCO informs the Supervisor that Train A780 has travelled through Level Crossing XE098 while the barriers were raised to road traffic.

404 Approximately twenty seconds after Driver A780 applied the emergency brakes Driver A780 releases the emergency brakes and applies power to the train. Train A780 is travelling at 29 mph (47 km/h).

405 At 07:11 hrs the LCCO contacts the GLS to inform him that Train A780 has travelled through Level Crossing XE098 while the barriers are raised to road traffic. The GLS attempts to contact Driver A780, but this is unsuccessful as the radio system is offline due to the lightning strikes. The GLS sets the next signal, GL458, to danger. The GLS then contacts the Regulator at CTC and informs the Limerick District Manager of the incident.

406 Train A780 continues past Level Crossing XE098 and attempts to contact the GLS, however, the radio system was offline as a result of the lightning strikes. Train A780 travels for a further 11 km observing the speed limits and comes to a stop at the next signal displaying a red aspect, Signal GL458 at Gort. Driver A780 contacts the GLS from the SPT. The GLS tells him not to move the

train and requests his mobile phone number, which in turn he gives to the Limerick District Manager.

407 The Limerick District Manager contacts Driver A780 to discuss the incident and assess the fitness of Driver A780 to move Train A780 to Gort Station. The Limerick District Manager assesses Driver A780 as fit and requests that the GLS set the route into Gort Station. The GLS contacts Driver A780 to tell him of the movement and upgrades GL458 to a proceed aspect. Train A780 arrives in Gort Station without further incident.

408 On arrival at Gort Station Driver A380 was relieved of duty and returned back to Limerick where he was screened for Drugs & Alcohol in line with IÉ company policy and the results were returned as negative.

Similar occurrences

General information

409 Since January 2012 to June 2015 there have been seven other SPADs during degraded train operations; these SPADs are as follows:

- SPAD at XW038US, Blackbog Level Crossing, on the 16th May 2012 (level crossing faults);
- SOY SPAD at GL353, Athenry, on the 10th July 2013 (Working of Single Lines by Pilotman (WSLP));
- SPAD at RC874, Charleville, on the 18th August 2013 (possession works);
- SPAD at LJ348, Limerick Junction, on the 25th August 2013 (possession works);
- SPAD at GL354, Athenry, on the 16th November 2013 (Regulation 11.7 in place at time of the SPAD);
- SAS SPAD at SAOIB, Limerick, on the 24th September 2014 (possession works);
- SAS SPAD at Signal XX062, Shanclough Level Crossing, on the 15th January 2015 (level crossing faults).

410 These SPADs are discussed in detail in ‘Part 8 – A Review of All Category A SPADs (January 2012 – June 2015)’ of this report.

Analysis

Signalling system

411 The signalling system was not in full working order on the day of the incident as a result of lightning strikes in the area, whereby the screen in the LCCO were showing failures for three level crossings, including Level Crossing XE098 (paragraph 378).

Rule Book

412 Section 3.5, 'Observance of Signal Failures or Irregularities' in the 'Instructions to Drivers' section of the Rule Book is clear and unambiguous regarding observance of signals that are not displaying any aspect i.e. they should be treated as displaying a danger aspect.

Driver Competency

413 Driver A780 was competent to drive this class of train, his training and mentoring was fully up to date and he is considered to have "exemplary record of driving over a thirteen year period". He had completed the route knowledge for this section of track in 2010 and had undergone a practical assessment over the Ennis to Athenry Line in the month before the incident.

414 Driver A780 was aware that signals not displaying any aspect should be treated as at danger.

Actions of Driver A780 on the day of the incident

415 Driver A780 was informed that there were issues with three level crossings and as he was signalled into the Ennis to Gort Section of track he was aware that he would approach two of these level crossings. Driver A780 was not informed of the full extent of the faults at the level crossings prior to departing Ennis.

416 Section H, Clause 3.6 of the Rule Book states that where, informed by the Signalman, that there is a failure affecting the level crossing, drivers must approach the level crossing "cautiously and be prepared to stop short of it". Driver A780 did not follow this instruction as he approached the level crossing at 69 mph (112 km/h); nor apply any defensive driving techniques to manage the risks associated with the failed level crossings. Driver A780 also had not realised that he was at the level crossing until he was on it, this was due to the poor weather conditions, which resulted in him losing situational awareness as to location in terms of the level crossing.

417 In addition, on travelling through the level crossing Driver A780 did not stop immediately (as required under Section H, Clause 3.6.1), but only slowed the train for a period and continued travelling for over 11 km past the level crossing.

Actions of the LCCO on the day of the incident

418 Section 6.6 of the LCCC Instructions require that the LCCO must immediately advise the Signalman (in this case the GLS) of the failure of level crossings and tell the Signalman not to allow any trains to enter the section in which the level crossing(s) are located until an EO has arrived at the level crossing and has verified that it is in order (to allow a train approach the crossing).

419 On the day of the incident, the LCCO did inform the GLS of the faults at the level crossing, but did not tell him not to allow trains into the section where the level crossings were situated. The LCCO stated that he was not aware of this requirement, and was not familiar with the LCCC Instructions and that LCCOs were trained using the Rule Book, with little emphasis on the LCCO Instructions. The Rule Book does not include the requirement for the LCCO to tell the Signalman not to allow trains into the section of track with faulty level crossings.

420 It was the LCCOs understanding that he was not responsible for the decision to allow trains into the section; and that the decision would be made by the GLS when informed of the situation with the faulty level crossings; this understanding appears to exist due to the GLS being a more senior grade than that of the LCCO.

421 It is the understanding of the RAIU that the majority of LCCOs were not aware of this instruction, included in the LCCO Instructions, at the time of the incident and it has since been briefed to the LCCOs and notices have been placed at all workstations at the LCCC of this requirement.

Actions of the GLS on the day of the incident

422 The GLS did not fully appreciate the severity of the faults at the level crossings. This was as a result of the LCCO also being unclear of the situation as the EOs had not arrived at the level crossings.

423 The GLS allowed the trains enter the section with the faulty level crossings, despite knowing that EOs were enroute to the level crossings to assess their status.

Conclusions

Immediate cause, contributory factors and underlying factors

Immediate cause

424 The immediate cause of the Driver A780 travelling past signal XE098DS at danger was that the GLS allowed Train A780 into the section of track where it was known there was two faulty level crossings, as the LCCO have not told the GLS not to allow trains into the section until the EOs had arrived at the level crossings and had verified that they were in order to allow a train approach.

Contributory factors

425 Contributory factors to Train A780 passing Signal XE098DS were:

- CF-07 – Driver A780 had not travelled toward Level Crossing XE098 cautiously (or applied any defensive driving techniques), as set out in the Rule Book, as he had an incorrect expectation that he would approach Level Crossing XE098 with the signals operational;
- CF-08 – The visibility of the signals was affected by the adverse weather conditions, which resulted in Driver A780 losing situational awareness as to his location in terms of the level crossing and resulting in him, not seeing Signal XE098DS until it was too late to stop;
- CF-09 – The LCCO was not familiar with the LCCC instructions, which resulted in him not telling the GLS not to allow trains into the section until the EOs had local control. In addition, the LCCO was not aware that he had to get the EO to verify the status of the level crossing;
- CF-10 – The GLS did not fully appreciate the role of the EO and was not aware that EOs were required to verify the status of the level crossing (to the LCCO) before allowing trains to approach them.

Underlying causes

426 Underlying causes to the SPAD are:

- UC-03 – The LCCC Instructions are not user friendly, which has resulted in the LCCOs reverting to the Rule Book which is not fully comprehensive in terms of the operation of CCTV level crossings;
- UC-04 – The roles and responsibilities of the LCCOs and the Signalman are not fully established, in that the LCCOs appear to have gained more responsibility over recent years, which is not supported by any documentation.

Root causes

427 The root cause to the SPAD are:

- RC-02 – Role of the LCCO and GLS do not appear to be fully outlined in any formal documentation.

PART 7 – SPAD at Signal WL167, Muine Bheag, 9th April 2013

Introduction

428 This part of the report will investigate the SPAD at Muine Bheag on the 9th April 2013. Category A SPAD events similar to the SPAD at Muine Bheag, such as SAS and SOY SPADs, will be discussed in 'Part 8 – A Review of All Category A SPADs (January 2012 – June 2015)' of this report. This part will outline the evidence found as part of the investigation, the analysis of this evidence, and the conclusions found as part of the investigation. Any additional observations made as part of this investigation will be outlined in 'Part 11 – Additional Observations'. Actions taken, by IÉ, as a result of the SPAD at Muine Bheag and similar SPADs will be outlined in 'Part 13 – Relevant Actions Taken or In Progress'. RAIU safety recommendations, related to this incident and similar occurrences; or related to additional observations, are made in 'Part 14 – Safety Recommendations' of this report.

The incident

Summary of the incident

429 At approximately 11:19 hrs on the 9th April 2013, the 10:15 hrs passenger service from Heuston to Waterford (Train A504) approaches Muine Bheag Station with Signal WLR161 displaying a double yellow aspect and Signal WL161 displaying a single yellow aspect with a route indicator onto the loop; this was as a result of Signal WL167 (on the exit of the station) displaying a red aspect. This was not the normal signalling sequence on the approach to Muine Bheag Station, when there were no trains crossing.

430 Train A504 was travelling with a driver and trainee driver and arrived as signalled into the loop platform. After performing a number of platform duties, such as ensuring all passengers disembarked and boarded the train safely, the Person in Charge (PIC) gave the 'Station Works Complete' for the driver to close the doors; and the 'Ready to Start' indication despite seeing that Signal WL167 was displaying a red aspect. The trainee driver saw these indications and the driver saw the indications on the in-cab MMI screen. The driver did not look at Signal WL167, which is positioned approximately 215 m off Muine Bheag Station Platform.

431 At approximately 11:23 hrs the driver then started Train A504, departing Muine Bheag Station, both the driver and trainee driver may have been engaged in casual conversation while departing the station. On approaching Signal WL167, approximately 20 m from the signal, the driver saw that Signal WL167 was displaying a red aspect and immediately applied the emergency brake,

coming to a stop approximately 5 m past Signal WL167. The signalman contacted the driver on the train radio to inform him he had passed Signal WL167 at danger and not to move the train.

432 This SPAD was assigned an SRR of 17.

Roles involved in the incident

Roles directly involved in the incident

433 There are a number of roles involved in the incident, the IÉ-RU roles are as follows:

- Driver A505 – The train driver who was driving the 10:15 hrs passenger service from Heuston to Waterford (Train A504) when it passed Signal WL167 at danger, without authority. He was not the driver rostered to drive the train, he had taken over driving duties at Carlow, as a result of local arrangements between drivers;
- Trainee Driver – A trainee driver who was under the care of IÉ's Driving Training School and was travelling in the driving cab on routine in-cab familiarisation at the time of the incident;
- Driver A503 – The driver who was rostered to drive the 10:15 hrs passenger service from Heuston to Waterford (Train A504). He stopped driving duties at Carlow, as a result of local arrangements between drivers;
- PIC Muine Bheag – Person authorised to give the 'Station Works Complete' and 'Ready to Start' indications to drivers, who on the day of the incident gave the 'Ready to Start' indication despite being aware that Signal WL167 was at danger.

434 The IÉ-IM roles are as follows:

- Waterford/Tralee Signalman – Signalman based in CTC, who is responsible for controlling the route.

General description of the railway

Infrastructure

435 The line between Cherryville Junction and Waterford is single track which is worked *bi-directionally*.

436 Muine Bheag Station is a two platform station located at the 66 MP, see Figure 57. The station building and ticket office is located on the loop and the 10:15 hrs passenger service from Heuston to Waterford normally serves the loop platform.

Rolling stock

437 The train involved in the incident were the 10:15 hrs Heuston to Waterford passenger service (Train A504). The train was a six-carriage DMU 22000 railcar consisting of carriages 22335, 22435, 22535, 22635, 22735 and 22135; unit 22335 was the leading carriage at the time of the incident. The train was fitted with an OTDR.

438 No factors associated with the rolling stock were found to have contributed to the incident.

Signalling and communications

439 The single track route from Cherryville to Waterford is signalled using two aspect colour light signals, controlled by the Waterford/Tralee Signalman based in CTC at Connolly Station, Dublin.

440 TCB regulations apply to this route and train detection over the part of the route involved in the incident is achieved by axle counters. The signalling layout for Muine Bheag Station is illustrated below, see Figure 57.

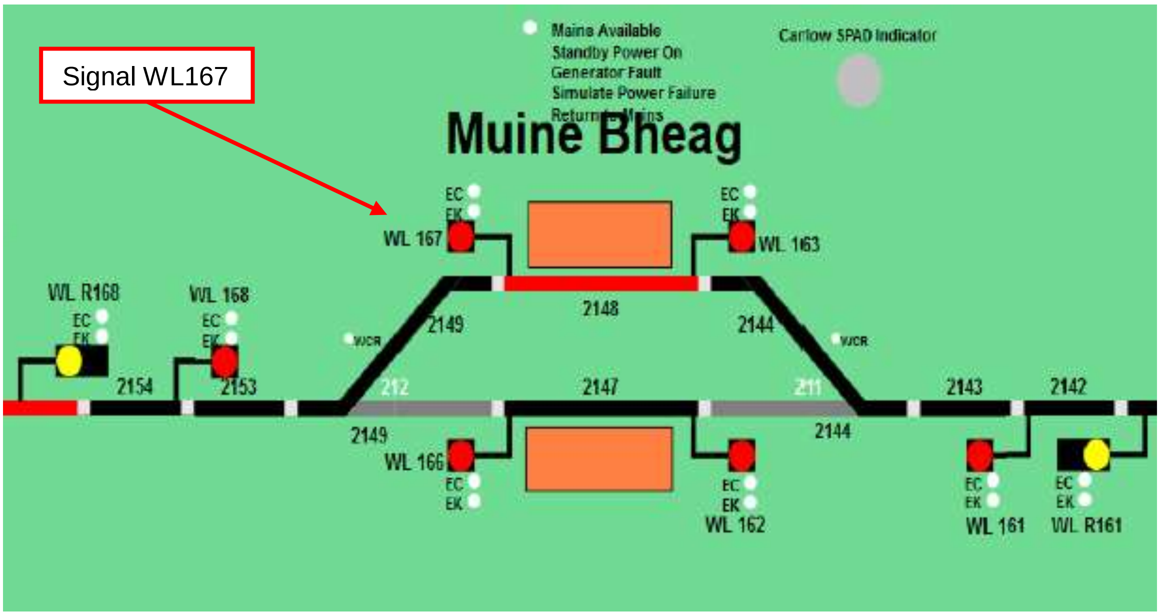


Figure 57 – Signalling layout for Muine Bheag Station

441 The means of communication between train drivers and the Signalman on this route is via train radio. Lineside signal telephones are also available.

Operations

442 The section where the incident occurred is not fitted with CAWS, ATP or other form of enhanced train overrun protection.

443 The maximum permitted speed exiting the station is 40 mph (64 km/h) and 30 mph (48 km/h) on the loop.

444 The rostered arrangements for the Waterford – Heuston services are as follows:

- Two drivers are rostered to drive the first two passenger services from Waterford to Heuston stations every weekday, the 06:05 hrs (Train A503) and the 07:10 hrs (Train A505) passenger services;
- The driver of the 06:05 hrs passenger service from Waterford to Heuston (Train A503) is then required to drive the 10:15 hrs passenger service from Heuston to Waterford (Train A504), in full;
- The driver of the 07:10 hrs passenger service from Waterford to Heuston (Train A505) is then required to work special or receive a home pass and travel passenger on the 10:15 hrs passenger service from Heuston to Waterford (Train A504).

445 However, a local arrangement started in January 2013, whereby:

- The drivers rostered to work the first two passenger services from Waterford to Heuston stations every weekday, the 06:05 hrs (Train A503) and the 07:10 hrs (Train A505) passenger services, worked these services in full;
- The driver who was rostered to work the 10:15 hrs passenger service from Heuston to Waterford (Train A504) would drive this service from Heuston to Carlow, and travel passenger from Carlow to Waterford;
- The driver who was rostered to travel passenger on the 10:15 hrs passenger service from Heuston to Waterford (Train A504) would travel passenger from Heuston to Carlow, and then drive the train from Carlow to Waterford. This would allow the driver with the earlier starting time have a break.

446 These arrangements (rostered and local) are illustrated below in Figure 58, where ✓ illustrates where drivers are driving; and ☑ indicates where drivers are travelling passenger. On the day of the incident, Driver A503 and Driver A505 operated under the local arrangements.

Service	Rostered Arrangement		Local Arrangement	
	Driver 1	Driver 2	Driver 1	Driver 2

A503 (06:05 hrs Waterford – Heuston)	✓	-	✓	-
A505 (07:10 hrs Waterford – Heuston)	-	✓	-	✓
A504 (10:15 hrs Heuston – Waterford) to Carlow	✓	☑	✓	☑
A504 (Carlow – Waterford) from Carlow	✓	☑	☑	✓

Figure 58 – Rostered & local arrangements for Waterford – Heuston – Waterford services

447 Although this arrangement started in January 2013, the District Manager and the DTE were not aware of this arrangement.

Fatalities, injuries and material damage

Fatalities and injuries

448 There were no fatalities or injuries as a result of this incident.

Material damage

449 There was no material damage to the infrastructure, rolling stock or signalling system as a result of this incident.

External circumstances

450 The weather on the day of the incident, as recorded by Met Éireann, was fine, dry and bright with temperatures between 3 – 6° C.

451 No factors associated with the weather conditions are thought to have contributed to the incident.

Evidence

Signalling

<u>General information</u>

452 Signal WL167 is located approximately 215 m off the platform on the right hand side exiting Muine Bheag Station. It is a two aspect signal mounted on a standard height pole that can display a red or green aspect, see Figure 59. Signal WL167 is the starting signal for the Muine Bheag to Kilkenny section. The sighting meets the requirements set out in I-SIG-2043.

Figure 59 – Signal WL167 & sighting from cab of Signal WL167

453 Muine Bheag Station Platform is a curved platform, see Figure 61. As a result the PIC has to be in a position where he/she can see Signal WL167 (Figure 60), and the driver, prior to giving the ‘Ready to Start’ indication.

Figure 60 – PIC's view from platform of Signal WL167

454 The driver should also be able to acknowledge the 'Station Work Complete' and 'Ready to Start' signals given by the PIC, see Figure 61, for a view of the PIC taken adjacent to the driving cab. The 'Station Work Complete' and 'Ready to Start' indications will be discussed in paragraphs 457 - 463.

Figure 61 – Curved platform & driver's view of PIC

Instructions to drivers in relation to SAS & SOY SPADs

455 The Professional Driving Handbook includes typical errors and error prevention techniques in relation to avoiding SAS and SOY SPADs in Section 5.1 ‘Avoiding start against SPADs’. Typical errors include not checking the signal, assuming it is off; and failure to control distraction. The full list is provided in Figure 62.

456 This section also provides techniques to avoid SAS and SOY SPADs, these include (for the full list see Figure 62) the checking of the signal prior to receiving the ‘Ready to Start’ signal, stating “Do not look for the ‘ready to start’ signal until the ‘platform starting signal’ has been cleared”. IÉ have developed the saying “Remember – When the signal is red don’t stick out your head”.

Typical errors leading to start against SPADs

- ✘ Not checking the signal, assuming it is off.
- ✘ Not using the reminder appliance, where provided.
- ✘ Looking at the wrong signal.
- ✘ Failure to control distraction.
- ✘ Failure to remember the aspect of the last signal passed (SOY SPAD).

Techniques to avoid Start Against SPADs

- ✔ Avoid being distracted when taking charge of a train from another driver.
- ✔ Always use your driver reminder appliance, where provided.
- ✔ If you are in doubt as to a signal aspect due to sunlight or if a semaphore signal is not showing correctly, clarify the signal aspect with the signalman immediately.
- ✔ Do not look for the ‘ready to start’ signal until the ‘platform starting signal’ has been cleared. Remember - “When the signal is red don’t stick out your head”.

Techniques to avoid SOY SPADs

- ✔ Be extra vigilant when starting from platforms where the next signal is not in view after receiving a caution aspect or if a platform starting signal is displaying a caution aspect. Memorise the last signal aspect using risk triggered commentary and limit the amount of traction power taken.

WARNING

REMEMBER

IF IT’S RED...

KEEP IT
IN YOUR HEAD!

Figure 62 – Extract from Professional Driver’s Handbook – Avoiding Start Against SPADs

'Station Work Complete' & 'Ready to Start' Signals

Instructions & Risk Assessments for PICs

457 Section H, 5.0, 'Instructions to Persons in Charge' sets out the requirements for PICs in relation to starting trains from platforms under Clause 5.3, 'What you must do when starting a train from a platform'. Clause 5.3.2, 'Driver Only trains with power-operated doors' requires that the PIC may give the 'Station Work Complete' signal to the driver when the station work is complete and the doors are ready for closing.

458 The PIC may give the 'Train Ready to Start' signal when the PIC has checked that all doors are properly closed and that the train is safe to start. Clause 5.3.4, 'Where a signal applying to the starting of the train is provided', states that: "where practicable, you must check that this signal has been cleared before giving any signal to the Guard or Driver concerning the starting of any train".

459 PICs are also provided with a Prompt Card (as discussed briefly in paragraph 225) which should be used in conjunction with Section H of IÉ's Rule Book. This Prompt Card sets out the correct procedure for despatching trains, see Figure 63. The correct despatch procedure includes that the PIC should "check (where possible) that the starting signal is off[9]".

CORRECT DESPATCH PROCEDURE

TO BE USED IN CONJUCTION WITH SECTION H OF THE RULE BOOK

- Position yourself at an optimum point on the Platform and check (where possible) that the starting signal is off.
- When satisfied that boarding is completed and there are no visible hazards give the station work complete signal to the driver.
- The Station work complete signal is one arm raised above the head in daylight or a white light held above the head at night or poor visibility.
- When satisfied that the doors are closed properly and there are no visible hazards give the driver the ready to start signal.
- The ready to start signal is a green flag waved above the head or a green light held steadily during darkness or poor visibility.
- Monitor the train as it departs the platform, look for signs of hazards and do not leave the platform until the whole train has safely departed the platform.

FOCUS ON THE CORRECT PROCEDURE FOR EVERY TRAIN DESPATCH!

Figure 63 – Platform Train Interface & Despatch Procedure Prompt Card

[9] "Starting signal is off" is a term used by IÉ to say that the signal is indicating a proceed aspect.

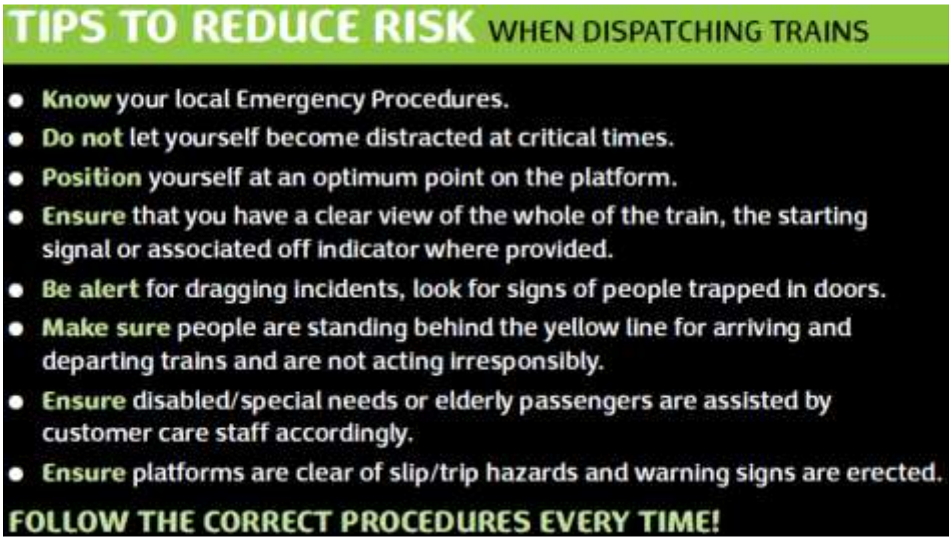
460 The Prompt Card also identifies a number of 'Typical Hazards' at the platform train interface and 'Tips to Reduce Risks' when despatching trains, see Figure 64 and Figure 65, respectively.


TYPICAL HAZARDS AT THE PLATFORM TRAIN INTERFACE

- Being distracted from your intended task by customer requests/ announcements/telephone calls.
- Passengers running for trains/passenger misbehaviour/intoxicated.
- Passengers unable to move away from a moving train due to their clothing or other possessions being trapped by a closed door.
- Overcrowding - large volumes of passengers on platforms can make it difficult to confirm that doors are fully closed and not obstructed.
- The curvature of platforms, making it difficult to see the full length of the train or the signal.
- The curvature of the platform may cause an excessive gap between the platform edge and the train.
- Platform structures/furniture obstructing signal off indicators or view of train.
- Slips trips and fall hazards due to wet platforms, ice or snow.

Figure 64 – Typical Hazards

461 One of the hazards includes the difficultly of seeing the signal, although this is specific to curved platforms. And one of the tips includes 'ensure you have a clear view of… the starting signal'.


TIPS TO REDUCE RISK WHEN DISPATCHING TRAINS

- Know your local Emergency Procedures.
- Do not let yourself become distracted at critical times.
- Position yourself at an optimum point on the platform.
- Ensure that you have a clear view of the whole of the train, the starting signal or associated off indicator where provided.
- Be alert for dragging incidents, look for signs of people trapped in doors.
- Make sure people are standing behind the yellow line for arriving and departing trains and are not acting irresponsibly.
- Ensure disabled/special needs or elderly passengers are assisted by customer care staff accordingly.
- Ensure platforms are clear of slip/trip hazards and warning signs are erected.

FOLLOW THE CORRECT PROCEDURES EVERY TIME!

Figure 65 – Tips to reduce risk

462 The 'danger aspect' (red signal) has not been specifically identified as a hazard or the risk associated with giving the 'Ready to Start' signal against a danger aspect has also not been identified.

463 In the risk assessment for Muine Bheag Station, there are no risks identified with the 'Station Work Complete' and 'Ready to Start' signals.

<u>Instructions to Drivers</u>

464 As mentioned previously, Section 5.1, 'Avoiding start against SPADs' of the Professional Driving Handbook gives the following instruction to drivers "Do not look for the 'ready to start' signal until the 'platform starting signal' has been cleared". It also identifies the role of the PIC and that "not checking the signal, assuming it is off" is a typical error for SAS SPADs.

Training & Competency Management

<u>Driver A505</u>

465 Driver A505 was passed as competent in October 2005 and received his last FDA in March 2013 where there were no issues identified.

466 Driver A505 was familiar with the EPTs from the Professional Drivers Handbook and the EPTs, however, he had not applied any of these techniques on the day of the incident.

<u>PIC Muine Bheag</u>

467 PIC was confirmed to be a competent staff member who was passed competent as a PIC Muine Bheag in 2006 and who received his last refresher training in 2012.

468 The PIC Muine Bheag was familiar with Prompt Card for the despatch of trains.

<u>Trainee Driver</u>

469 The Trainee Driver was in his third week of training with IÉ's driver training school and as such had no formal competencies. He had been briefed on his role in the driving cab (i.e. not to distract the drivers).

Trainee Drivers Familiarisation

470 Trainee drivers travel with lead drivers in the cab to become familiar with the driving experience. Trainee drivers are told not to talk to drivers on the approach to stations or signals. They are not required to perform any duties in the cab and they are not required to check the signals.

Sequence of Events

Events before the incident

471 A system had developed in January 2013 whereby local drivers informally swapped driving rosters.

472 Driver A505 booked on duty at 06:10 hrs on the 9th April 2013 and read his notices for the day, including the *Weekly Circular* which included a TRV crossing at Muine Bheag Station (which was not a normally scheduled movement).

473 Driver A505 commenced driving duties with the 07:10 hrs passenger service from Waterford to Heuston. Driver A505 took a personal needs break on arrival at Heuston. Here, Driver A505 discussed driving duties with Driver A503 (rostered to driver the 10:15 hrs passenger service from Heuston to Waterford) and it was agreed between the drivers that Driver A505 would take over driving duties at Carlow to allow Driver A503 to have a break.

474 At 10:05 hrs the TRV departed Waterford; the TRV was scheduled to cross Train A304 at Muine Bheag Station.

475 At 10:15 hrs Driver A503, accompanied by Trainee Driver, departed Heuston (towards Waterford).

476 On the journey to Waterford, at Carlow Station, Driver A505 entered the cab and took over driving duties for the remainder of the journey to Waterford. Driver A503 went to sit in the train saloon. The Trainee Driver remained in the driving cab with Driver A505.

477 At 11:11 hrs Driver A505 departed Carlow Station.

478 At 11:18:30 hrs the TRV was due to arrive at Muine Bheag Station and cross with Train A504, however, the TRV was delayed.

479 At 11:19:00 hrs, on the approach to Muine Bheag Station, Train A504 passes Signal WLR161 displaying a double yellow aspect. At 11:19:49 hrs Train A504 passes Signal WL161 displaying a single yellow aspect. At 11:21:52 hrs Train A504 arrives at Muine Bheag Station, see Figure 66 for a signalling sequence on Train A504's approach to Muine Bheag Station & Platform (located on the crossing loop). Signal WL167 was displaying a red aspect.

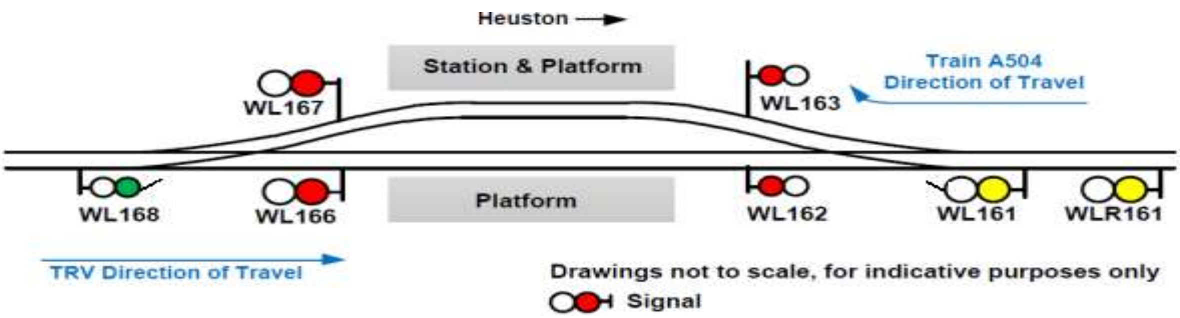


Figure 66 – Signalling sequence for Train A504 & TRV on approaches to Muine Bheag

480 After performing a number of platform duties, such as ensuring all passengers disembarked and boarded the train safely, the PIC Muine Bheag gave the 'Station Works Complete'. The Trainee Driver relayed this information to Driver A505, who requested that the Trainee Driver close the doors (as the controls were on the Trainee Driver's side of the cab).

481 After the doors had closed, the PIC Muine Bheag gave the 'Ready to Start' indication, despite seeing that Signal WL167 was displaying a red aspect (danger).

482 At approximately this time, the TRV had been given the proceed aspect (Signal WL168) into Muine Bheag Platform, Figure 66.

483 The Trainee Driver saw the 'Ready to Start' indication and said to Driver A505 that he "was clear to go" or something to that effect. Driver A505 was watching the PIC Muine Bheag on the in-cab MMI screen and had seen both indications.

484 Driver A505 did not look at Signal WL167, which is positioned approximately 215 m off Muine Bheag Station Platform. When Driver A505 normally travelled through Muine Bheag Station, Signal WL167 would have been displaying a proceed aspect on departure.

485 The Trainee Driver, although only on in-cab familiarisation, also did not see that Signal WL167 was displaying a red aspect as he had been standing and the train blind was pulled down.

486 At 11:22:42 hrs Driver A505 then started Train A504, departing Muine Bheag Station. Driver A505 and the Trainee Driver were unsure if they were engaged in conversation on departing the station, but acknowledge that may have been engaged in light conversation.

487 At 11:23:10 hrs, Train A504 had travelled almost 200 m when Driver A505 saw Signal WL167 displaying a red aspect and immediately applied the emergency brake.

Events during the incident

488 Despite the emergency brake being applied, the front of Train A504 passed Signal WL167 at danger, without authority, coming to a stop a short distance past the signal.

489 The signalman contacted Driver A505 on the train radio, after receiving a SPAD alarm for the signal; and informed him he had passed Signal WL167 at danger and not to move the train.

Event after the incident

490 The DM Waterford contacted Driver A505 in relation to the SPAD to assess the situation. The DM Waterford was initially confused as to why Driver A505 was driving the train, this was as a result of Driver A503 travelling in the train saloon as a result of the local arrangements between drivers.

491 Driver A503 was requested to return Train A504 to Muine Bheag Station, which he carried out without incident.

Similar occurrences

General information

492 Between January 2012 and June 2015, inclusive, there have been eighteen recorded SAS SPADs and eight SOY SPADs, totalling twenty-six SAS or SOY SPADs. The SPADs are as follows:

- SAS SPAD at Signal PE31s, Pearse (Dublin), 16th January 2012;
- SAS SPAD at Signal LJ368, Limerick Junction, 7th March 2012;
- SAS SPAD at Signal BY488, Ballybrophy (Laois), 8th May 2012;
- SOY SPAD at Signal TS469, Thurles (Tipperary), 1st November 2012;
- SAS SPAD at BR44s, Bray (Wicklow), 5th February 2013;
- SAS SPAD at SL719, Killucan (Westmeath), 21st June 2013;
- SOY SPAD at LK5, Limerick (Limerick), 8th July 2013;
- SOY SPAD at Signal GL353, Athenry, 10th July 2013 (under degraded train operations);
- SAS SPAD at TL241, Killarney (Kerry), 9th August 2013;
- SOY SPAD at Signal DD262, Dundalk, 10th August 2013;
- SAS SPAD at PE35s, Pearse (Dublin), 10th August 2013;
- SAS SPAD at TL226, Rathmore (Kerry), 26th February 2014;
- SOY SPAD at HK196, Curragh (Kildare), 14th March 2014;
- SAS SPAD at DD269, Dundalk, 13th May 2014;
- SAS SPAD at MW826, Mallow, 16th May 2014;

- SOY SPAD at Signal CE842, Glounthaune, 29th June 2014;
- SOY SPAD at Signal BR36, Bray (Wicklow), 20th August 2014;
- SAS SPAD at SAOIB, Limerick, 24th September 2014 (under degraded train operations);
- SAS SPAD at Signal HN291, Heuston (Dublin), 11th October 2014;
- SAS SPAD at Signal XX062US, Shanclogh, 15th January 2015 (under degraded train operations);
- SAS SPAD at Signal SL817, Boyle (Roscommon), 18th January 2015;
- SAS SPAD at Signal DN201, Howth (Dublin), 21st April 2015;
- SOY SPAD at Signal BR31, Bray (Wicklow), 28th April 2015;
- SAS SPAD at Signal RL543, Enniscorthy (Wexford), 9th June 2015;
- SAS SPAD at Signal MN143, Maynooth (Kildare), 23rd June 2015;
- SAS SPAD at Signal CY69, Fairview (Dublin), 25th June 2015.

493 These SPADs are discussed in details in Part 8, Similar Occurrences, of this report.

Analysis

Signalling

494 The signalling system was in working order at the time of the incident and meets the requirements set out in I-SIG-2043. Signal WL167 is the starting signal for departing the station, but the signal is located approximately 215 m off the platform on the right hand side exiting Muine Bheag Station.

Error Prevention Techniques in relation to SAS/SOY SPADs

General description

495 EPTs, in terms of SAS and SOY SPADs, will be discussed in relation to the documentation available to drivers, such as the Professional Driving Handbook and Competence Standards will be discussed below. The actions of the driver on the day of the incident, will also be discussed, below (paragraphs 501 - 504).

496 The use of EPTs in relation to the SAS and SOY SPADs from 2012 to mid-2015, collectively, will be discussed in 'Part 8 – A Review of all Category A SPADs (January 2012 – June 2015).

Driver documentation in relation to EPTs for SAS/SOY SPADs

497 The Professional Driving Handbook includes typical errors (such as not checking the signal, assuming it is off, and failure to control distraction) and EPTs to manage the errors (such as RTC and vocal reminders "Remember – When the signal is red don't stick out your head") in relation to avoiding SAS and SOY SPADs.

498 The Competence Standards focuses on the key activities and tasks that train drivers undertake as part of their role, including the specific risks associated with the operation of IÉ services, which would include starting against signals at red or yellow. Specifically, the 'Mobilise and start trains', sets out a number of requirements for assessment, such as drivers confirming the signal is at proceed prior to starting (prevention of SAS SPADs); or ensuring extra vigilance when starting on a cautionary aspect (prevention of SOY SPADs); as well as explaining the locations for the potential of SAS and SOY SPADs and demonstrating the appropriate actions at these locations.

Training & competence management of parties involved in the incident

Driver A505

499 Driver A505 was passed as competent on the 10/10/2005, with his last FDA, prior to the incident, being held on the 26/03/2013 with no issues identified; he also attended a SBUD on the

07/02/2013. At the time of the SPAD, Driver A505 was classified as a Category U Driver, with no previous operational safety related occurrences.

PIC Muine Bheag

500 The PIC Muine Bheag has held his certificate of competence since 20/09/06, with his latest refresher held on the 22/05/2012 with no issues identified.

Actions of parties involved in the incident

Driver A505

501 In relation to the above documentation for drivers in relation to EPTs for SAS/SOY SPADs, Driver A505 did not utilise the information available, in that he did not identify and manage the typical errors associated with SAS SPADs, as he:

- Did not check the aspect of Signal WL167 at any stage prior to or after PIC Muine Bheag gave the 'Train Ready to Start' signal despite the signal displaying a red aspect);
- Assumed Signal WL167 was displaying a proceed aspect;
- Failed to manage the in-cab distraction as he may have been conversing with the Trainee Driver on the approach to Signal WL167.

502 In addition to this, Driver A505 was not anticipating the crossing of the TRV, which had been included in the Weekly Circular. This was not a movement that was normally scheduled for this time and location; and Driver A505 had expected Signal WL167 to be displaying a proceed aspect, which would be the normal sequence of signals when travelling through Muine Bheag Station.

503 By not identifying these as typical errors, Driver A505 then did not apply any EPTs to manage these, such that he did not apply any form of EPTs, such as RTC or using vocal reminders.

504 The factors identified in the paragraphs above resulted in Driver A505:

- Having an incorrect expectation that Signal WL167 would be displaying a green aspect as he:
  - Normally exited Muine Bheag Station with a proceed aspect;
  - Was unaware that there was a TRV scheduled crossing his train at Muine Bheag Station;
  - Saw that the PIC Muine Bheag had given the 'Train Ready to Start' signal;
- Being distracted from the primary task of driving due to the presence of the Trainee Driver (without being able to use any EPTs to manage this distraction).

Trainee Driver

505 As the Trainee Driver was travelling in the driving cab on routine in-cab familiarisation at the time of the incident. At the station, he acknowledged the signals from the PIC Muine Bheag and relayed the information to Driver A505; he also pressed the button to close the doors of the train. These actions did not contribute to the SPAD.

506 The Trainee Driver did not check Signal WL167 prior to departing the station, however, he was not required to do so; however, if there was a requirement for trainee drivers to check the signals, the Trainee Driver may have alerted Driver A505 to the red signal.

507 The Trainee Driver was aware that he was not to distract the driver on the approach to stations or signals (paragraph 469 - 470). It cannot be fully established by the RAIU whether they were engaged in conversation at the time.

PIC Muine Bheag

508 The PIC Muine Bheag gave the ‘Ready to Start’ signal, despite knowing that Signal WL167 was displaying a red aspect, however, the PIC Muine Bheag assumed that Driver A505 would proceed to the signal, which was located 215 m off the platform, and wait for the signal to upgrade to a proceed signal.

Conclusions

Immediate cause, contributory factors and underlying factors

Immediate cause

509 The immediate cause of the Driver A505 starting against and travelling past Signal WL167 at danger was that he did not check the signal prior to departing Muine Bheag Station.

Contributory factors

510 Contributory factors to Driver A505 not checking Signal WL167 prior to departing the station:

- CF-11 – There was no DRA in the driving cab which would have reminded Driver A505 to check the signal prior to starting against Signal WL167;
- CF-12 – Driver A505 had an incorrect expectation that Signal WL167 was displaying a proceed aspect due to an over-familiarisation with the normal signal sequencing at Muine Bheag Station; not knowing that a TRV was due to cross his train at Muine Bheag Station; and receiving the 'Ready to Start' signal from the PIC Muine Bheag;
- CF-13 – Driver A505 may have been distracted by the presence of the Trainee Driver in the driving cab;
- CF-14 – Driver A505 did not apply any EPTs to remind him to check the signal and manage the distraction in the cab, as he did not have appropriate EPT training;
- CF-15 – PIC Muine Bheag giving the 'Ready to Start' signal despite knowing the signal was at danger.

Underlying cause

511 Underlying cause to the SPAD is:

- UC-05 – The EPTs training and competency management systems are not fit for purpose, especially for SAS SPADs which account for the largest amount of SPADs on the IÉ network, and where there was, historically, no DRA present in the driving cabs.

Section 3

Part 8 – A Review of All Category A SPADs

Part 9 – SPAD Management

Part 10 – SPAD Management of Drivers

RAIU
Railway Accident Investigation Unit

PART 8 – A REVIEW OF ALL CATEGORY A SPADs (January 2012 – July 2015)

Introduction

512 Parts 5, 6 and 7 of this report set out the events leading to the SPADs with the highest SRRs for the relevant event types, i.e. SPADs during normal train operations, SPADs during degraded train operations and SAS/SOY SPADs. The 'Evidence' section of this part of the report outlines all the other Category A SPADs (from January 2012 to July 2015) by these event type:

- SPADs during normal train operations;
- SPADs during degraded train operations;
- SAS SPADs;
- SOY SPADs.

513 In the 'Analysis' section of this part of the report, the RAIU will review and analyse the factual information from all the Category A SPADs (collectively), such as:

- Experience of the drivers – in terms of time driving;
- Driver profile history – in terms of previous safety operational incidents);
- Times of SPAD occurrences;
- Driving time prior to the occurrence of SPADs;
- Annual leave/ return to work arrangements;

514 The RAIU will then review and analyse the SPADs in terms of contributory factors, assigning the appropriate, and previously identified human factor contributory factor terms (i.e. loss of situational awareness, distraction and preoccupation, incorrect expectation). The RAIU will also identify where third parties have been contributory to the occurrence of the SPAD (e.g. through poor communications). These human factor contributory factors will be reviewed and analysed by event type (i.e. SPADs during normal train operation; SPADs during degraded conditions; SAS and SOY SPADs), to identify any common trends related to the occurrence of SPAD events.

515 The RAIU will also review the use of EPTs by drivers involved in the SPAD occurrences.

Evidence

Summary of Category A SPADs during normal train operations

General description

516 SPADs during normal train operation, similar to the SPAD at Millstreet on the 8th December 2013 (Part 5 of this report) are SPADs which occurred while the train was operating in normal conditions (driving or shunting), and moving towards the signal at danger after previously receiving a cautionary aspect. These SPADs include:

- SPAD at Signal XE010DS, Longpavement Level Crossing, on the 9th April 2012;
- SPAD at Signal XE061, Curravorrin Level Crossing, on the 2nd October 2012;
- SPAD at Signal GL336, Caherryon Level Crossing, on the 26th October 2012;
- SPAD at Signal HK152, Hazelhatch, on the 15th February 2013;
- SPAD at Signal WL131, Athy/Cherryville Junction, on the 12th March 2013;
- SPAD at Signal DD276, Dundalk, on the 9th May 2013;
- SPAD at Signal CY26, Connolly (Dublin), on the 3rd April 2014;
- SPAD at Signal CY33, Connolly, on the 11th September 2014;
- SPAD at Signal PE34, Pearse (Dublin), 18th January 2015;
- SPAD at Signal GL391, Galway Station (Galway), 30th January 2015;
- SPAD at Signal CL102, Clonsilla (Dublin), 15th May 2015.

517 These SPADs will be briefly outlined below, and the findings of the RAIU will be given.

518 It should be noted that although not identified in the individual RAIU findings, the RAIU found, in all SPAD incidents related to normal train operations, that none of the drivers involved applied any form of EPTs at the time of the SPAD.

SPAD at Signal XE010DS, Longpavement Level Crossing (Limerick), on the 9th April 2012

519 On the 9th April 2012, while operating the 14:15 hrs passenger service from Limerick to Galway (Train A786) the driver (Driver A786) approached Longpavement Level Crossing, he approached Signal XE010DD displaying a yellow aspect and he did not slow his train as he approached Signal XE010DS displaying a red aspect. On seeing the red aspect Driver A786 immediately applied the emergency brakes, but came to a stop approximately 4 m past Signal XE010DS.

520 Driver A786 called the GLS, but there was a misunderstanding, whereby, the GLS though that Train A786 was blocking Longpavement Level Crossing. The GLS contacted the level crossing keeper who informed him that the gates were closed. The GLS then informed Driver A786 “that

he should have a green signal". Driver A786 propelled[10] Train A786 behind Signal XE010DS to look at the signal, and informed the GLS that Signal XE010DS was displaying a red aspect (Signal XE010DS was passed at red and remained red); only then did the GLS realise that Train A786 had travelled passed Signal XE010DS at danger (there is no SPAD alarm for Signal XE010DS).

521 Driver A786 had almost three years of driving experience and was classified as a Category U Driver with no previous operational safety related occurrences or requirements for additional support.

522 IÉ assigned an SRR of 13 to the SPAD. IÉ's internal Investigation Remit (Safety Office Ref. 12/049) published the 19th April 2012 found that the cause of the SPAD was that Driver A786 did not: react to the cautionary aspect at XE010DD; apply defensive driving techniques; or apply the '15 x 20' Rule. Underlying causes associated to the SPAD were Driver A786 did not control the speed on the approach to Signal XE010DS or have permission to move Train A786 after the SPAD.

523 As a result of the incident, Driver A786 was reclassified as a Category B driver and was assigned to a DD&SS for a period of two years. The lessons learnt from the SPAD were highlighted at a SBUD for drivers on the Limerick – Galway Line.

524 The RAIU review of the incident found that Driver A786 had an incorrect expectation as to what aspect XE010DS would be displaying as he had previously approached the signal displaying a green aspect on numerous occasions. Poor communications after the incident was also identified, whereby it took some time for the GLS to realise that a SPAD had occurred.

SPAD at Signal XE061, Curravorrin Level Crossing, on the 2nd October 2012

525 On the 2nd October 2012 the driver (Driver A489) was operating the 17:30 hrs passenger service from Galway to Limerick as normal. When the train initiated Curravorrin Level Crossing, the LCCO confirmed the barriers were down but did not ensure that the signals had upgraded for the approaching train. As Driver A489 approached the up distant signal for the level crossing, Signal XE061UD, it was displaying a yellow aspect (this was a fixed yellow signal due to repeated theft of the SET cables). He was travelling at 45 mph (72 km/h) due to the 45 mph (72 km/h) TSR.

526 On passing Signal XE061UD he approached a speed board for 60 mph (96 km/h) and forgot about the previous signal at yellow and began to increase the speed of the train. Driver A489 then approached Signal XE061US, and on noticing that the signal was displaying a red aspect he

[10] Propelling in this instance is a violation.

applied the brakes and stopped the train; however, the train passed Signal XE061US by approximately 10 feet (3 m).

527 Driver A489 had twenty-four years of driving experience and was classified as a Category U Driver at the time of the incident with no requirements for additional support. Driver A489 had two previous operational safety related occurrences (platform overrun and speeding) in the ten years previous to the incident which had resulted in him being reclassified as a Category B Driver and assigned a DD&SS for a two year period.

528 IÉ assigned a SRR of 15 to the SPAD. IÉ's 'Five Working Day Panel Review' (Ref SYNERGI Ref: 18103), published on the 15th October 2012, found that the immediate causes of the SPAD was that Driver A489 failed to stop the train; and that the train brake did not operate as expected. Underlying causes were identified as: Driver A489 not correctly responding to the cautionary signal (XE061UD); the LCCO not ensuring the signals ungraded when he requested them; Signal XE061US being fixed at yellow; the location of the speed board and the brake performance. The report made recommendations to SET in terms of the signal, to the DM Limerick for the inclusion of the risks associated with the fixed yellow to be included in the route risk assessment and to the CTE for the inclusion of human factors training in the SBUD days. As a result of the incident, Driver A489 was reclassified as a Category B Driver, and assigned a DD&SS for a period of two years.

529 The RAIU review of the incident found that Driver A489 had lost situational awareness as he had forgotten that he had passed a cautionary aspect, this was heavily influenced by the incorrect placing of a speed board[11] in a location where drivers should not be increasing their speeds causing Driver A489 to be distracted by the speed board.

SPAD at Signal GL336, Caherryon Level Crossing, on the 26th October 2012

530 The driver (Driver A708) booked on duty at 16:00 hrs and read his notices for the day. He then worked the 17:07 hrs passenger service from Athlone to Galway (Train A708). Driver A708 approached Signal GLR336 (see Figure 67) on a yellow aspect which indicated that the next signal, Signal GL336 (see Figure 68), would be at danger. The driver applied the train brakes to reduce speed with the intention of stopping at Signal GL336, however, due to the strong sunlight he did not see Signal GL336 until he was too close to stop at the signal, and past Signal GL336 at danger by approximately 66 yards (60 m).

[11] The RAIU have found that the placement of speed boards near signals has been a contributory factor in four SPADs reviewed during this RAIU investigation, including the SPAD at Millstreet on the 8th December 2013, as a result this warrants a safety recommendation, see Part 14.

531 Driver A708 had eighteen years of driving experience and was classified as a Category U (Uncategorised) at the time of the incident with no requirements for additional support. Driver A708 had previously been classified as a Category B Driver and a Category C Driver as a result of two SPADs in Tullamore (Signal TE138) in 1998 and Heuston (Signal HN286) in 2003.

Figure 67 – Signal GLR336

Figure 68 – Signal GL336

532 IÉ assigned an SRR of 16 to the SPAD. IÉ's internal investigation 'Report of the Investigation into the Signal GL336 passed at danger, 26th October 2012' published on the 23rd December 2012 found that the sunlight (from the setting sun, which was low in the sky) was very strong and the windscreen was smudged and that these together affected Driver A708's view of Signal GL336. IÉ internal investigation report (Synergi Ref – 18209) published on the 23rd December 2012 identified the immediate cause as Driver A708 failing to control his train in accordance with the restrictive aspect (yellow signal) in Signal GLR336 and passed GL336 at danger. Underlying causes were identified as: the very strong sunlight at the time (with the sun shade on the 2800 DMU driving cars not being able to be lowered enough to block out strong sunlight) and the windscreen of the cab being smudged, which both this affected his view of Signal GL336; and Driver A708 failing to react to the yellow aspect in Signal GLR336 and applying the train brakes accordingly.

533 As a result of the incident, Driver A708 was reclassified as a Category A driver and placed on a DD&SS with special emphasis on human factors and defensive driving (there were instances of over-speeding identified on the day of the SPAD during the investigation). Two recommendation resulted from this investigation, which included for the introduction of a more robust system to be put in place to deal with driving in strong sunlight (by adding to defensive driving presentation

delivered on SBUD dates); and driver briefings on different braking capabilities of different traction units (by adding to the traction section of presentation delivered on SBUD dates).

534 In addition to the IÉ findings, the RAIU review of the incident found that Driver A708 may have become distracted by a passenger taken ill earlier in the service, which is an unusual occurrence for a driver; and that Driver A708 had lost situational awareness in terms of the location of the signal due to the distraction of the strong sunlight.

SPAD at Signal HK152, Hazelhatch, on the 15th February 2013

535 On the 15th February 2013 as the 06:25 hrs passenger service from Portlaoise to Heuston was approaching Hazelhatch, the driver (Driver P202) thought he saw that Signal HK154 was displaying a double yellow aspect (meaning that the next signal would be a single yellow). However, Signal HK154 was displaying a single yellow aspect (meaning that the next signal was red). Driver P202 did not look at the CAWS after passing Signal HK154 or on the approach to Signal HK152. As Driver P202 approached Signal HK152 he saw that it was displaying a red aspect and he immediately applied the brakes, but passed the signal by forty metres before coming to a stop.

536 Driver P202 had five years of driving experience and was classified as a Category U Driver at the time of the incident with no requirements for additional support. Driver P202 had been previously reclassified as a Category B Driver as a result of a SPAD at Heuston Station in 2007 when Signal HN286 was passed at danger during a shunting movement; which resulted in Driver P202 being placed on a DD&SS for a period of two years.

537 IÉ assigned an SRR of 0 to the SPAD. IÉ’s internal Five Working Day Panel Investigation, published on the 19th February 2013, identified the immediate cause as the “Driver passed Signal HK152 at danger because of a failure to react appropriately to the previous restrictive signal aspect displayed in HK154 and in his in-cab CAWS. The underlying factor was identified as the driver being “over reliant on previous experience at this signal and failing to maintain the required level of concentration”. As a result of the SPAD, Driver P202 was reclassified as a Category B Driver and assigned a DD&SS for a period of two years; there was also a recommendation in relation to the auto-routing functions at HK152.

538 The RAIU review of the incident found that Driver P202 had become distracted by earlier issues with the doors in Kildare where he was eventually required to lock the doors off at Kildare. The RAIU also found that Driver P202 had an incorrect expectation as to the colour of the signals, this was as a result of the driver:

- Travelling the route the two days previous and receiving proceed aspects;
- Only being detained once previously at HK152;
- Knowing that the train in front of him had departed some time previously, and thought this would mean that the signals would be cleared for him.

SPAD at Signal WL131, Athy/Cherryville Junction, on the 12th March 2013

539 On the morning of the 12th March 2013 the Driver of the 07:25 hrs passenger service from Heuston to Waterford (Driver A500) was travelling with a Permanent Way Patrolman in the cab (whose role was to examine the line following adverse weather conditions from the previous night). As the train was approaching Athy, Signal WL131(R) was displaying a yellow aspect and 1,740 m further down the track Signal WL131 (see Figure 69) was displaying a red aspect. Having passed Signal WL131(R) displaying a cautionary aspect, Driver A500 made a brake application to slow the train.

Figure 69 – Signal WL131 with Athy Station in the distance

540 Driver A500 then noticed that there was no train travelling in the opposite direction at Athy Station (see Figure 69); as he was expecting to see the 07:10 hrs passenger service from Waterford to Heuston, which was scheduled to cross his train in Athy. This prompted Driver A500 to check the scheduled running time for his train and he picked up his Working Time Table (WTT) which was open on the driving console. However, to read the WTT he needed to put on his reading glasses.

541 Having consulted his WTT Driver A500 looked up and saw that Signal WL 131 displaying a red aspect and realised that the train was going to SPAD Signal WL131. Driver A500 immediately made an emergency brake application and the train came to a stop approximately two coach lengths beyond Signal WL131. Driver A500 spoke to the Controlling Signalman and acknowledged that he had passed Signal WL131 at danger.

542 Driver A500 had nearly ten years of driving experience and was categorised as a Category U Driver at the time of the incident with no recorded safety related occurrences in the previous ten years.

543 IÉ assigned an SRR of 18 to this SPAD. The internal IÉ investigation report determined that the immediate cause was that "the driver of A500 passed Signal WL131 at danger as he did not have his train under sufficient control approaching a red (stop) aspect" and that the underlying causes were that "The driver was consulting his WTT approaching Signal WL131 instead of giving his full attention to bringing his train under control" and that the "driver failed to prioritise his actions, instead of concentrating on Signal WL131 he was looking beyond the signal and querying why the train was not on the platform".

544 As a result of the incident Driver A500 was reclassified as a Category B Driver and placed on a DD&SS for a period of two years. In addition, the internal report recommended that the IÉ-RU Safety Manager was to publish a weekly circular notice reminding all staff whose duties require them to travel in the footplate should comply with driving cab protocol; and that IÉ-RU review the Professional Driving Handbook to ensure train operations in non-CAWS areas is adequately covered.

545 The RAIU review of the incident found that Driver A500 had initially become distracted by the Patrolman, as it was the Patrolman who first mentioned the crossing point. He became further distracted when he could not see the other train and consulted with the WTT. Driver A500 had also lost situational awareness due to operating services where CAWS was in operation in the weeks previous to the day of the SPAD and this was the first day Driver A500 was driving in a non-CAWS area after a number of weeks of driving in a CAWS area, which contributed in him not responding to the cautionary aspect as required.

SPAD at Signal DD276, Dundalk, on the 8th May 2013

546 Driver D822 booked on duty, fit and well rested at 17:30 hrs on the 7th May and operated six services without incident. During his last service, the 22:30 hrs passenger service form Pearse to Dundalk, Driver D822 arrived at Platform 2 in Dundalk without incident.

547 The normal manoeuvre is then to shunt the train onto Platform 1 to dispose of the train, however, on this occasion Platform 1 was under possession; therefore he was required to shunt the train into the running loop. To carry out this manoeuvre Driver D822 was required to shunt a train stabled on the running line into the yard, he did this without incident.

548 Driver D822 returned to his train on Platform 2. He thought that he was required to shunt over 201 Points and behind Signal DD277 to stable the train on Platform 1 (see blue line Figure 70), he had forgotten about the possession on Platform 1.

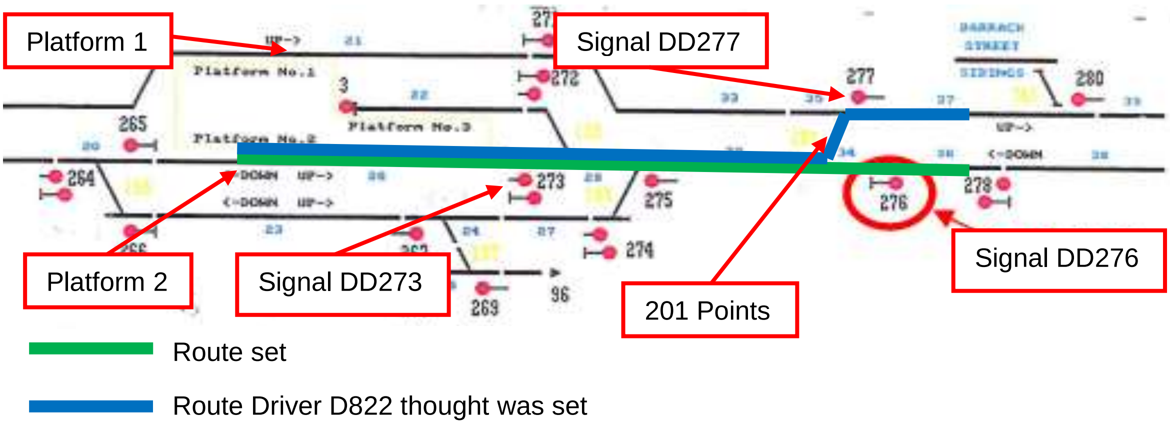


Figure 70 – Set and assumed manoeuvres

549 As a result, when Signal DD273 cleared, Driver D822 began the manoeuvre. As he approached Signal DD276, it was displaying two white lights in the vertical position, which means that the route is set to proceed to Signal DD276, (green line Figure 70). Driver A822 was not aware of this and still thought that he was about to traverse 201 Points and travel towards Signal DD277.

550 When Driver D822 past Points 201 without traversing them, he realised he was travelling towards Signal DD276, which was displaying a red aspect, the train was travelling at 35 mph (56.55 km/h). Driver D822 applied the full service and emergency brakes, but continued past Signal DD276 at danger by 75 m (it is noted in the report that Driver D822 stated that he only past Signal DD276 by a few inches).

551 Driver D822 had ten years of driving experience, and had undergone a FDA, an out-of-hours FDA and unannounced monitoring in 2013; as well as a Summary Assessment, train simulator training and attended a SBUD in 2012. At the time of the incident Driver D822 was classified as a

Category D Driver, requiring a low level of additional support and monitoring, as a result of overrunning a platform in 2007.

552 IÉ assigned an SRR of 14 to this SPAD. IÉ internal investigation report, (Report No. R0303-2014-17) published in March 2014, identified the immediate cause as Driver D822 not having his train under sufficient control. Causal factors to the incident included that Driver D822: made the wrong assumption about the manoeuvre required; was speeding; misread Signal DD273; and failed to see that Points 201 was in the reverse position. Underlying causes to the incident were the lack of out-of-hours monitoring of shunting in Dundalk and the known risk issues with Driver D822 (which were managed by a driving development plan).

553 As a result of this incident, Driver D822 was removed from driving duties. In addition, a review commenced related to the DD&SS (specifically the categorisation of drivers). The report made two other safety recommendations related to out-of-hours monitoring and DD&SSs.

554 The RAIU investigation found that Driver D822 had lost situational awareness as he had forgotten about the possession and he had not gained a clear understanding of the manoeuvre he was required to undertake, which resulted in him reverting to carrying out his normal manoeuvre, thus having an incorrect expectation of the signals.

SPAD at Signal CY26, Connolly (Dublin), on the 3rd April 2014

555 On the 3rd April 2014, Driver P709, signed on for duty fit and well rested at 17:30 hrs and operated services without incident. As Driver P709 approached Connolly Station, while operating the 22:05 hrs service from Drogheda to Connolly, he approached Signal CY18 which was displaying a red aspect, this cleared to yellow and Driver P709 proceeded towards Signal CY26. Signal CY26 and Signal CY33 were displaying red aspects, see Figure 71. Driver P709 acknowledged the CAWS downgrades for Signals CY18 and CY26.

556 Signals CY26 and CY33 can be viewed in tandem by drivers approaching the platforms at Connolly Station, see Figure 71. When Train P709 was 509 m from Signal CY26, Driver P709 commenced braking and continued to do so until he came to a stop 3 m past Signal CY26. Three seconds prior to the SPAD Signal CY33 had cleared to yellow, with the route indicator displaying that the route was set for Platform 4.

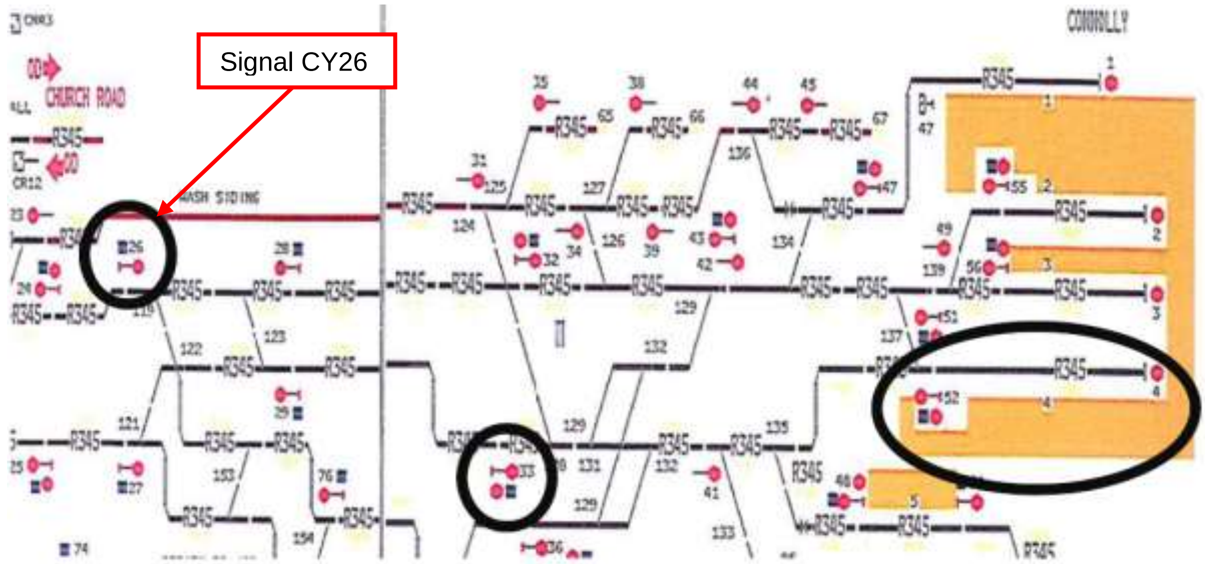


Figure 71 – Layout at Connolly Station

557 At the time of the incident, Signal CY26 had been previously past at danger on one occasion in the previous ten years.

558 Driver P709 had over nineteen years of driving experience and was classified as a Category U Driver at the time of the SPAD; Driver P709 had previously been reclassified as a Category B Driver as a result of a derailment in Tara Mines in 2011.

559 IÉ assigned an SRR of 14 to this SPAD. IÉ's internal Operational Occurrence Report (OOR) (Report No. R0903-2014-34) published on the 22nd August 2014 identified the immediate cause of the incident as Driver P709 failing to stop at Signal CY26 due to a lapse of concentration. The OOR identifies causal factors as Driver P709's personal issues and preoccupation with Signal CY33; it also notes incorrect prioritisation of signalling sequence by the signalman. The OOR identifies that the ability to view Signals CY26 and CY33 in tandem as an underlying factor.

Figure 72 – Signal CY26, with Signal CY33 in background

560 As a result of the incident Driver P709 was reclassified as a Category B Driver and placed on a DD&SS for a period of two years. In addition, SET carried out some maintenance works on the signals in the area and signalmen were requested not to clear CY33 when CY26 is at danger, where possible.

561 The OOR made three recommendations, two which were related to staff reporting personal issues to line managers and staff attending the Chief Medical Officer (CMO). And one recommendation was related to changing, if appropriate, Signal CY32 and CY33 to approach release to prevent read through of signals.

562 The RAIU review of the incident found that the personal issues identified in the IÉ report did not contribute to the incident. Driver P709 had lost situational awareness and had an incorrect expectation as to the signal's aspect, as he was looking beyond the signal into Connolly Station.

SPAD at Signal CY33, Connolly (Dublin), on the 11th September 2014

563 On the 11th September 2014 the driver (Driver E221) of the 16:15 hrs passenger service from Howth to Bray (Train E221) took over the service at Fairview. Approximately five minutes later he was approaching Connolly Station when he approached Signal CY26 displaying a red aspect, which subsequently upgraded to a proceed aspect and Train E221 continued past the signal, towards Signal CY33 which was displaying a red aspect. On passing Signal CY26 Driver E221 operated the running release of the ATP as the train approached CY33. He then started removing his high visibility vest due to the hot weather and he started to retrieve his water bottle when he noticed the sound of the beeping from the running release and realised he had passed Signal CY33 at danger and stopped his train.

564 Driver E221 had three years of driving experience and was classified as a Category U Driver with no previous operational safety related occurrences in the previous three years.

565 IÉ assigned an SRR of 14 to this SPAD. The internal IÉ investigation report found that Driver E221 “did not focus on the primary task of controlling the train on approach to Signal CY33”. The engagement of the ATP running release function on the approach to Signal CY33 was identified as a contributory factor[12]. Causation factors were identified as Driver E221 “engaging the running release” on the approach to Signal CY33 and being “distracted” by taking off his high visibility vest and retrieving the water bottle.

566 As a result of the SPAD, Driver E221 was reclassified as a Category B Driver and assigned a DD&SS for a period of two years. Procedures for the use of the running release were also submitted for review.

567 The RAIU review of the incident found that Driver E221 had initially become distracted and preoccupied with thinking about his planned annual leave (ten days commencing the day after the SPAD) which he had been discussing immediately prior to taking over the service at Fairview. He then became further distracted by the high visibility vest and the water bottle. In addition, Driver E221 may have had an incorrect expectation that the aspect of Signal CY33 would upgrade to a proceed/ cautionary due to previous instances of abnormal downgrades at CY26 and CY33 (due to SET issues)[13], as a result he did not immediately react to the ATP warnings.

[12] Drivers must engage the running release to approach a signal displaying a red aspect, this engagement of the running release on approach to a signal displaying a red aspect, overrides the train protection function of the ATP.

[13] Abnormal upgrades can change the expectation of drivers, as a result the RAIU feel this warrants a safety recommendation, see Part 14.

568 The RAIU also found that Driver E221 engaged the running release, which eliminated the train protection function of the ATP[14].

SPAD at Signal PE34, Pearse (Dublin), 18th January 2015

569 At 08:00 hrs on Sunday 18th January 2015, the driver (Driver A601) signed on duty, fully rested, in Connolly Station and operated the 10:25 hrs Connolly to Rosslare Europort passenger service (Train A600), without incident, to crossing point at Wicklow. He then worked the continuation, from Wicklow, of 09:40 hrs passenger service from Rosslare Europort to Connolly Station, Dublin (Train A601).

570 On the approach to Pearse Station at 12:18:14 hrs, Driver A601 acknowledged the downgrade to red in the CAWS, while the train was travelling at 19 mph (30.4 km/h) and 193 metres in rear of Signal PE34, see Figure 73.

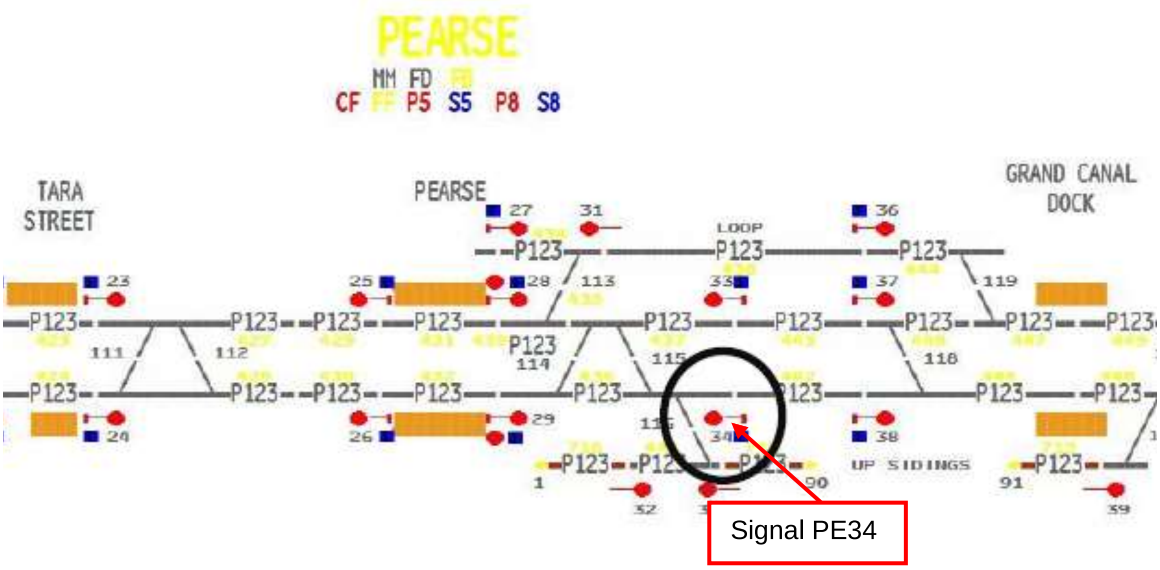


Figure 73 – Signalling at Pearse Station

571 Driver A601 stated that at this time he began to pack his bag in anticipation of finishing his turn of duty at Connolly Station.

572 Train A601 was travelling at 20 mph (32 km/h) when Driver A601 looked back at Signal PE34. He saw the red aspect and applied the emergency brake, however, he passed Signal PE34 at danger by approximately 5 m.

[14] The ability to 'override' the ATP, a system designed to prevent SPADs, through engaging the running release on approaching a red signal has been identified as a contributory factor in two SPAD incidents on the DART network; as a result this warrants a direct safety recommendation, see Part 14

573 Driver A601 has over eight years of driver experience and was classified as a Category U Driver with no previous operational safety related occurrences or requirements for additional support at the time of the incident.

574 The SPAD was assigned an SRR of 18. IÉ's internal OOR, published in April 2015, identified the immediate cause of the SPAD as Driver A601 not focusing on the primary task of controlling the train on approach to Signal PE34 while it was still at danger. The contributory factors were identified as Driver A601 deciding to personally optimise his time by packing his bag rather than focussing on the primary task of controlling the train on approach to a red signal (IÉ deem this to be a violation rather than an error); Driver A601 did this after acknowledging the CAWS downgrade. Underlying to the incident was the fact that the train was not fitted with ATP.

575 As a result of the SPAD, Driver A601 was reclassified as a Category B Driver and placed on a DD&SS for a period of two years. The OOR noted that the development of *IÉ Hybrid System* (IÉHS) is ongoing. As a result of these actions, there were no other recommendations.

576 The RAIU review of the incident found that Driver A601 had become distracted by packing his bag, which in turn resulted in him losing situational awareness, in that, he hadn't realised he was so close to Signal PE34.

SPAD at Signal GL391, Ceannt Station (Galway), 30th January 2015

577 At 13:00 hrs on the 30th January 2015 the driver (Driver A714) booked on duty; he was rostered to work two trains and finish the shift at 22:00 hrs. The driver had operated the 13:45 hrs Limerick to Galway Service when he was requested to move the 17:30 hrs passenger service from Heuston to Galway (Train A714), which arrived at Ceannt Station (Galway) at 19:57 hrs, from the Main Platform. Train A714 involved was a seven piece 22000 Class Inter City Railcar (ICR).

578 The Galway Station Controller told the Galway Line Signalman (GLS) to set the route to allow Train A714 to from the main platform into the Loop and then down behind signal GL391 which is located on the No.1 Road (see green movements 1a, 1b & 1c, Figure 74). (Note: A train consist of less than seven pieces are stabled in the Yard, Train A714 consisted of seven carriages). As there was an area of non-circuited track (see Figure 74), the Galway Station Controller had set the hand points, located between signals GL378s and GL391, to the normal position, i.e. to the No.1 Road. The Galway Station Controller talked to Driver A714 on the Main Platform, mainly in relation to a change of driving shift; it cannot be established if a clear instruction was given for the movement of Train A714 onto No.1 Road.

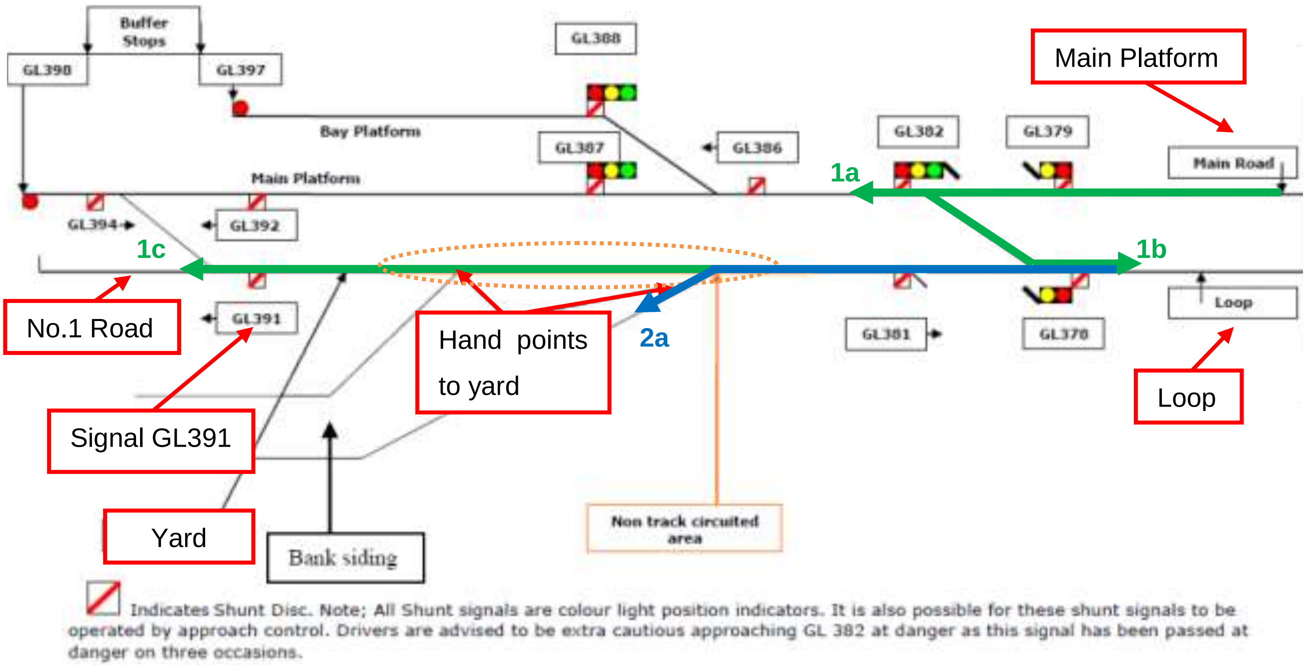


Figure 74 – Ceannt Station (Galway) Layout

579 The GLS was not familiar with the name 'No.1 Road', as he was more familiar with requests to place the train 'behind signal GL391'. As a result, the GLS thought the route was to be set into the Yard; and set the route from the Main Platform to signal GL378 on the Loop line at Galway (1a & 1b, Figure 74), and then cleared the route from signal GL378 to the Yard in Galway (blue route, 2a, Figure 74). As a result, the GLS did not clear the route into No.1 Road, and as a result, Signal GL391 remained at danger.

580 There was no communication between Driver A714 and the GLS in relation to the movement.

581 Driver A714 then proceeded to move the train, he had assumed that he was moving Train A714 into the Yard, he carried out the first movements as expected (1a & 1b, Figure 74). When Driver A714 approached the first set of handpoints, he was expecting the train to 'jolt' as it travelled over the handpoints into the Yard, he never felt the jolt and then remember it was a seven piece train and realised he was travelling to the No.1 Road. He then travelled over the second set of handpoints and passed Signal GL391 which remained at danger, and another 113 m towards the *stopblock* to stable the train. Driver A714 was unaware he had passed Signal GL391 at danger and returned to the Main Platform.

582 As Train A714 travelled past Signal GL391 at danger, the SPAD alarm was activated for the Signal and the GLS contacted the Galway Station Controller to advise him of the situation. When Driver A714 arrived at the Main Platform, the Galway Station Controller advised him of the SPAD.

583 At the time of the SPAD, Driver A714 was a PQA Driver, having entered the grade on the 17th May 2013. Previous to this SPAD, he had a SPAD on the 16th November 2013, he was also involved in a platform overrun; LRA was identified as contributory in both these incidents.

584 IÉ assigned a SRR of 10 to this SPAD. IÉ's OOR, published in July 2015, states that the immediate cause of the SPAD was "while conducting the shunt movement and after realising that the train was not going into the Yard sidings but to the No.1 Road the driver did not check the aspect in shunt signal GL391". A number of contributory cause were identified, including:

- Driver A714 did not pay sufficient attention to the route, points and signals during the movement. His focus was not on the primary task of the particular movement but was thinking ahead to the next train movement that he was to conduct. He was personally optimising in anticipation of finishing his shift early;
- The Galway Station Controller and GLS did not reach a clear understanding of the movements that were to take place. They did not clearly establish that the train was to go to the No. 1 Road;
- There was an over reliance by all parties on previous experience while conducting the movements. The placing of trains in the station was a routine task and complacency had set in resulting in the required communication protocols not being applied.

585 No underlying factors were identified by IÉ.

586 As a result of the SPAD, Driver A714, the GLS and the Galway Station Controller were screened for drugs and alcohol; all tests were negative. Driver A714 was placed on a DD&SS, the GLS received corrective coaching for safety critical communications (SCC) and resumed normal duties the next day, and he also underwent unannounced assessment two days after the incident. The Galway Station Controller also received corrective coaching for SCC. The shunting arrangements at Ceannt Station, which were under review prior to the occurrence, were updated, whereby the train drivers must communicate directly with the controlling signalman for movements around Ceannt Station. As a result of the above actions, no further recommendations were made as a result of this SPAD.

587 In addition to the IÉ findings, the RAIU found that poor communications between Driver A714, the GLS and Galway Station Controller contributed to the SPAD. This resulted in Driver A714 not having a full situational awareness of the movements he was required to undertake and the size of the train also made him less situationally aware. The cause of the SPAD was also as a result of lack of situational awareness on the part of the GLS as he did not have a clear idea of the movements to be undertaken.

SPAD at Signal CL102, Clonsilla (Dublin), 15th May 2015

588 On Friday 15th May 2015 Driver P733 signed on duty, with the required rest and operated the first services without incident. Driver P733 then operated the 18:55 hrs passenger service from Maynooth to Connolly Station Dublin.

589 After departing Clonsilla, Train P733 was travelling at 92.73 km/h when the CAWS downgraded to yellow for Signal CL105, the signal in rear of Signal CL102 which was displaying a yellow aspect. The train speed increased to 99.86 km/h on the approach to Signal CL102 and the emergency brake was applied and the speed reduced to 86.51 km/h when the CAWS downgraded to red for Signal CL102, which Driver P733 acknowledged, however Train P733 passed Signal CL102 at danger without authority before the train came to a stop 15 m after the signal.

590 At the time of the SPAD, Driver P733 had almost five years of driving experience and was classified as a Category B Driver as a result of a number of safety related occurrences.

591 IÉ assigned an SRR of 17 to the SPAD. IÉ's OOR, published on the 23rd October 2015 (Report No. R1101-2015-38), found that the immediate cause of the SPAD was that "the driver did not have the train under sufficient control with the expectation that the signal would upgrade to green. It was running on a restrictive aspect with the in cab CAWS display relaying this information to him". Contributory factors were identified as: the driver increasing the speed of the train on the approach to Signal CL102; not reacting correctly to the cautionary aspect (Signal CL105) in the rear; not adhering to IÉ's Defensive Driving Policy; and being reliant on past experience that Signal CL102 would be displaying a green aspect. Underlying causes were identified as: the absence of ATP and risk assessments associated with the level crossing.

592 As a result of the SPAD, Driver P733 was removed from the driving grade. IÉ have taken a number of actions in relation to relaying the SPAD information to drivers and updating route notes. As a result of this incident, the report recommended that a route risk assessment should be undertaken in relation to the interlocking of the level crossing for the occurrence of SOY SPADs.

593 The RAIU found the Driver P733 was distracted by a number of personal issues at the time of the SPAD, which he had reported to, and was being managed by, his DTE and the CMO. He also had an incorrect expectation of the signals as he normally had proceed aspects in this location.

Summary of Category A SPADs during degraded train operations

General information

594 SPADs during degraded train operations, similar to the SPAD at Gortavogher on the 19th December 2013 (Part 6 of this report) are SPADs which occurred while the train was operating in degraded conditions i.e. trains not running under normal signals or signalling arrangements, including where there is:

- Signal equipment failure/disconnection;
- Single Line Working (SLW);
- Examination of the line (passing a signal at danger);
- Movements to, from and within possessions;
- Track circuit failure;
- Level crossing failure;
- Failure of block signalling equipment.

595 From January 2012 to June 2015, there have been seven other SPAD during degraded train operations. These SPADs are as follows:

- SPAD at XW038US, Blackbog Level Crossing, on the 16th May 2012 (level crossing faults);
- SOY SPAD at GL353, Athenry, on the 10th July 2013 (WSLP), this SPAD is discussed with the SOY SPAD section of this report;
- SPAD at RC874, Charleville, on the 18th August 2013 (during possession works);
- SPAD at LJ348, Limerick Junction, on the 25th August 2013 (during possession works);
- SPAD at GL354, Athenry, on the 16th November 2013 (degraded conditions, Regulation 11.7 in place at time of the SPAD);
- SAS SPAD at SAOIB, Limerick, on the 24th September 2014 (during possession works);
- SAS SPAD at Signal XX062, Shanclough Level Crossing, 15th January 2015 (level crossing faults).

596 It should be noted that although not identified in the individual RAIU findings, the RAIU found, in all SPAD incidents related to degraded train operations, that none of the drivers involved applied any form of EPTs at the time of the SPAD. However, it should be noted that the actions of third parties also contributed to the drivers not using any form of EPTs, as they were following instructions.

SPAD at XW038US, Blackbog Level Crossing, 16th May 2012

597 On 16th May 2012 the WSLP was in place between Carlow and Muine Bheag Stations. There was an EO in place at Level Crossing XW038, who was operating the barriers and providing information to the LCCO, who normally remotely operated the level crossing for the LCCC (Athlone).

598 When the 11:00 hrs passenger service from Waterford to Heuston (which will be referred to as Train ID A509 for the remainder of the report) was entering the WSLP section at Muine Bheag the controlling signalman instructed the Pilotman to tell the train driver (referred to as Driver A509 for the remainder of the report) that it was in order to pass the section signal, Signal WL163, at danger; he also incorrectly instructed the Pilotman to tell Driver A509 to stop short of all level crossings and to observe that the barriers were down and that is was safe to cross. The Pilotman did not tell Driver A509 to obey all other signals in the section. The Pilotman did not accompany the train as he was waiting to travel in another train.

599 At approximately 12:50 hrs, as Train A509 approached Blackbog Level Crossing he observed that the barriers were down and that it was safe to cross, and as a result passed Signal XW038US at danger and continued to Carlow Station.

600 Driver A509 was classified as a Category U Driver with no requirements for additional support; he had a SPAD previously in 2006 in Heuston (Dublin).

601 The SPAD was assigned an SRR of 19. IÉ's internal investigation report into the incident identified the immediate cause of the accident as "Train A509 passed signal XW038US at danger without authority because the Driver did not react to the signal as he misinterpreted its meaning during WSLP". Causal factors and underlying causes to the incident were:

- The Pilotman did not instruct Driver A509 correctly about obeying signals after entering the WSLP section;
- The controlling signalman gave Driver A509 incorrect information to stop short of all level crossing and ensure the barriers were down and did not follow the procedure for authorising the Pilotman to pass the section signal at danger and did not have a clear understanding of the operation of level crossings and their associated signals during WSLP;
- Driver A509 did not have a clear understanding of the operation of level crossings and their associated signals during WSLP;
- Section G of the Rule Book lacked clarity in the explanation and instructions regarding CCTV level crossings;
- The competence assessment material for pilotmen did not contain reference to authorising movements by Pilotman as set out in the Rule Book.

602 IÉ took a number of actions relating to the development of Driver A509 and the signalman as a result of the incident and made one recommendation in relation to providing better clarity in Section G of Rule Book regarding the operation of CCTV level crossings. Driver A509 was not reclassified, and remains as a Category U Driver.

603 The RAIU review of the incident found that the actions of the Pilotman and Signalman were major contributory factors to the SPAD occurring, this in turn, led to poor communications between Driver A509 and the signalman as the signalman and Driver A509 did not come to a clear understanding of what was expected of both parties, which ultimately caused the SPAD.

SAS SPAD at Signal RC874, Charleville, 12th August 2013

604 On the 12th August 2013 an OTM, a tamping machine, which was stabled in the Charleville Yard, was scheduled to undertake tamping operations between the 130 ½ and 132 ½ mile posts on the Down main Dublin to Cork line.

605 The driver (Driver Y224), a Lloyd Rail staff member, received instructions from the Person in Charge of Possession (PICOP) in relation to moving the tamping machine from its stabling point onto the Down Loop prior to the possession being granted, see Figure 75.

606 Driver Y224 took up his position in the tamping machine and began moving it to the south of the yard. He then passed Signal RC874 at danger and on realising this stopped his train immediately.

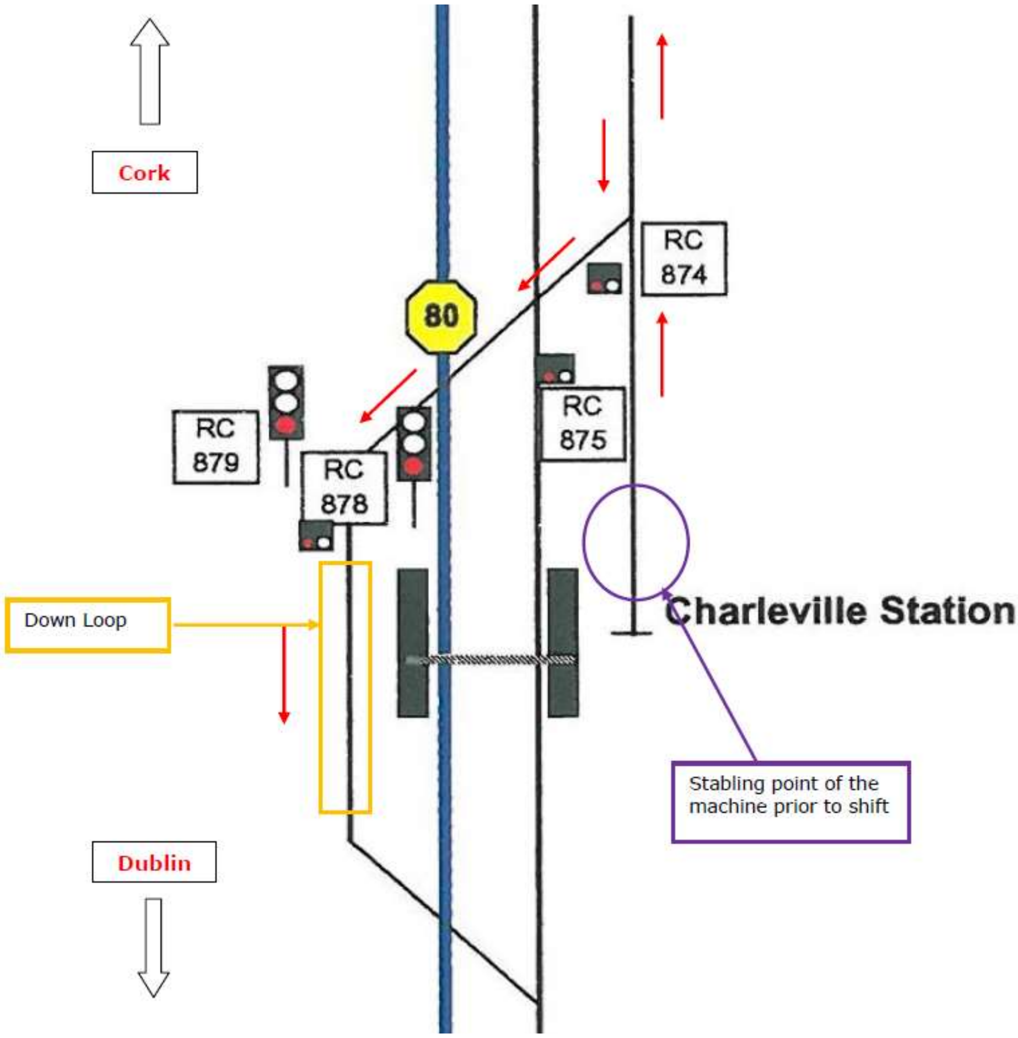


Figure 75 – Charleville Station layout and proposed movement outlined in red arrows (from IÉ investigation report)

607 Driver Y224 was not classified under OPS-SMS-3.2 as he was a Lloyd Rail driver. Although it should be noted that he had no previous operational safety related occurrences or requirements for additional support.

608 The SPAD was assigned an SRR of 8. IÉ-IM/BBRI's internal investigation report, published on the 21st February 2014, did not specifically identify any immediate causes or underlying factors but states that Driver Y224 had a "serious lapse of concentration" and "perhaps got a little complacent" as he had carried out the movement several times previously.

609 As a result of the SPAD, Driver Y224 was removed from his senior position and was subject to "strict monitoring" for a minimum of six months. Two recommendations were made as a result of this SPAD, one related to the briefing of OTMDOs on the importance of checking signals; and one related to the appointment of an OTM assessor.

610 Driver Y224 was sitting on the left hand side of the OTM cab on the approach to Signal RC874; as a result, Signal RC875 was the closest signal to him. The RAIU found that this resulted in Driver Y224 having an incorrect expectation that he was authorised to proceed, as he was looking at the proceed aspect of Signal RC875 (the closest signal). On passing Signal RC874, Driver Y224 immediately became aware that he was looking at the wrong signal and stopped the OTM.

SPAD at LJ348, Limerick Junction, 25th August 2013

611 On the night of the 24th August 2013 there was a T3 Possession to facilitate ballast cleaning at Limerick Junction. At 05:00 hrs the PICOP granted permission to the guard of the Spoil Train (the Guard) for the Spoil Train to exit the possession limits and travel towards Limerick Junction.

612 At approximately 05:50 hrs the Spoil Train Driver arrived at Platform 1 at Limerick Junction and carried out a number of train movements to move the Spoil Train towards Walsh's Siding (see Figure 76).

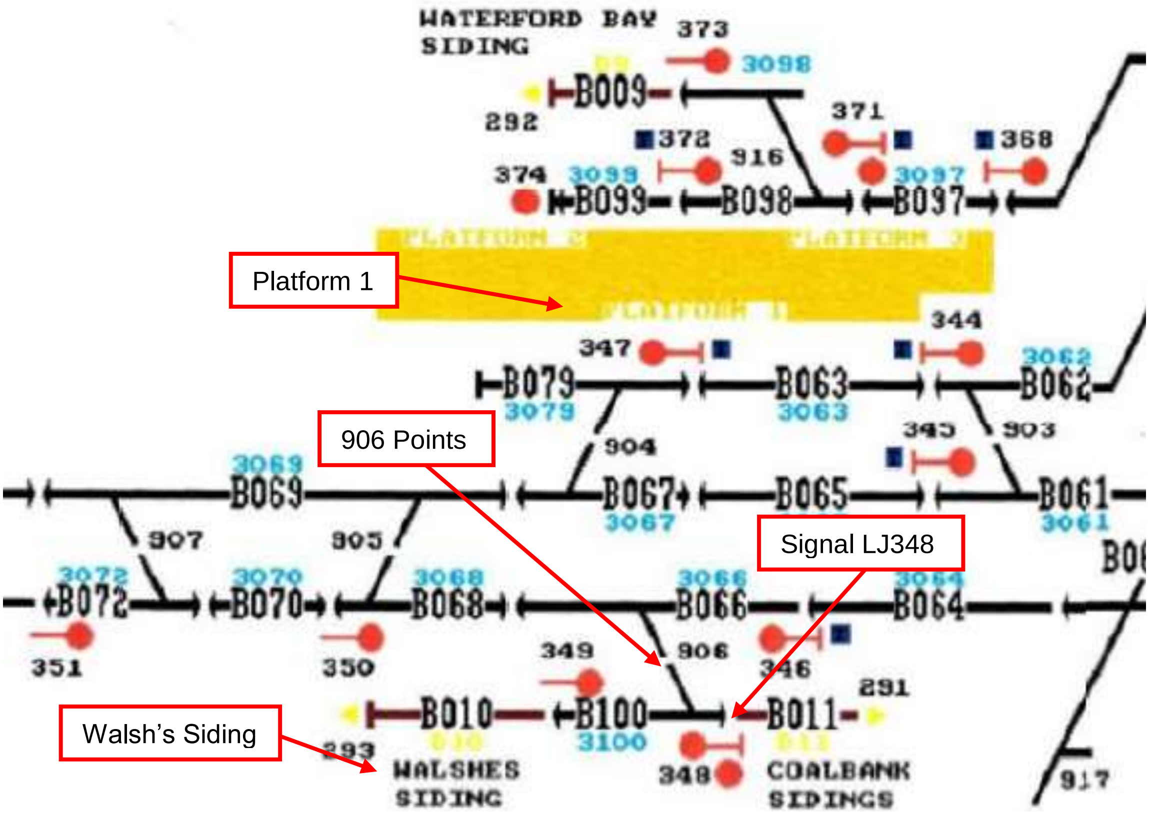


Figure 76 – Layout at Limerick Junction

613 When the Spoil Train was positioned in the Coalbank Siding, the Guard was standing at the back of the Spoil Train near 906 Points (see Figure 76) when he observed 906 Point being normalised (to travel into Walsh's Siding) and he assumed the shunt signal, Signal LJ348 was cleared for the Spoil Train Driver to propel the Spoil Train back into Walsh's siding.

614 The Guard instructed the Spoil Train Driver using the Guard Driver Communication (GDC) (handset-radio) to propel into Walsh's Siding (where shunt radios are not available, guards and drivers are required to communicate through handsignals i.e. not the use of GDC). The Spoil Train Driver had propelled the Spoil Train into Walsh's Siding when the CTC Mainline Signalman rang advising him he had passed Signal LJ348 at danger. The Spoil Train Driver stopped the train.

615 The Spoiler Train Driver was classified as a Category U Driver with no previous operational safety related occurrences or requirements for additional support.

616 IÉ assigned a SRR of 11 to the SPAD. IÉ's internal investigation report (Report No. R0905-2014-36), published in August 2014 found that the immediate cause of the SPAD was that the Guard instructed the Spoiler Train Driver to propel the Spoil Train past LJ348s at danger; as the Guard failed to observe Signal LJ348 at danger and assumed that the route had been set as 906 Points were normalised.

617 The RAIU found that the Guard had an incorrect expectation that Signal LJ348 would be displaying a proceed aspect as he saw that the points were set for the route. The RAIU found that the Spoiler Train Driver was operating as instructed and his actions were not contributory to the SPAD.

SPAD at Signal GL354, Athenry, 16th November 2013

618 On the evening of the 15th November 2013, following heavy rain and high winds, two trains failed to operate track circuits as they approached Athenry from Gort, a location where TCB regulations apply, which resulted in SPAD alarms on the PCECP in Athlone. As a result, the GLS reported the fault to the relevant parties and the DTE and DM made the decision to introduce 'Regulation 11.7 – Failure of Trains to Operate Track Circuits' from the SGIs. These regulations state:

- Consider the affected portion of line to include
  - the failed track circuit(s) and;
  - the next three track circuits to correctly show occupied and then clear beyond the failed track circuit(s);
- Do not then permit any other train to enter the affected portion of line (except a train required to assist a disabled train) until the train concerned has passed clear of the affected portion of line.

619 As a result, the next morning the decision was made by the GLS and the LCCC Supervisor to stop trains at Signal GL354 prior to giving drivers permission to proceed. The driver (Driver A782) of the 09:20 hrs passenger service from Limerick to Galway (Train A782) operated the train as normal to Gort. At Gort Driver A782 was informed, by the GLS, that he would be blocked at Signal GL354, he was told this was due to leaves on the line.

620 Driver A782 departed from Gort Station and continued towards Galway. On approaching the repeater signal, Signal GLR354, he saw that it was displaying a yellow aspect and continued past it at 15 mph (24 km/h). On approaching Signal GL354 at danger, Driver A782 slowed the train to 10 mph (16 km/h). Train A782 then went into a slide, Driver A782 applied the emergency brake, but the train passed Signal GL354 at danger without authority.

621 Driver A782 had six months of driving experience and was a PQA Driver at the time of the SPAD, with no previous operational safety related occurrences or requirements for additional support.

622 The SPAD was assigned an SRR of 0. IÉ's internal investigation report, published on the 6th July 2015, identified the immediate cause of the SPAD as "the driver did not have his train under sufficient control to prevent passing Signal GL354 at danger without authority". Causal factors were identified as:

- The LRA conditions;
- The incorrect application of Regulation 11.7 (whereby the signal was maintained at danger without any train in the section, as opposed to maintaining the signal at danger until the first train had cleared the section);
- The lack of understanding, on the part of the GLS, of Regulation 11.7;
- The GLS or the LCCC Supervisor did not have the SGIs at their workstations.

623 Underlying causes were identified as the signalmen in the location not being assessed in the application of Regulation 11.7 and there was no assigned location for the SGIs in the required locations.

624 The RAIU found that Driver A782 had an incorrect expectation in relation to what Signal GL354 would be displaying.

SAS SPAD at SAOIB, Limerick (Limerick), 24th September 2014

625 On the night of 23rd September 2014, a T3 possession was granted by the Station Cabin (see Figure 77 for location) to facilitate renewal works at Limerick Station; there were no issues reported prior to the possession being cancelled at 05:29 hrs. The possession works affected the stabling of the trains and the Signalman was informed of the movements to be undertaken. Due to a fault being detected by the SET department, the Station Cabin Signalman granted another T3 possession at 05:30 hrs to facilitate SET to carry out repairs to the panel at the Station Cabin.

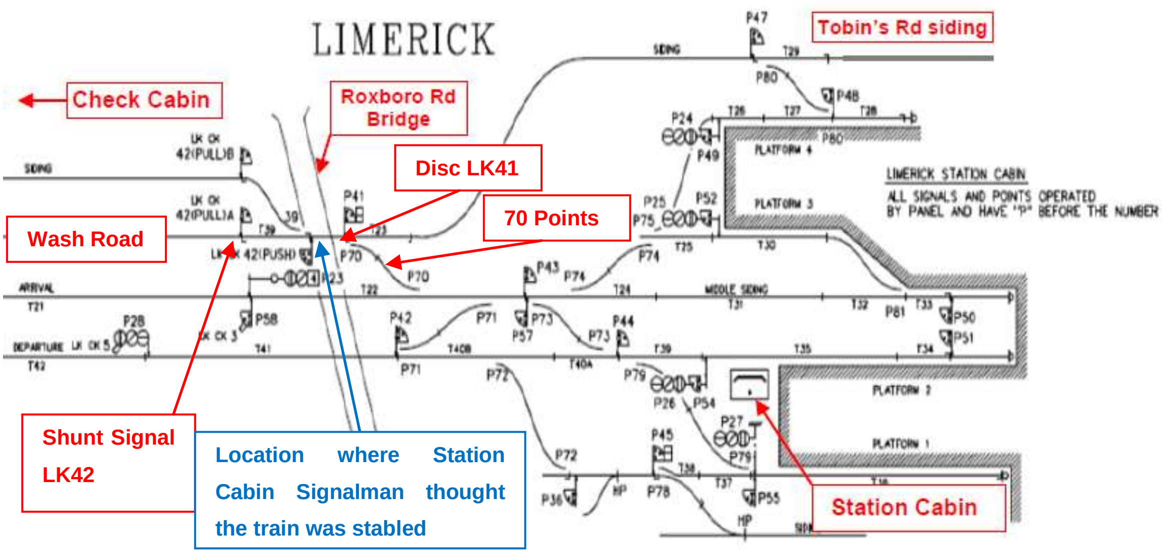


Figure 77 – Limerick Station layout

626 At approximately 05:50 hrs, the driver (Pilot Driver) carrying out the shunting manoeuvre in preparation for the 06:25 hrs passenger service from Limerick to Limerick Junction, contacted the Station Cabin Signalman from the trains location on Tobin's Road Siding (see Figure 77) to request the route into the Station. The Station Cabin Signalman informed Pilot Driver that there was a fault in the Station Cabin and he would get back to him. Pilot Driver then saw the Limerick to Galway passenger service departing and re-contacted the Station Cabin Signalman to request the route. At this stage the Station Cabin Signalman said that he would request that the Check Cabin Signalman, located into the Check Cabin (see Figure 77) to request the route.

627 There was some confusion on the part of the signalmen about the stabling location of the train which was not fully clarified. However, the Station Cabin Signalman requested that the Check Cabin Signalman commence setting the route into the Wash Road, by setting Shunt Signal LK42 to proceed. The Check Cabin Signalman cleared Shunt Signal LK42 to proceed.

628 On seeing Shunt Signal LK42 set to proceed, the Pilot Driver re-contacted the Station Cabin Signalman. It is not clear what communications occurred between the Pilot Driver and the Station Cabin Signalman, but the Pilot Driver thought that he was authorised to travel into the Wash Road. However, 70 Points were not set and the Pilot Driver was not authorised to travel past the Stop & Obtain Instruction Board (SAOIB), which under the Rule Book has the same meaning as a stop signal and permission must be granted by an authorised person for drivers to pass these boards, see Figure 78. As a result, the Pilot Driver travelled past the SAOIB and 70 Points which were in the reverse position and proceeded into the Wash Road.

Figure 78 – SAOIB & LK42 & Wash Road

629 When SET completed repairs to the panel in the Station Signal Cabin, the Station Cabin Signal commenced completing the route for the train when he noticed that the train was not on Tobin's Road, and saw that there was no detection on 70 Points; he then requested SET to examine. SET found that the points had been run through. When Pilot Driver changed driving cab ends, he noticed the gapping points and contacted the Station Cabin Signal.

630 Pilot Driver was classified as Category U Driver at the time of the SPAD. Pilot Driver had previously been classified as a Category B Driver as a result of a SPAD (Shunt Signal 55) in Limerick in 2011.

631 The SPAD was assigned a SRR of 13. The IÉ internal investigation report, published in June 2015, identified the immediate cause of the incident as "the train passed the SAOIB without authority, traversing 70 Points which were not set for the movement". Causal factors were identified as parties not following "the protocols for safety critical communications" and not reaching a "clear understanding" regarding the movement. Other causal factors were that Pilot Driver "did not observe the lie of 70 Points" and the use of the SAOIB exiting siding with traverse points. Underlying factors were identified as "failure to follow communication protocols and the lack of recording to monitor the communications in Limerick and the lack of guidance for the placement of SAOIBs.

632 As a result of the incident, the Pilot Driver was placed on a DD&SS. The Station Cabin Signalman was also placed on a development plan. In addition, the 'safe system of works' were reviewed.

633 Two recommendations were made as a result of this incident, one related to the placing of SAOIBs and the other in relation to recording voice communications in Limerick Station Cabin.

634 The RAIU review of the incident found that the Pilot Driver had an incorrect expectation that he was authorised to carry out the movement, this incorrect expectation was heavily influenced by the poor communications[15] with the Station Cabin Signalman; the Station Cabin Signalman had lost situational awareness as he was not aware of the location of the train, this was as a result of poor communications with Pilot Driver.

SAS SPAD at Signal XX062, Shanclough Level Crossing, 15th January 2015

635 On the morning of the 15th January 2015, there were weather related faults at Level Crossing XX062 (Shanclough) that affected both signalling and level crossing equipment, which resulted in the level crossing being manually operated by an EO.

636 The Mayo Line Signalman (Signalman) contacted the driver (Driver A861) of the 07:05 hrs passenger service from Ballina to Manulla Junction (Train A861) via train radio to advise him of the fault at the level crossing and that an EO was on site at the crossing. The Signalman also advised Driver A861 that he would have to “get down” (to use the signal post telephone) and contact the LCCO (based in Athlone) on arrival at XX062US.

637 When Train A861 approached Signal XX062US it was displaying a red aspect. Driver A861 then saw that the EO exhibiting a white light. Driver A861 made a decision to turn on his personal mobile phone and contact the EO, whom he knew, to confirm it was the EO that was exhibiting the white light. The EO advised Driver A861 that he was the EO at XX062 and that the crossing was safe. Driver A861 then made the decision not to use the signal post telephone to contact the LCCO as he believed he had permission to proceed from the EO. Driver A861 released the train brake and proceeded past Signal XX062US at Danger and through the crossing.

638 The LCCO observed on the CCTV monitor the passage of Train A861 through the level crossing. The LCCO, following consultation with the Supervisor, advised the MLS that Train A861 should be stopped. The Supervisor proceeded to the Signalman’s workstation and observed Train A861 continuing its journey towards Foxford. The Supervisor then contacted the Deputy Operations Control Manager, West (OCM West) and a decision was made to allow the train to continue.

639 The EO was relieved of duty and screened for drugs and alcohol under the company post incident protocol. Driver A861 was not relieved of duty and continued his rostered turn of duty, nor was Driver A861 requested to undergo drugs and alcohol screening post incident.

[15] Poor communications has been noted in a number of SPAD occurrences, the absence of recording communications, results in inadequate monitoring of safety critical communications.

640 Driver A861 only became aware that the incident had been classified as a Category A SPAD in October 2015, one month after the report of investigation was completed by IÉ (Report No. R1005-2015-37, published on the 30th September 2015). As a result, Driver A861 was not reclassified and had received no DD&SS immediately after the SPAD and was only reclassified as a Category B Driver nine months after the SPAD, in October 2015[16].

641 Also of note is the fact that when the RAIU requested information on SPADs in 2015, in July 2015, IÉ-IM forwarded a list of Category A SPADs with the exclusion of this SPAD at Shanclough on the 15th January 2015, and it was only after another request that the information was provided to the RAIU.

642 IÉ assigned an SRR of 18 to the SPAD. The internal OOR into the SPAD, published in September 2015, found that the immediate cause was that Driver A861 "passed controlling Signal XX062US at Danger without authority from the LCCO". Causal factors were that Driver A861 "did not contact the LCCO to obtain authority to pass Signal XX062US at Danger as per Rule Book requirements and as advised by the Signalman prior to the train arriving at the crossing", and that Driver A861 contacted the EO by use of his personal mobile phone and this communication between them was mistaken as authority to proceed. Another casual factor was that the EO "exhibited a white light" to Driver A861 on its arrival at Signal XX062US. An underlying cause was identified relating to the competence training for the EO which did not include a practical simulation of the operation of a CCTV level crossing in degraded conditions.

643 Other observations made in the report referred to the fact that the "Supervisor did not provide sufficient clear and concise information to the Deputy OCM West to enable a comprehensive and detailed account of the occurrence be presented to the on-call RU District Manager. The initial details provided to the on-call RU District Manager was insufficient to alert him to the seriousness of the occurrence" thus allowing Train A861 to continue on its journey; and this also resulted in Driver A861 not being screened for D&A.

644 As a result of the SPAD, the EO was given corrective coaching in relation to the operation of CCTV level crossings and is to attend the training centre to engage in practical simulation of CCTV level crossing operation in degraded conditions. The EO also received feedback and corrective coaching on safety critical communications. In addition, the Supervisor has received corrective coaching to address the areas of incident response identified in the above paragraph.

[16] Driver A861 was not subject to drugs and alcohol tests and received no form of development for nine months after the SPAD while still operating passenger services, despite a Category A SPAD being a serious operating occurrence, as a result this warrants an RAIU safety recommendation, see Part 14.

As mentioned above, Driver A861 was not subject to any testing or re-classification until nine months after the incident.

645 In relation to recommendation, the report recommended: that Driver A861 be placed on a DD&SS; EO training should include simulated degraded conditions at level crossings; and that the Rule Book be update to include the role of the LCCO.

646 The RAIU found that Driver A861 was aware that he was required to call the LCCO to obtain authority, however, due to the poor weather he did not adhere to this instruction. In addition, the poor communication between Driver A861 and the EO, and the fact that the barriers were lowered to road traffic, resulted in Driver A861 having an incorrect expectation that he was authorised to travel through the level crossing.

Summary of Category A SAS & SOY SPADs

General information

647 SAS & SOY SPADs, similar to the SAS SPAD at Muine Bheag on the 9th April 2013 (Part 7 of this report) are discussed in this section of the report.

SAS SPADs

648 Between 2012 and mid 2015 there have been nineteen recorded SAS SPADs (including the SPAD at Muine Bheag on the 9th April 2013), as follows:

- SAS SPAD at Signal PE31s, Pearse (Dublin), on the 16th January 2012;
- SAS SPAD at Signal LJ368, Limerick Junction, on the 7th March 2012;
- SAS SPAD at Signal BY488, Ballybrophy (Laois), on the 8th May 2012;
- SAS SPAD at Signal BR44s, Bray (Wicklow), 5th February 2013;
- SAS SPAD at Signal SL719, Killucan (Westmeath), 21st June 2013;
- SAS SPAD at Signal TL241, Killarney (Kerry), 9th August 2013;
- SAS SPAD at Signal PE35s, Pearse (Dublin), 10th August 2013;
- SAS SPAD at Signal TL226, Rathmore (Kerry), 26th February 2014;
- SAS SPAD at Signal DD269, Dundalk (Louth), 13th May 2014;
- SAS SPAD at Signal MW826, Mallow (Cork), 16th May 2014;
- SAS SPAD at SAOIB, Limerick, on the 24th September 2014 (discussed above in relation to SPADs during degraded train operations);
- SAS SPAD at Signal HN291, Heuston (Dublin), 11th October 2014;

- SAS SPAD at Signal XX062, Shanclough Level Crossing, 15th January 2015 (discussed above in relation to SPADs during degraded train operations);
- SAS SPAD at Signal SL817, Boyle (Roscommon), 18th January 2015;
- SAS SPAD at Signal DN201, Howth (Dublin), 21st April 2015;
- SAS SPAD at Signal RL543, Enniscorthy (Wexford), 9th June 2015;
- SAS SPAD at Signal MN143, Maynooth (Kildare), 23rd June 2015;
- SAS SPAD at Signal CY69, Fairview (Dublin), 25th June 2015.

SOY SPADs

649 Between 2012 and mid 2015 there have been eight recorded SOY SPADs, as follows:

- SOY SPAD at Signal TS469, Thurles (Tipperary), on the 1st November 2012;
- SOY SPAD at Signal LK5, Limerick (Limerick), 8th July 2013;
- SOY SPAD at Signal GL353, Athenry (Galway), on the 10th July 2013;
- SOY SPAD at Signal DD262, Dundalk, 10th August 2013;
- SOY SPAD at Signal HK196, Curragh (Kildare), 14th March 2014;
- SOY SPAD at Signal CE842, Glounthaune (Cork), 29th June 2014;
- SOY SPAD at Signal BR36, Bray (Wicklow), 20th August 2014;
- SOY SPAD at Signal PE18, Connolly (Dublin), 11th March 2015.

650 This section of the report summarises the events leading up the SAS and SOY SPADs and includes the immediate causes, causal factors and underlying factors identified by internal IÉ investigations or reviews. In addition, the summaries include a brief history of the drivers driving history and the findings of the RAIU. The incidents summarised in chronological order, starting with the oldest SAS/SOY SPAD incident.

651 It should be noted that although not identified in the individual RAIU findings, the RAIU found, in the vast majority of SAS and SOY SPAD incidents, the drivers involved had not applied any form of EPTs at the time of the SPAD. A very small minority of drivers had applied some EPTs in the past or on the day of the SPAD, but these EPTs were ineffective at preventing the SPADs.

SAS SPAD at PE31s, Pearse (Dublin), 16th January 2012

652 The driver (Driver P671) operated the 21:05 hrs passenger service from Maynooth to Pearse (Train P671) without incident. At Pearse, Driver P671 stabled the train in the down loop due to *reversible working* between Pearse and Tara (and vice versa). Driver P671 sees signal PE33 upgrade to yellow and assumes he is clear to return the platform; he does not see signal PE31s and passes it at danger, see Figure 79.

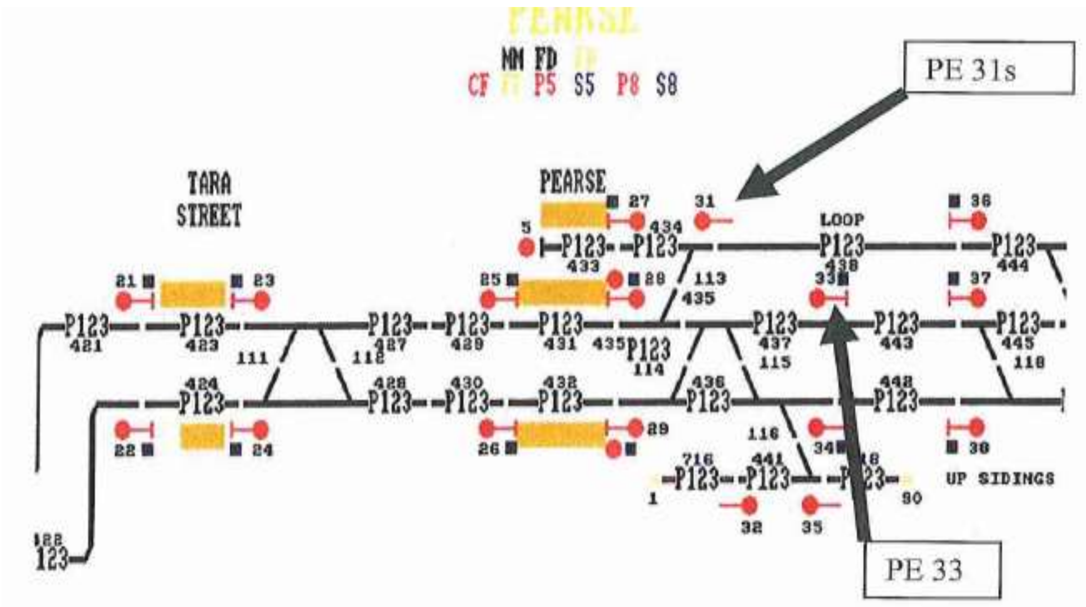


Figure 79 – Pearse Station layout (taken from IÉ report)

653 At the time of the incident, Signal PE31 had been previously past at danger on one occasion in the previous ten years.

654 Driver P671 had five years of driving experience and was classified as a Category U Driver with no requirements for additional support.

655 The SPAD was assigned an SRR of 11. IÉ’s internal investigation report (Synergi Ref 17305) published on the 6th March 2012 identified the immediate cause of the SPAD as the “driver reading across to the wrong signal, PE33” and the underlying cause was “a lack of concentration by the driver”. The report recommended that the driver be placed on a DD&SS and the marker boards be erected as a result of findings of the SCC.

656 The RAIU review of the incident found that Driver P671 had lost situational awareness, as although he was familiar with the area, he was not familiar with the movement (there was a change of movements as a result of the reversible working); this loss of situational awareness resulted in Driver P671 not fully understanding the signal sequencing for the movement.

<u>SAS SPAD at LJ368, Limerick Junction, 7th March 2012</u>

657 The driver (Driver A406) of the 15:25 hrs passenger service from Heuston to Limerick (Train A406) was requested to stop in Limerick Junction as a result of a fire at Limerick Station, he was requested to stop on Platform 2/3 (he was occupying both Platforms 2 and 3 as he was operating a 6-piece train), see Figure 80. At Limerick Junction the passengers disembarked to travel the remainder of the trip to Limerick by bus, however, the line was re-opened to Limerick and the passengers re-boarded the train.

658 As the train was occupying Platforms 2/3 the CTC Signalman issued Driver A406 an authority number to pass Signal LJ372 at danger and proceed up to and obey LJ368 where the CTC Signalman would contact him again, see Figure 80 for location of signals. Although the CTC Signalman was aware that Signal LJ372 was behind Driver A406, as he was occupying both platforms, the CTC Signalman did not state that the authority number was being issued for Signal LJ372, behind him.

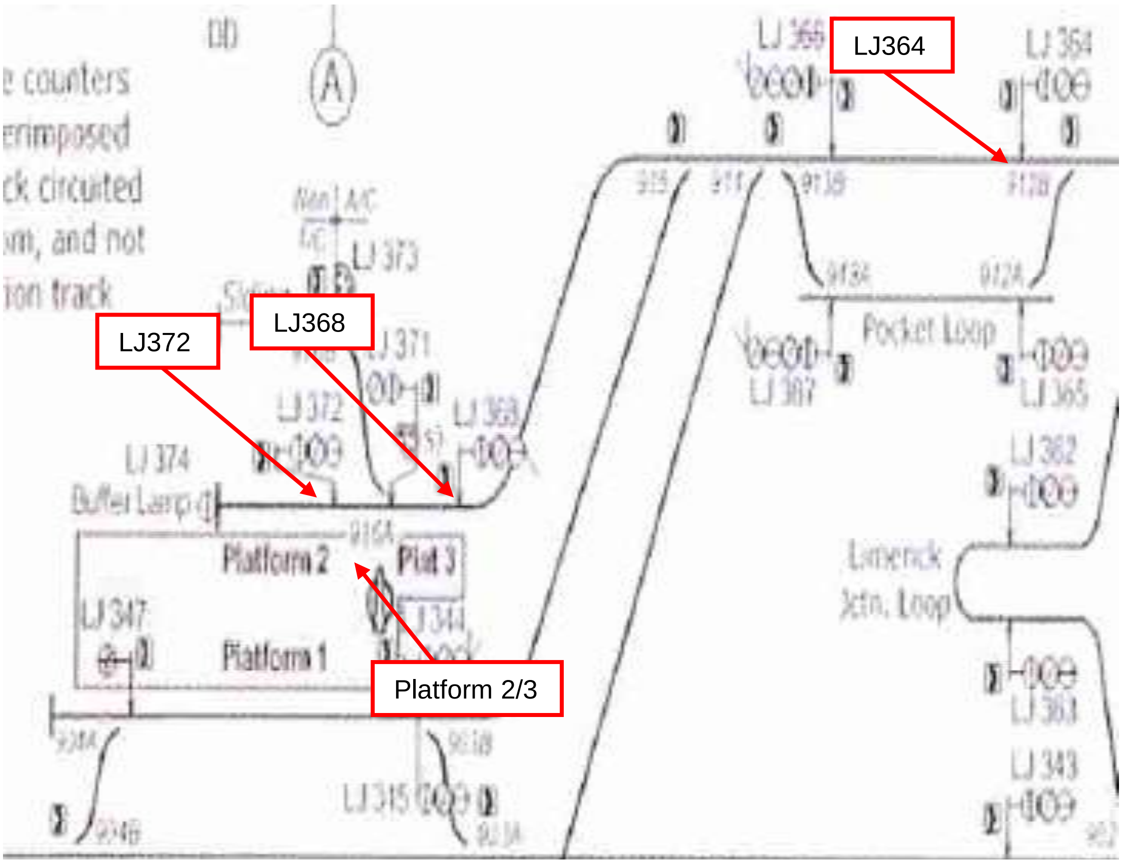


Figure 80 – Limerick Junction layout leaving Platform 2/3 (taken from IÉ report)

659 Driver A406 thought that Signal LJ372 was in fact the signal ahead of him, Signal LJ368 and passed the signal at danger. The CTC Signalman contacted Driver A406 and asked him if he had passed Signal LJ368 at danger, Driver A406 stated that he was approaching Signal LJ368. The CTC Signalman ended the call but called back requesting that Driver A406 stop the train. Driver A406 was now standing in rear of Signal LJ364, where he then realised he had passed Signal LJ368 at danger.

660 Driver A406 had twenty-one years of driving experience and was classified as a Category U Driver with no requirements for additional support at the time of the incident. Driver A406 had previously been classified as a Category D as a result of an over-speeding incident in 2003, a SPAD in Limerick in 2009 (Signal LK41), a 'failure to call' incident at Newbridge Station in 2010.

661 The SPAD was assigned an SRR of 18. IÉ's internal investigation report, published on the 28th June 2012, identified the immediate cause of the SPAD as a "misunderstanding on the part of the driver"; five underlying causes associated with the protocol of occupying Platforms 2/3 were identified and one underlying cause associated with the issuing of authority numbers was identified. As a result of the incident the driver was assigned a DD&SS and a protocol was developed for the occupation of Platforms 2/3. Two further recommendations were made in relation to the alteration of signals at Platforms 2/3 and in relation to the instructions for signalmen dealing with trains starting ahead of signals.

662 The RAIU review of the incident found that the driver had lost situational awareness as he had made assumptions on the signal numbers based on the information provided by the signalman and thought that all the signals the signalman was referring to were in front of him; in addition, he was unfamiliar with the movement.

SAS SPAD at BY488, Ballybrophy (Laois), 8th May 2012

663 On Tuesday 8th May Driver A312 was operating the 17:05 hrs passenger service from Heuston to Tralee (Train A312). After the passengers alighted and boarded Train A312, the PIC gave the 'Station Work Complete' signal and Driver A312 then closed the doors. Despite Signal BY488 displaying a red aspect (see Figure 81 for drivers' view of Signal BY488) the PIC gave the 'Ready to Start' signal without checking the signal as it was obscured by a water tower (see Figure 82 for PIC's obscured view of Signal BY488); however he was aware, due to experience, that it would be displaying a red aspect as a result of the previous train, travelling in the same direction, being delayed (as a result it had not cleared the section, resulting in Signal BY488 remaining at red). Signal BY488 is located 119 m from the platform end and the PIC assumed that Driver A312 would depart from the station and stop at Signal BY488.

Figure 81 – Drivers' view of Signal BY488

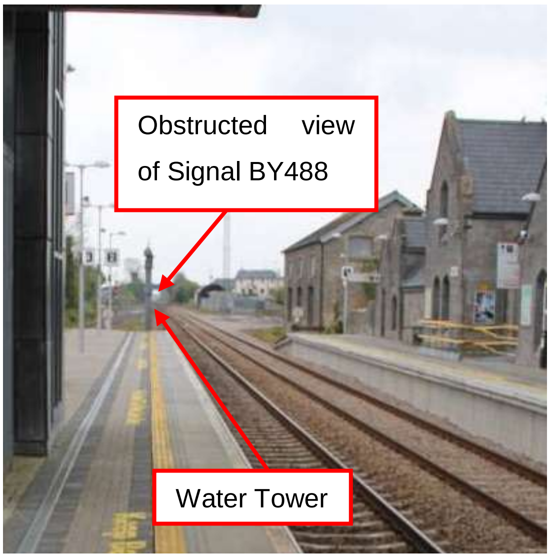


Figure 82 – PIC's view of Signal BY488

664 Driver A312 did not look at Signal BY488 prior to departing, and while departing was looking at the PIC on the in-cab MMI screen in case the PIC wanted to stop the train. Driver A312 travelled past Signal BY488 at danger. On passing the signal, Driver A312 saw that the next signal, Signal CLXDD, was showing a yellow aspect while the CAWS indication in the cab was displaying red. Driver A312 then realised that he may have passed Signal BY488 at danger and started to bring his train to a stop, he stopped 815 m past Signal BY488. The signalman then contacted Driver A312 to inform him of the SPAD. As there were no other drivers available, Driver A312 was allowed to proceed with a second person, the Travelling Ticket Checker (TTC) to Thurles and then a DTE from Thurles to Limerick Junction, where he was relieved from his duties.

665 Driver A312 had almost three years of driving experience and was classified as a Category U Driver with no previous occupational safety related occurrences in the previous three years.

666 IÉ assigned an SRR of 19 to this SPAD. IÉ's internal investigation report (R006/2012) published on the 20th November 2012 found that the immediate cause of the accident was as a result of Driver A312 failing to observe signal BY488 at danger before starting or any time after starting his train from the down platform at Ballybrophy Station due to a lack of concentration; and he could not explain why he did not observe the signal and only noticed that the next signal was yellow after a distance of 235 m. Causal factors related to Driver A312 included: not obeying the Rule Book; not prioritising his tasks (looking at the MMI screen instead of the signal); not being aware of the risks on the route. Causal factors related to the PIC included the PIC giving the 'Ready to Start' while a red aspect was being displayed and the PIC's view of Signal BY488 by a water tower.

667 Underlying causes related to drivers included that there are were no route risks identified for the Dublin to Cork route available to drivers working from the Cork District as required by OPS-SMS-3.3; and the method of assessment was not "robust"; and that "the method for assessing Human Factors and other issues is not robust as set out in the Competence Assessment Form of OPS-SMS-3.1, Competence Management of Drivers. There is no means of recording what was observed or the answers given by the driver during the assessment". Underlying causes associated with the PIC included that there was no risk assessment for the despatch of trains at Ballybrophy Station and the competence assessment documentation does not reflect the specific risks at Ballybrophy Station.

668 As a result of the incident, a development plan has been developed for Driver A312. IÉ made four recommendations related to route knowledge and assessment for drivers, including the review and updating of current documentation; and two recommendations in relation to the risks and assessment of PICs.

669 The RAIU review of the incident found that Driver A312 became distracted by the station work and continued to monitor the platform from the in-cab MMI screen in case the PIC wanted to stop the train. Driver A312 also developed an incorrect expectation as to the aspect of the signal, this was initially as a result of receiving the 'Ready to Start' indication from the PIC but also Driver A312 was familiar with the area and knew that the previous train was ahead of him and assumed it had cleared the section.

SOY SPAD at TS469, Thurles (Tipperary), 1st November 2012

670 The driver (Driver J461) was operating an empty train from Limerick to Thurles to return as the 07:30 hrs passenger service from Thurles to Limerick departing from Platform 2. To arrive on Platform 2 the train was required to pass Signal TS471 on the up road, crossover points 742 to travel onto the down road and pass Signal TS469 onto Platform 2.

671 Prior to this movement, Driver J461 was stopped at Signal TS471 for approximately two minutes before the signal upgraded to yellow; Signal TS469 which was in view was displaying a red aspect. Driver J461 travelled past Signal TS471 at yellow and onto the crossover points. At this stage, Driver J461 attempted to answer a call from the signalman on the train radio, however it immediately cut off, immediately afterwards another call came in which Driver J461 answered. However, in doing this, he travelled past Signal TS469 at danger.

672 Driver J461 had over three years of driving experience and was classified as a Category U Driver with no previous occupational safety related occurrences.

673 IÉ assigned an SRR of 8 to this SPAD. IÉ's internal investigation report (Safety Office Ref: 12/128) into the incident, published on the 7th November 2012 found the immediate cause of the incident was "the driver failing to control and stop the train on approach to TS469 which was showing a red aspect". Underlying causes associated with the driver included that he acknowledged the CAWS without reducing the speed of the train, he did not implement the 15x20 Rule, and he answered a call on approaching a red signal. Underlying causes associated with the signalman include the fact that that entire route was not set and that he did not inform the driver that he would be stopped at TS469. Driver J461 was assigned a DD&SS as a result of the SPAD and a recommendation was made to the DM Limerick to review the risk assessment for the Limerick to Thurles route.

674 The RAIU review of the incident found that Driver J461 had become distracted as a result of the second call from the signalman; Driver J461 thought there was a serious issue if the signalman was returning the call immediately. As a result of this distraction Driver J461 lost situational awareness and forgot that he was approaching a red aspect.

SAS SPAD at BR44s, Bray (Wicklow), 5th February 2013

675 At 09:28 hrs on the 5th February 2013 the 06:45 hrs passenger service from Newry to Bray (Train P605) arrived in Bray without incident. After all the passengers had disembarked the train, the driver (Driver P605) shunted the train into the loop. Driver P605 changed driving cab ends and on getting into the driving cab he thought he was slightly ahead of Signal BR44s and thought that he may be holding the road, as a result he began to drive forwards towards BR42, passing BR44s at danger.

676 At the time of the incident, Signal BR44s had been previously past at danger on two occasions in the previous ten years.

677 Driver P605 had over ten years of driving experience and was classified as a U Category Driver with no previous occupational safety related occurrences in the previous ten years.

678 IÉ assigned an SRR of 12 to the SPAD. IÉ's internal investigation report published on the 1st March 2013 identified the immediate cause as "the driver stopping his train too close to signal BR44s and drawing forward towards BR42 without contacting the signalman". The underlying causes were identified as "the driver mistakenly believing that he was holding the road and the next signal to obey was BR42"; and that the driver "did not adhere to the Shed Notice" in relation to BR44s.

679 Driver P605 was assigned a DD&SS as a result of the SPAD. The report also made recommendations in relation to: the signal sighting of BR44s; and the Shed Notices and holding roads should be incorporated into SBUDs.

680 The RAIU review of the incident found that Driver P605 had lost situational awareness, and lost sighting of Signal BR44s as he had pulled up too close to the signal. This was as a result of: carrying out a movement in a longer train (eight-piece) than normal; the movement not being a regular movement for the driver; and he was unsure if he was holding the road.

SAS SPAD at SL719, Killucan (Westmeath), 21st June 2013

681 On Friday 21st June 2013 the 18:00 hrs passenger service from Sligo to Connolly (Train A913) and the 19:05 hrs passenger service from Connolly to Sligo (Train A914), were scheduled to swap trains and drivers at Killucan.

682 While enroute to Killucan, a passenger was taken ill at Kilcock and used the emergency passenger phone to call the driver (Driver A913). At Enfield the driver went to attend to the passenger and requested assistance for the passenger. The decision was made to continue the journey with the passenger onboard and Driver A913. On leaving Enfield, Driver A913 realised

that he had not reset the emergency passenger phone and became worried about how the ill passenger would now contact him.

683 At Killucan, the new driver entered the cab of Train A913 and Driver A913 informed the new driver of the service of the situation with the passenger and the emergency passenger phone. Both drivers looked at the signal and saw that the signal was displaying a green aspect for Train A913 to continue to Connolly.

684 Driver A913 then entered his new train but did not look at Signal SL719 (which was located 77 m from the front of the train) before departing Killucan, see Figure 83 for the signal displaying a red aspect. Train A913 accelerated to a speed of 16 mph (25.6 km/h) before Driver A913 saw Signal SL719 at danger and applying the full service and emergency brakes. However, Train A913 passed Signal SL719 at danger, with the train stopping 10 m beyond the signal.

Figure 83 – Signal SL719

685 Driver A913 had over four years of driving experience and was classified as a Category B Driver at the time of the incident as a result of six previous operational safety related occurrences, which meant that he was a driver that required a high level of additional monitoring and support.

686 The SPAD was assigned an SRR of 12. IÉ's internal investigation report (Safety Office Ref 130621-1) published on the 8th October 2013 identified the immediate cause of the incident as Driver A913 failing to look at Signal SL719 before moving his train. Causal factors were identified as Driver A913 being distracted by the earlier incident of a passenger being taken ill. An underlying cause to the incident was Driver A913 having a lapse in concentration as a result of the earlier incident. As a result of this incident, Driver A913 was removed from driving duties.

687 The RAIU review of the incident found that Driver A913 had become distracted by the passenger taken ill on the train, in addition, he forgot to reset the passenger phone resulting in him becoming preoccupied in thinking about the phone. He also had an incorrect expectation of the signal, as he had looked at the green aspect for Train A913 and forgot (loss of situational awareness) that he was no longer on Train A913.

SOY SPAD at LK5, Limerick (Limerick), 8th July 2013

688 At 20:25 hrs on the 8th July 2013 the driver (Driver A478) departed Platform 3 Limerick Station operating the 20:25 hrs passenger service from Limerick to Ennis (Train A478) while LK25 the starting signal, was displaying a yellow aspect; this was as a result of a delay to the train travelling in the opposite direction, which meant that Signal LK5 was displaying a red aspect. Driver A478 thought that Signal LK5 was displaying a yellow aspect and proceeded past Signal LK5 at danger, and came to a stop at the next signal LK6/8 which was displaying a red aspect. A signalman located in the signal cabin which was located close to LK5 saw Train A478 passing Signal LK5 at danger and advised Driver A478 of this and requested that he not move the train.

689 Driver A478 had over 43 years of driving experience and was classified as a Category U Driver at the time of the SPAD. Driver A478 had been previously classified as a Category A Driver as a result of an irregular movement in 2005.

690 This SPAD was assigned an SRR of 14. Signal LK5 is now a multi-SPADed signal. IÉ's 5DIR (Report No. R0402-2014-19), published the 31st March 2013 determined that the immediate cause of the incident was Driver A478 misread Signal LK5 due to the visibility of the signal being affected by the sunlight, see Figure 84 for a photograph taken the day following the incident at approximately the same time. Underlying causes were identified as Driver A478's perception of Signal LK5 was affected by the sunlight and that as Signal LK5 is ground mounted on the right, these signals are harder to interpret during bright conditions.

Figure 84 – Signal LK5

691 Driver A478 was assigned a DD&SS. IÉ also undertook a number of other actions as a result of this incident, including a plan for the repositioning of LK5, as well as re-briefing to Signallers and drivers on issues involved in this incident. In relation to the sunlight, the District Manager Limerick issued a drivers notice in January 2014 highlighting the effect that sunlight can have on visibility of signals and the risks associated with starting on yellow when departing Limerick Station. As a result of these actions, and previous actions already taken in relation to signalling in the area, the

5DIR made one recommendation related to reviewing the risk assessment associated with trains departing Limerick Station on a yellow aspect.

692 The RAIU found that Driver A478 had become distracted by the bright sunlight, leading him to an incorrect expectation that Signal LK5 was displaying a yellow aspect.

SOY SPAD at GL353, Athenry (Galway), 10th July 2013

693 On the 10th July 2013 there was WSLP in operation in the Athenry to Galway section due to an axle counter fault. In addition, there was a fire on the canopy of Platform 1 at Athenry. The driver (Driver A489) who was operating the 17:45 hrs passenger service from Galway to Limerick (Train A489) was informed of the situation.

694 The service departed Galway fifty-five minutes late, on arriving on the Galway Loop the train was held at this location. While waiting on the loop, a Revenue Protection Officer informed Driver A489 that a wheelchair passenger was in distress (this was due to the hot weather). The train departed from the Galway Loop one hour, fifteen minutes behind schedule. Train A489 was then stopped at Garraun Level Crossing (XG167) and Oranmore Level Crossing (XG165) where Driver A489 contacted the signalman to activate the barriers. Train A489 then approached Signal GL369 displaying a red aspect, and contacted the signalman to get an authority number to pass the signal at danger, which was granted; and Driver A489 continued to Athenry without further incident. At Athenry Station, as Driver A489 was changing driving cab ends, he was approached by irate passengers who were annoyed about the delays and the heat on the train; he also noted the emergency services on site dealing with the fire on the canopy.

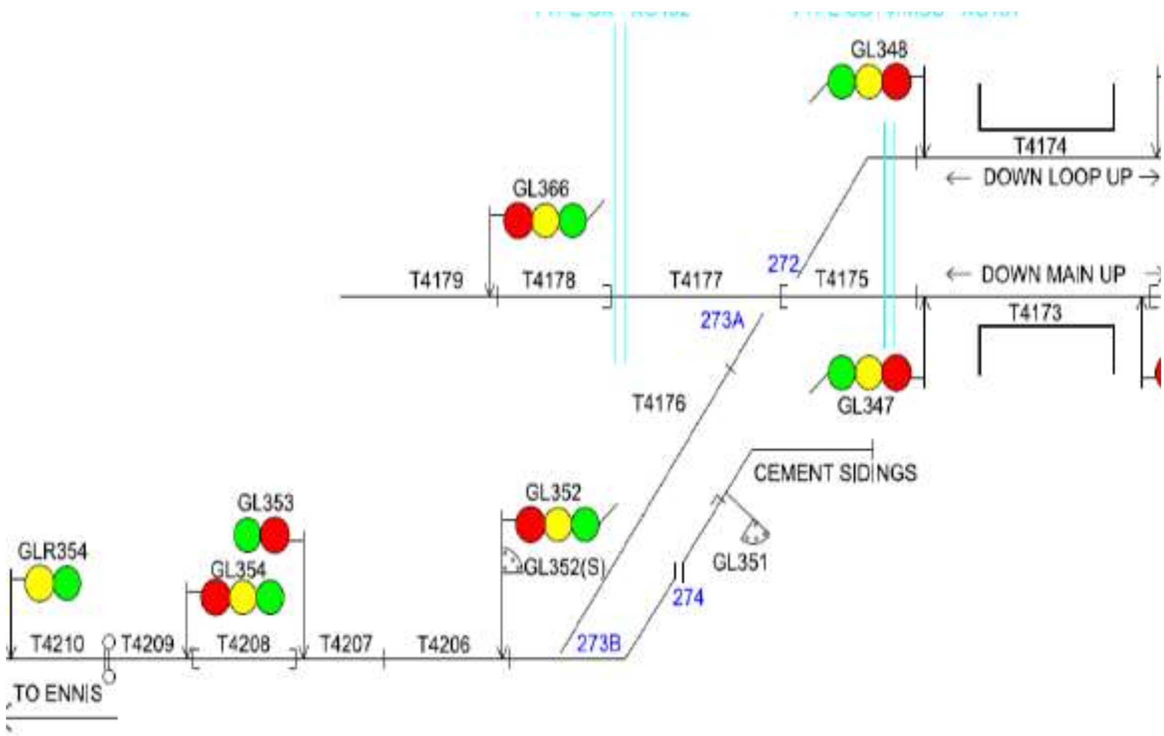


Figure 85 – Athenry Station layout

695 While Train A489 was at Athenry Station, the signalman requested Signal GL348, which upgraded to yellow, and the train departed, see Figure 85. The signalman requested GL353 (see Figure 85) three times within thirty seconds but the signal did not upgrade. This was as a result of the incorrect WSLP switch being operated (the switch was operated for the Athenry to Gort line instead of the Athenry to Galway line), however, this was not noticed by the signalman.

696 Driver A489 departed Athenry with Signal GL348 displaying a yellow aspect obeying the speed restriction of 20 mph (32 km/h) and then increasing the speed of the train when passing the PSR of 80 mph (128 km/h). Driver A489 then looked out the window of the train and back towards the fire on the canopy. When Driver A489 looked back at the track, he saw that Signal GL353 was displaying a red aspect and immediately applied the brakes, but passed the signal at danger without authority.

697 Driver A489 had four years of driving experience and was classified as a Category U Driver with no previous occupational safety related occurrences.

698 IÉ assigned an SRR of 0 to the SPAD. IÉ's internal 5 working day panel review, published on the 27th November 2011 identified the immediate cause as "the driver did not react to the cautionary aspect". Underlying causes associated with the signalman were identified as the signalman engaging the wrong switch and being too distracted to check that the route was set. Underlying causes associated with Driver A489 included that the driver was distracted with the WSLP, fire,

irate passengers, wheelchair passenger and the speed board. Another underlying cause was identified as the “abnormally warm temperatures” on the day.

699 As a result of the SPAD, Driver A489 was assigned a DD&SS and the signalman’s performance under WSLP was reviewed. Vegetation around Signal GL353 was also cut back.

700 The RAIU review of the incident found that Driver A489 had become distracted by a number of factors on the day of the incident, namely the WSLP, the late running of the trains, the wheelchair passenger, the irate passengers, the fire at Athenry and the speed board[17]. He also had an incorrect expectation of the signal, which normally displayed a green aspect. These factors led to Driver A489 losing situational awareness and forgetting he was operating under WSLP and departing the station on a yellow aspect.

SAS SPAD at TL241, Killarney (Kerry), on the 9th August 2013

701 On the 9th August 2013 driver (Driver A310) was rostered to “driver as required” and was assigned to the 17:25 hrs passenger service from Mallow to Tralee (Train A310). To travel from Killarney to Mallow, trains are shunted into Killarney Check to be forwarded onto Mallow. When Train A310 was routed into Killarney Check, Driver A310 changed driver cab ends, he then started the train without looking at Signal TL241 which was displaying a red aspect and passed the signal at danger without authority.

702 At the time of the incident, Signal TL241 had been previously past at danger on one occasion in the previous ten years.

703 At the time of the SPAD, Driver A310 was a PQA driver with no previous occupational safety related occurrences.

704 IÉ assigned an SRR of 14 to the SPAD. IÉ’s internal 5 Working Day Panel Review, published on the 13th August 2013, identified the immediate cause as the driver “failed to check the aspect of signal TL241 before starting his train” and the underlying cause as “the driver was not focused on the task at hand due to a lapse in concentration”. Driver A310 was assigned a DD&SS as a result of the SPAD and there were no other recommendations.

705 The RAIU review of the incident found that Driver A310 was distracted by the late running of the train. He had an incorrect expectation that the signal would be displaying a green aspect as he

[17] The RAIU have found that the placement of speed boards near signals has been a contributory factor in four SPADs reviewed during this investigation, including the SPAD at Millstreet on the 8th December 2013. As a result, the RAIU feel this warrants a safety recommendation, see Part 14 – Safety Recommendations.

normally had a green aspect. Driver A310 also assumed that signalmen were required to route trains out of Killarney Check as a priority. In addition, Driver A310 was not fully aware of his situation as he had not been scheduled to drive the train and was “driving as required”, which Driver A310 felt contributed to the SPAD.

SOY SPAD at Signal DD262, Dundalk, on the 10th August 2013

706 On Saturday 10th August 2013 the 16:50 hrs passenger service from Connolly to Belfast (Train A132) departed from Dublin on time and operated to Dundalk without incident; Driver A132 operated this service throughout. Prior to the arrival of Train A132 the signalman attempted to clear the route for Train A132 from Dundalk to Newry, two times, but was unsuccessful as there was a train occupying the section. As a result, the signal on the approach to Dundalk Station (Signal DD278) was displaying a double yellow aspect; the signal at the exit of Dundalk Station (Signal 265) was displaying a yellow signal; and Signal DD262 was displaying a red aspect.

707 At Dundalk, after the passengers had disembarked and boarded the train, the Train Guard sounded the bells, and Driver A132 closed the doors; the Train Guard then sounded the Ready to Start bells and Driver A132 proceeded. The Train Guard noticed that Signal DD265 was displaying a yellow aspect. Driver A132 did not notice that Signal DD265 was displaying a yellow aspect.

708 After departing Dundalk, the CAWS downgrades to red, and Train A132 continued to accelerate to a speed of 39.76 mph (63.6 km/h) and holds this speed. Driver A132 then looks away from the track to retrieve the Northern Ireland Railways (NIR) mobile phone from the cross border bag (drivers operating into Northern Ireland are required to carry this mobile phone). When Driver A132 retrieved the mobile phone and looked back at the track he saw that Signal DD262 was at danger, he then applied the brakes, and came to a stop approximately 51 m past Signal DD262.

709 Driver A132 had ten years of driving experience and was classified as a Category B Driver at the time of the incident as a result of a speeding incident in February 2013.

710 The SPAD was assigned an SRR of 15. The investigation report into the incident, published in June 2014 (Report No. R0701-2014-25), identifies the immediate cause of the incident as Driver A132 being distracted and failing to react in time to the CAWS aspect displayed in his cab and Signal DD262. Causal factors include Driver A132 not heeding Signals DD278, DD265 or DD262 and not applying the brake to emergency on receiving the CAWS downgrade. Underlying causes were identified as Driver A132 being over reliant on Signals DD265 and DD262 being at proceed and that Driver A132 did not have situational awareness of his surroundings. The report also noted that if Driver A132 had applied the emergency brakes instead of the full service brake, the SPAD would not have occurred.

711 After the incident: Driver A132 remained on a DD&SS; briefings occurred in relation to the use of mobile phones and the application of emergency brakes on approaching red aspects. The report made six recommendations, including two specifically related to Driver A132, two on mobile phones, one on PIC duties and one related to the review of the route risks in relation to SOY SPADs.

712 The RAIU review of the incident found that Driver A132 had become distracted by retrieving the NIR mobile phone; he also had an incorrect expectation that Signals DD265 and DD262 would be displaying a green aspect, as he assumed that all trains travelling into Northern Ireland were required to be cleared; he also had not fully appreciated that signalling sequence when driving into the station, i.e. that Signal DD278 was displaying a double yellow and Signal DD265 was displaying a single yellow.

SAS SPAD at PE35s, Pearse (Dublin), 10th August 2013

713 At 06:30 hrs on the 10th August the driver (Driver A905) of the 07:40 hrs passenger service from Pearse to Maynooth (Train A905) reported for duty fit and rested for driving duties. At 07:32 hrs Driver A905 arrived at Pearse Station shunted into Pearse Street Station Yard to change driving cab ends and continue back into Pearse Station. On changing driving cab ends Driver A905 has difficulty with connecting the radio to the correct channel. At 07:39 hrs, he has not resolved the issue with the radio but made the decision to travel back onto the platform at Pearse Station where he would try again to fix the radio.

714 Driver A905 checks that the points are set for his return onto the platform at Pearse Station and sees that they are. He then starts driving the train towards the platform without checking what aspect position light signal, Signal PE35s was displaying (which was displaying a danger aspect). Driver A905 then travels past Signal PE35s at danger (see PE35s in Figure 86).

715 At the time of the incident, Signal PE35s had been previously passed at danger on two occasions in the previous ten years.

716 Driver A801 had over twelve years of driving experience and was classified as a Category U Driver with no previous operational safety related occurrences or requirements for additional support in the previous twelve years.

Figure 86 – Position light signal, Signal PE35s

717 This SPAD was assigned an SRR of 17. Signal PE35s is now a multi-SPADed signal. The IÉ internal investigation report (Safety Office Ref: 130810-IM01) published on the 8th October 2013 identified the immediate cause as Driver A905 failing to look at Signal PE35s before moving his train; the causal factor was that Driver A905 was distracted by another task (setting up the train radio); and the underlying cause was a lapse in concentration by Driver A905.

718 As a result of this incident Driver A905 has been reclassified as a Category B Driver for a period of two years and assigned a DD&SS. The report also makes two recommendations: for the signal to be identified as a multi-SPADed signal and for drivers to be re-briefed on the auto routing system (especially the movement of points).

719 The RAIU review of the incident found that Driver A905 had become distracted and preoccupied with the radio which he could not get to work. He also had an incorrect expectation that the signal was displaying a proceed aspect, as when he saw the points set for his route, he assumed the signal was displaying a proceed aspect, as a result of losing situational awareness.

<u>SAS SPAD at TL226, Rathmore (Kerry), 26th February 2014</u>

720 On Friday 26th February 2014 the Inspection Car Driver (Driver Y370) was required to operate the Inspection Car (Train Y370) from Rathmore to Tralee, and then return to Limerick Junction. At Rathmore, as Train Y370 was stabled in the siding (see Figure 87), Driver Y370 contacted CTC to advise he was ready to shunt Train Y370 in readiness to travel to Tralee.

721 When CTC cleared Signal TL227 (See signal marked A in Figure 87) Driver Y370 drove Train Y370 onto the running line and stopped in rear of Signal TL226 (see signal marked B in Figure 87). He then switched the control of Train Y370 in order to travel towards Tralee. Driver Y370

then saw that the point were set towards Tralee and saw that Signal TL231 (see signal marked C in Figure 87) was displaying a green aspect. Train Y370 then proceeded towards Tralee, with Signal TL226 displaying a danger aspect, and passed Signal TL226 at danger without authority.

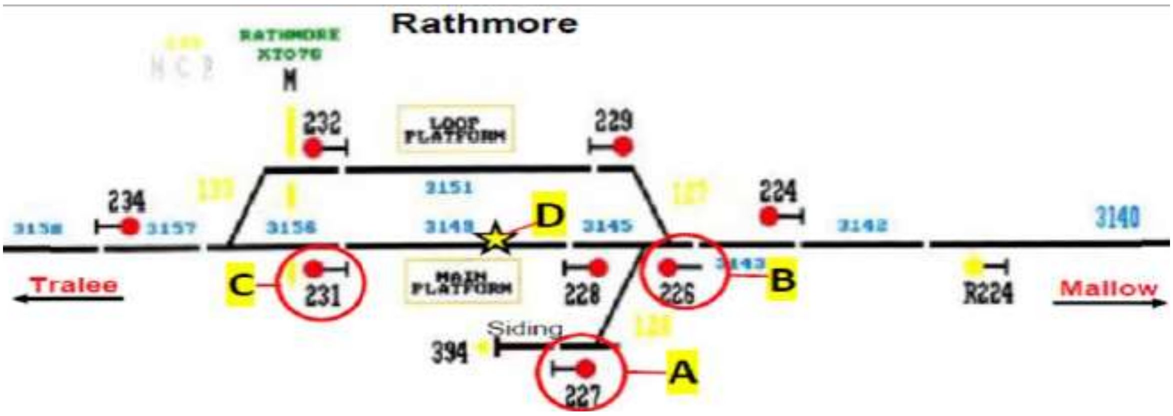


Figure 87 – Layout at Rathmore

722 Driver Y370 had over four years of driving experience as an Inspection Car driver. He was not subject to any development plan or additional monitoring as he has no previous operational safety occurrence issues. Although familiar with the Mallow to Tralee route, he had never carried out a movement from the siding.

723 The SPAD was assigned an SRR of 0. The BBRI/IÉ-IM's 5DIR (Ref: 24076) published the 2nd May 2014 identified the immediate cause of the inspection as Driver Y370 reading the wrong signal (TL231) as his starting signal. Causal factors associated with Driver Y370 were identified as the driver not having: a full understanding or appreciating requirements associated with Signal TL223; or adequate route knowledge.

724 As a result of the SPAD, Driver Y370 was re-briefed and assessed. There were no recommendations as a result of this incident.

725 The RAIU found that Driver Y370 had lost situational awareness as he did not have a full appreciation of the movement to be carried out, this may have been the result of inadequate route knowledge.

SOY SPAD at HK196, Curragh (Kildare), 14th March 2014

726 On Friday 14th March 2014 Driver A801 took up driving duties out the 05:15 hrs passenger service from Westport to Heuston at Athlone. As the train approached Kildare Station, Signal HK210R and Signal HK210 displayed double yellow and single yellow aspects, respectively. The starting signal, Signal HK202 (see Figure 88), was initially displaying a red aspect, which

upgraded to a yellow aspect as the train approached (there was no downgrade to the CAWS as it was already displaying a single yellow).

727 There was no PIC present at the Kildare Station resulting in Driver A801 performing the train despatch procedures. Driver A801 departed Kildare Station at approximately 07:53 hrs, with the starting signal, Signal HK202 still displaying a yellow aspect. The weather was foggy at the time. Driver A801 increased speed to 60 mph (100 km/h) over a distance of 1.2 miles (1.96 km).

Figure 88 – Signal HK202

Figure 89 – Signal HK196

728 When Signal HK196 (see Figure 89) came into view, Driver A801 remembered that Signal HK202 was displaying a yellow aspect. He immediately applied the brakes to the full service position (07:55 hrs), but the train passed signal HK196 at danger by twenty metres.

729 Driver A801 had over eight years of driving experience and has been classified as a Category U Driver since 2005, with no previous operational safety related occurrences.

730 The SPAD was assigned an SRR of 18. IÉ's internal OOR, R0802-2014-29, published on the 21st June 2014 identified the immediate cause of the incident as Driver A801 "forgetting" that the starting signal was displaying a yellow aspect, which was as a result of overreliance on past experience (of usually starting on a green aspect). Causal factors to the incident included: that the visibility was reduced as a result of the fog and there was some LRA; Driver A801 was over-reliant on past experience; he was not using self-checking techniques (such as RTC); and was accelerating the train rather than controlling the train as required with a cautionary aspect. Underlying to this incident was that the train was not fitted with DRA which may have assisted Driver A801 in remembering that the starting signal was displaying a yellow aspect.

731 Driver A801 was reclassified as a Category B Driver and assigned a DD&SS as a result of the SPAD; and all drivers were briefed on SOY SPADs and their associated risks. In addition, at the time of publication of the internal report, the programme for the fitting of all traction rolling stock

with a DRA was ongoing and as a result no recommendations were made as a result of this SPAD.

732 The RAIU review of the incident found that Driver A801 was distracted as a result of the late running of the trains. In addition, Driver A801 had lost situational awareness, partially as a result of the foggy weather conditions and partially as he forgot he had departed the station on a yellow aspect.

SAS SPAD at DD269, Dundalk, 13th May 2014

733 On the 13th May 2013 a train driver worked the 22:37 hrs passenger service from Connolly to Dundalk (referred to as Dundalk Driver for the remainder of this section). He was required to terminate the train in Drogheda at 23:23 hrs due to engineering works taking place between Drogheda and Dundalk. As a result he continued to Dundalk on the replacement bus service, arriving in Dundalk before the normal scheduled time. On arriving, he offered his assistance to another driver who was shunting a train in preparation for service (referred to as the Shunt Driver for the remainder of the report). The Shunt Driver would normally carry out the shunting on his own.

734 The Shunt Driver contacted the signalman for permission to carry out the shunting moves, which was granted. The Shunt Driver then carried out the first shunt move from the front cab of the train, by taking the train from the siding up into the yard, see Figure 90. The Shunt Driver then keyed out of driving duties from the front cab.

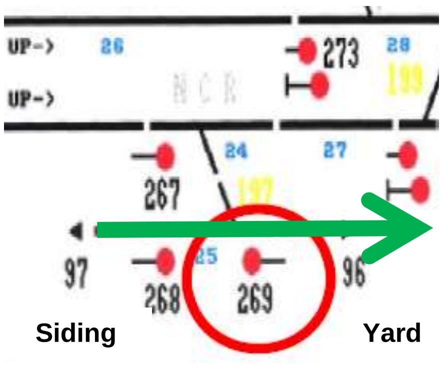


Figure 90 – Shunt Driver movement into Yard

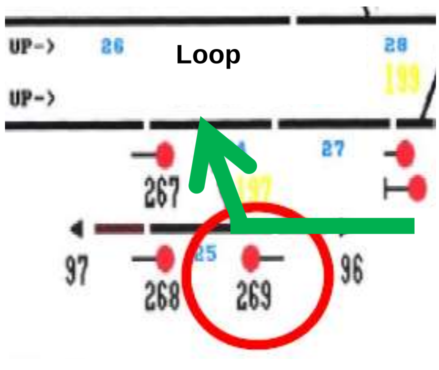


Figure 91 – Train Driver movement onto Loop

Figure 92 – Shunt Signal DD269

735 The Dundalk Driver, who was positioned in the rear cab, keyed into driving duties from the rear cab. The Dundalk Driver thought that Shunt Signal 269 was displaying as proceed aspect (two white lights), and began the shunting move from the yard onto the loop, see Figure 91. On approaching Shunt Signal 269 he saw that it was in fact displaying a restrictive aspects (one red

and one white light), as illustrated in Figure 92. He immediately applied the emergency brake, however he passed Shunt Signal DD269 at danger by three metres.

736 The Dundalk Driver had over five years of driving experience and was classified as a Category U (Uncategorised) Driver with no previous operational safety related occurrences recorded in the previous five years.

737 The internal IÉ OOR, R1001-2014-40, published on the 8th September 2014, assigned an SRR of 10 to the SPAD. It found that the immediate cause of the incident was as a result of the Dundalk Driver viewing but misreading Shunt Signal DD269. Causal factors were identified as the fact that two drivers were performing the duties of one driver and that the Dundalk Driver was speeding at the time of the incident. IÉ did not identify any underlying causes.

738 The report found that there were no special features, apart from the engineering works, in place at the time of the incident. In particular reference to Dundalk Driver, the investigation found that Dundalk Driver, after medical examination, had no medial factors which contributed to the incident. The investigation panel found that Dundalk Driver had been well rested, had received all his personal needs breaks and had been driving for approximately three hours before the incident.

739 The DTEs took a number of actions as a result of this incident, namely:

- Dundalk Driver was placed on a driver development plan;
- Increased monitoring of drivers in the location, both in frequency and times (i.e. more out-of-hours monitoring);
- Briefing driver on speed limits and requirements for only one driver performing shunting moves.

740 As a result of these actions, no additional recommendations were made.

741 The RAIU review of the incident found that the Dundalk Driver had an incorrect expectation of the signal and thought it was displaying a proceed aspect, this was as a result of the manoeuvre normally taking longer when the movement is carried out with only one driver, and usually results in the signal being at proceed. This incorrect expectation was also compounded by the fact that the Dundalk Driver was distracted by the fact that it was his last movement of the night and was rushing to finish.

SAS SPAD at MW826, Mallow, 16th May 2014

742 On Friday 16th May 2014, the 08:55 hrs passenger service from Cork to Tralee (Train A302) was due to be auto-routed into Platform 3 at Mallow, as normal, at 09:18 hrs. However, on this day, the PIC at Mallow Station requested CTC to cancel this route and route the train into Platform 1, to facilitate passengers. The service arrived into Platform 1 four minutes late, at 09:22 hrs. The PIC was dealing with a couple of passengers in relation to what trains they should be travelling on.

743 After arriving on Platform 1 the train driver (to be referred to as Driver A302) was required to switch ends to work the continuation of the service from Mallow to Tralee. The PIC was standing at the driver's cab door when he gave Driver A302 the "station work complete" and the "ready to start" signal, indicating that it was safe for the train to proceed; the PIC and the train driver were engrossed in conversation throughout these actions.

Figure 93 – Mallow Station with Signal MW826

744 Driver A302 then looked along the train and departed without checking the Signal MW826 (see Figure 93), assuming this was done by the PIC prior to giving the "ready to start" signal. Signal MW826 was displaying a red aspect as the CTC Signalman had not yet set the route. Driver A302 passed Signal MW826 at danger, and continued a distance of 966 m before the train was stopped on the request of the Waterford/Tralee Line Signalman.

745 Driver A302 had over seven years of driving experience and was classified as a Category U Driver with no previous operational safety related occurrences recorded in the previous seven years.

746 IÉ assigned an SRR of 16 to the SPAD. IÉ’s internal OOR (R1002-2014-41), published on the 17th September 2014 found that the immediate cause was as a result of Driver A302 failing to focus on the next primary task of checking the signal for a proceed aspect after receiving the signals from the PIC. IÉ found the causal factors to be that Driver A302 and the PIC were engrossed in conversation and not focused on the primary task at hand and that the PIC gave the “ready to start” signal without checking the aspect of Signal MW826. IÉ did not identify any underlying causes.

747 As a result of the incident Driver A302 was placed on a DD&SS and the PIC was re-briefed on the Rule Book and despatching procedures. Three other recommendations were made related to the stopping position of trains at Mallow Station; briefing of PICs and train radio reminder boards at Mallow Station.

748 The RAIU review of the incident found that Drive A302 had initially become distracted by the PIC and the late running of the service. Driver A302 also had an incorrect expectation of the aspect of Signal MW826, this was as a result of the PIC giving the ‘Ready to Start’ indication and seeing that the points for exiting the station was set.

SOY SPAD at Signal CE842, Glounthaune, 29th June 2014

749 On 29th June 2014 as the 07:15 hrs passenger service from Cork to Midleton (Train D273) was approaching Glounthaune Station, Signal CE473 (located on the platform) was displaying a red aspect, upgrading to yellow as Train D273 arrived on the platform.

750 On arrival at the platform, the driver (Driver D273) carried out a number of station platform and despatch duties. Driver D273 departed Glounthaune Station, ahead of schedule, with the starting signal, Signal CE473 (Figure 94), displaying a yellow aspect and proceeded towards Signal CE842 (Figure 95) which was displaying a red aspect (this was as a result of the Cork East Signalman waiting for the train approaching Glounthaune Station in the opposite direction to clear the section).

Figure 94 – Signal CE473 **Figure 95 – Signal CE482**

751 On approach to Signal CE482, Driver D273 saw that it was displaying a red aspect and applied the brakes. However, Train D273 passed Signal CE842 at danger, passing the signal by 82 m before coming to a stop.

752 Driver D273 had over four years of driving experience and was classified as a Category U Driver. Driver D273 had previously been classified as a Category D Driver, as a result of a 'Failure to Call' at a station incident.

753 IÉ assigned an SRR of 18 against this SPAD. The internal IÉ OOR (R1301-2014-53) published on the 24th December 2014 recorded the immediate cause of the incident was recorded as Driver D273 failing to focus on the primary task of checking Signal CE842 after starting on a yellow aspect (Signal CE473). Causal factors were recorded associated with Driver D273 were recorded as, Driver D273; did not have Train D273 under sufficient control; assuming that the train travelling in the opposite direction had cleared the section; not applying defensive driving techniques; not performing self-checking techniques (such as RTC); departing Glounthaune Station ahead of schedule. Underlying causes were identified as that there was no CAWS fitted and a personal issue related to Driver D273.

754 IÉ carried out a number of actions as a result of this incident, namely: placing Driver D273 on a DD&SS; briefing drivers on not departing station ahead of scheduled time; reviewing risks associated with SAS and SOY SPADs; and reviewing practicalities of providing additional control measures to reduce SPADs.

755 The RAIU review of the incident found that Driver D273 had an incorrect expectation that Signal CE482 was displaying a proceed aspect, as he could see the lights of the train in front of him and he assumed that the section had cleared and he was okay to proceed. Driver D273 also stated

that he had become distracted by the speed board[18] located in rear of Signal CE482 which was displaying an increased speed (see Figure 95). The RAIU found that Driver D273 was not adversely affected by any personal issues at the time of the incident as stated in the internal IÉ report.

SOY SPAD at Signal BR36, Bray, on the 20th August 2014

756 On the 20th August 2014, Train Y674 (an inspection car) was due to travel from Connolly to Greystones at 10:00 hrs, it was being operated by a BBRI staff member (Driver Y674). On the approach to Bray DART Station, Train Y674 stopped at the next red aspect, Signal BR28, see Figure 96. The signalman upgraded BR28 to a yellow aspect (meaning the next signal, Signal BR36 (see Figure 96) was displaying a red aspect) and Train Y674 travelled past Signal BR28 and continued towards the red Signal BR36. Driver Y674 saw that the route was made for his movement and looked at BR46 which was displaying a proceed aspect. Driver Y674 did not see Signal BR36 and continued past it at danger without authority. The signalman phoned Driver Y674 requesting that he immediately stop the train.

[18] The RAIU have found that the placement of speed boards near signals has been a contributory factor in four SPADs reviewed during this investigation, including the SPAD at Millstreet on the 8th December 2013. As a result, the RAIU feel this warrants a safety recommendation.

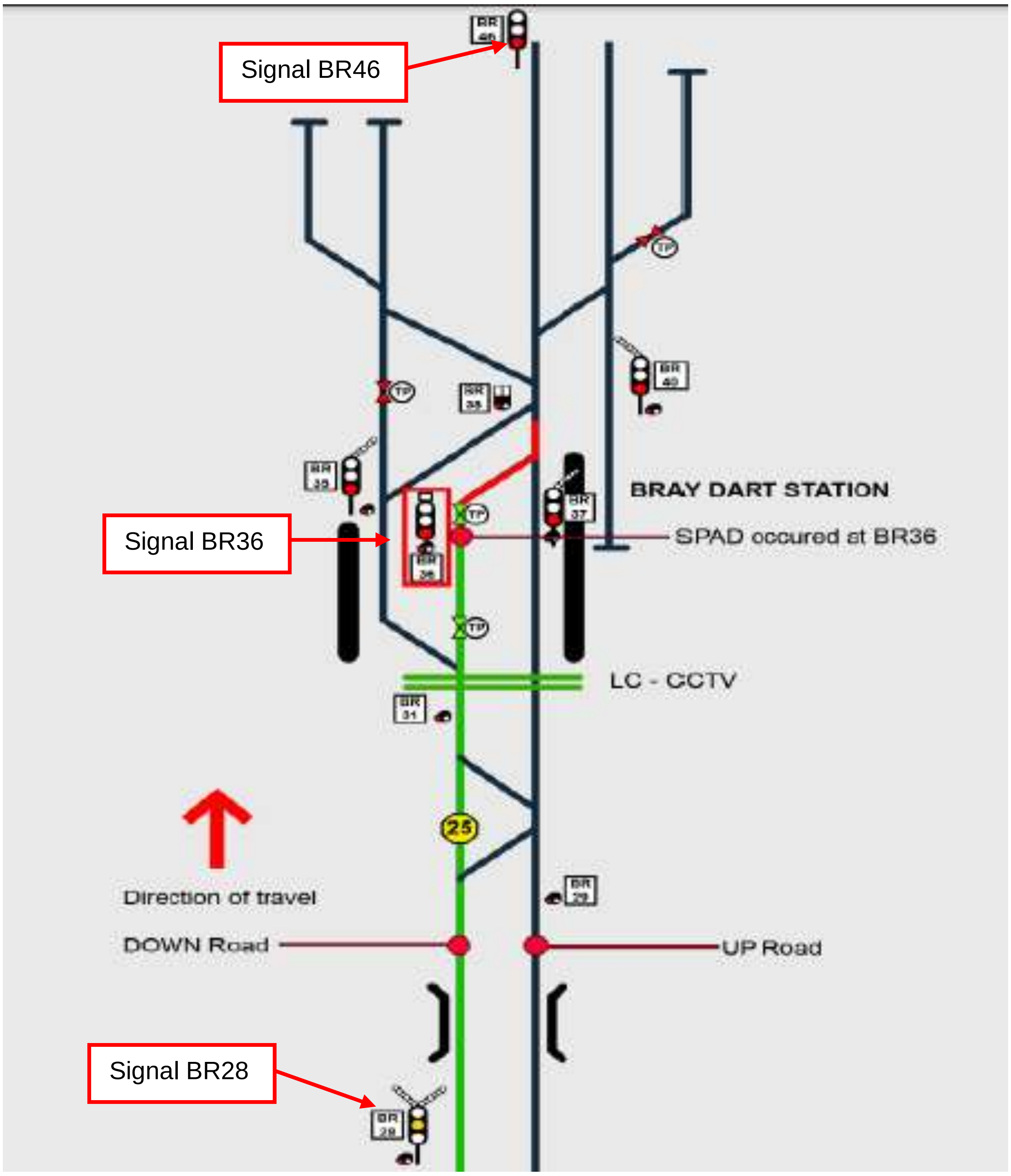


Figure 96 – Bray Station Layout & intended route (taken from IÉ internal report)

757 IÉ assigned an SRR of 16 to the SPAD. The BBRI/IÉ-IM investigation report found that the immediate cause of the SPAD was Driver Y674 "not locating and observing Signal BR36 at danger". Causation factors were identified as Driver Y674 "focussing on Signal BR46" and not having "adequate route knowledge for the route concerned". The underlying cause of the SPAD was "the lack of route packs for operators".

758 As a result of the SPAD, BBRI issued all OTMDOs with route knowledge packs and provided additional communications training for all OTMDOs. With specific reference to Driver Y674, as he was not an IÉ employee he was not assigned a DD&SS, however, BBRI:

- Driver Y674 was placed on an agreed corrective action plan (CAP) when returned to driving duties;
- Issued Driver Y674 with route knowledge pack and assessed him of the route;
- Carried out extra monitoring on Driver Y674.

759 The RAIU review of the incident found that Driver Y674 had become very distracted by an earlier incident, whereby the keys of Train Y674 were missing; although he did locate the keys he became preoccupied with thinking about the keys while driving as he thought there may be some disciplining involved from BBRI had he not located the keys. In addition, he had lost situational awareness, as although he had travelled the route previous to the day of the SPAD, he did not see or look for BR36, and on seeing BR46 at proceed, with the route set, he had an incorrect expectation that he was authorised to proceed.

SAS SPAD at Signal HN291, Heuston (Dublin), 11th October 2014

760 On Saturday 11th October 2014, Driver I215 was required to shunt an empty train (Train I215) from a Carriage Siding into Heuston Station. This was a regular movement which required a forward movement for the Carriage Siding onto the Up Main, driven from the locomotive, which would require the points to be set in the reverse position (the points are normally set in the trap position, as the Siding leads onto the Up Main). A reverse movement driven from the control car towards Platform 4 (see Figure 97) is then required.

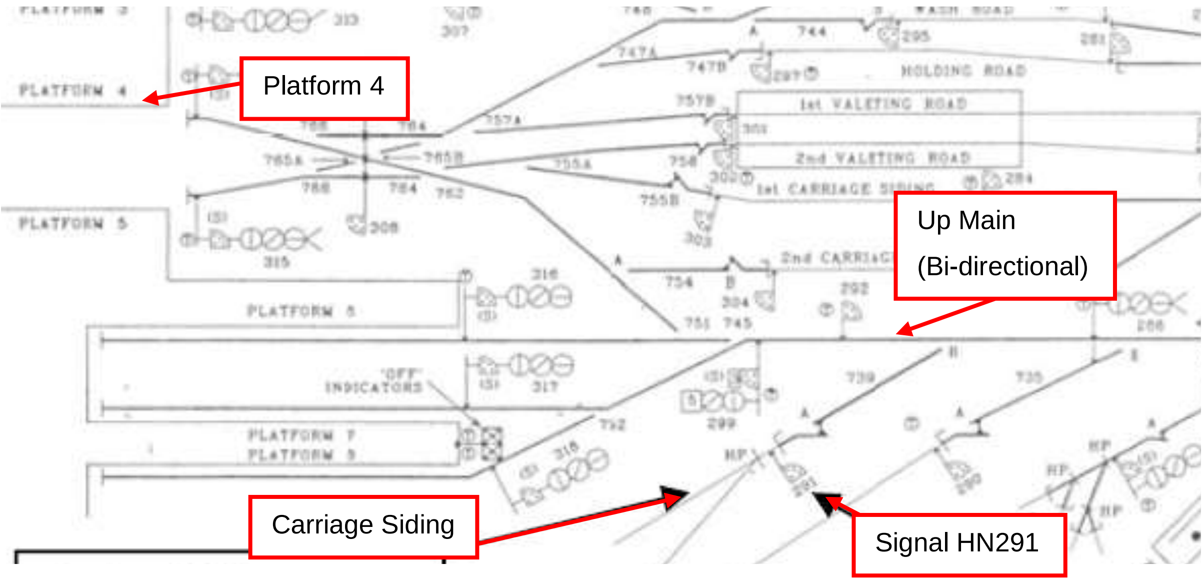


Figure 97 – Layout at Heuston

761 After requesting the movements from Signal Equipment Room (SER) Driver I215 commenced the movement, believing that Signal HN291 (see Figure 97) was displaying a proceed aspect. As Driver I215 proceeded with the movement and on the approach to Signal HN291 Driver I215 noticed that the points were lying in the trapping position and immediately applied the emergency brakes. However, Train I215 continued past Signal HN291 at danger, and became derailed as it travelled over the points; he immediately called the signalman in SER to inform him of the SPAD.

762 At the time of the SPAD Driver I215 had seven years of driving experience and was classified as a Category U Driver with no previous operational safety related occurrences in the previous seven years.

763 The SPAD was assigned an SRR of 14 to this SPAD. IÉ's internal OOR (Report No. R0209-2015-09) published on the 20th February 2015 found that the immediate cause of the incident was due to Driver I215 misreading Signal HN291. A causal factors associated with Driver I215 was related to Driver I215 forming the opinion that Signal HN291 was displaying a proceed aspect; three other causal factors were identified as miscommunication and improper communication. An underlying cause associated with the incident was identified as a DRA not being fitted to Train I215.

764 As a result of the SPAD, briefing and notices were issued in relation to communication procedures. At the time of issue of the IÉ report a programme of self-checking skills was being introduced for drivers and a programme of the introduction of DRA on rolling stock was underway.

765 The RAIU found that Driver I215 had lost situational awareness as he assumed he had the proceed aspect as he misread the signal, which may have been as a result of an incorrect expectation that he was authorised to proceed.

SAS SPAD at Signal SL817, Boyle, 18th January 2015

766 At 12:20 hrs on Sunday 18th January 2015, the driver (Driver A911) signed on duty fully rested in Sligo Station. He prepared and shunted the 18:00 hrs passenger service from Sligo to Connolly (Train A911).

767 During the preparation of Train A911, Driver A911 encountered problems forming a brake, contributing to the train departing Sligo Station five minute late at 18:05 hrs.

768 Driver A911 travelled to the approach of Boyle Station, without incident. On the approach to the distant signal, Signal SL822R at Boyle, it was displaying a double yellow aspect; the home signal, Signal SL822, was displaying a single yellow aspect and the section signal, Signal SL817 was displaying a red aspect, see Figure 98.

769 At Boyle Station, the late running 15:05 hrs passenger service from Connolly Station to Sligo, (Train A904) was standing on the loop platform in Boyle Station, awaiting the arrival of Train A911. Additionally the 16:00 hrs passenger service from Connolly Station to Sligo (Train A906), was standing at Signal SL815 awaiting the departure of A904 from the loop platform, see Figure 98.

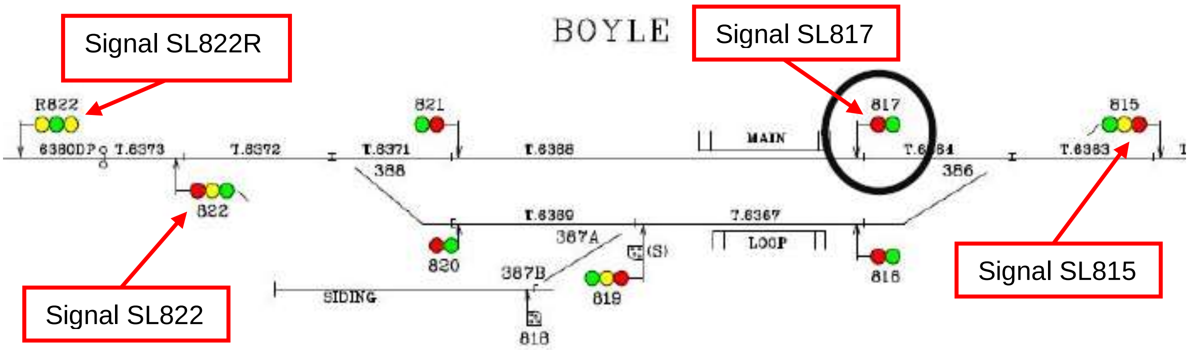


Figure 98 – Signalling at Boyle Station

770 At Boyle Station, train despatch was performed by Driver A911 and after completing these duties he closed the doors and applied power to the train, departing Boyle Station with Signal SL817 displaying a red aspect (Signal SL817 is located 24 m from the top of the ramp on the main platform at Boyle Station). Train A911 was travelling at 7 mph (11.2 km/h) when Driver A911 saw that Signal SL817 was displaying a red aspect; he immediately applied the brakes, but the train travelled past the signal by approximately 5 m.

771 After the SPAD, the decision was made by the Deputy District Manager Northern to allow Driver A911 to change driving cab ends and return to Boyle Station Platform, to allow access to the Loop Platform. The Signalman contacted Driver A911 to advise him that he would be returning to Boyle

Station, and requested that he change driving cab ends and call him once he was in the other cab (it was noted that these communications were not clear or concise).

772 Driver A911 changed driving cab ends, and without contacting the Signalman, began travelling back to Boyle Station. The Signalman, while waiting for Driver A911 to call him, saw that Train A911 was moving. The Signalman immediately contacted Driver A911, via train radio, and told him to stop his train.

773 At the time of the SPAD Driver A911 had over three years of driving experience. At the time of the incident, Driver A911 was categorised as a Category A driver, and was one year and seven months into a four year DD&SS. Driver A911 was on a DD&SS as a result of an operational occurrence on the 4th June 2013, where Driver A911 departed Maynooth Station with a door open in one of the units on the train, while he operated the 13:00 hrs passenger service from Sligo to Connolly.

774 IÉ assigned an SRR of 20 to the SPAD. IÉ's OOR, published on the 28th April 2015, identified that the immediate cause of the SPAD was as a result of Driver A911 failing to check Signal SL817 prior to starting the train from the platform due to not paying attention to the signal to ascertain its aspect. The Driver was over reliant on past experience where signal SL817 would normally display a proceed aspect. The OOR identified the contributory factors as Driver A911 assuming the signal was displaying a proceed aspect and moving his train without checking what aspect was displayed in Signal SL817; and Driver A911 being distracted by the late running of the services, as the late running may have resulted in him missing the next crossing point of his train with another train, further delaying his return trip to Sligo. Underlying causes were identified as the absence of DRA, CAWS/ATP.

775 At the time of publication of the OOR, the fitment and introduction of DRA was ongoing; and the project to upgrade train protection, through the development and installation of IÉHS was underway; as a result of these, no further recommendation were made.

776 The RAIU review of the incident found that Driver A911 had become distracted and preoccupied by the late running of the train. In addition, Driver A911 was unaware that there were two trains crossing his train at Boyle Station; and when the first train had passed, he had an incorrect expectation that he would have proceed signals.

SOY SPAD at Signal PE18, Pearse (Dublin), 11th March 2015

777 At 13:00 hrs on the 11th March 2015, Driver P618 signed on duty, fully rested, in Drogheda Station. He operated the 17:00 hrs Drogheda to Pearse passenger service (Train P618) without incident prior to receiving a call from the CTC Suburban Signalman to caution him of trespassers on the line at Malahide Viaduct. On reaching Malahide Viaduct Driver P618 did not see any trespassers and informed the CTC Suburban Signalman of this.

778 Train P618 continued, without further incident, until it arrived on Platform 5, Connolly Station. The signal departing Platform 5, Signal CY91, was displaying a red aspect on arrival of Train P618 (see Figure 99). The signal upgraded to a single yellow while passengers were boarding and alighting from the train on Platform 5. When station working was complete Driver P618 closed the doors on the train, rechecked the monitor on Platform 5 and departed Connolly Station at approximately 18:01:39 hrs.

Figure 99 – Signal CY91 (Platform 5)

Figure 100 – Signal PE18

779 Driver P618 started to accelerate the train, and 147 m in rear of Signal PE18 (see Figure 100), Driver P618 acknowledged the downgrade to red in the CAWS whilst travelling at 18.16 km/h. At 18:02:27 hrs, 14 m in rear of Signal PE18, Driver P618 applied the brake to the braking position; he applied the emergency brake 5 m in rear of Signal PE18; however, Train P618 passed Signal PE18 at danger by approximately 3 m.

780 At the time of the incident, Signal PE18 had been previously past at danger on one occasion in the previous ten years.

781 At the time of the SPAD Driver P618 had fifteen years of driving experience and was classified as a Category U Driver with no previous operational safety related occurrences.

782 IÉ assigned an SRR of 16 to the SPAD. The OOR, published in May 2015, identified the immediate cause of the SPAD as Driver P618 not focusing on the primary task of controlling the train sufficiently on approach to Signal PE18 resulting in the signal being passed at danger. Contributory factors were identified as:

- Train P618 starting from Platform 5, Connolly Station, with a yellow aspect in signal CY91; and Driver P618 acknowledging the CAWS downgrade at 147 m in rear of Signal PE18 but did not reduce the speed of the train;
- Driver P618 did not apply the first brake application until the train was 14 m in rear of Signal PE18 with an emergency brake application made 5 m in rear of the signal;
- Train P618 was following behind a DART service from Howth Junction; as a result Driver P618 was anticipating that Signal PE18 would upgrade to a proceed aspect as the DART continued on its journey.

783 IÉ identified the underlying cause to the SPAD as the train not being fitted with the ATP function.

784 As a result of the SPAD, Driver P618 was reclassified as a Category B Driver, and assigned a DD&SS for two years.

785 The OOR notes that the train protection upgrade programme, IÉHS, is underway. In addition, Signal PE18 is to be removed from its current position and replaced with two new signals, installed between Connolly and Tara Street Stations.

786 As a result, this OOR resulted in one new recommendation, whereby, the RU Safety Manager is to prepare and issue a specific briefing/notice to remind train drivers of the risks of running on restricted signals, the management of the resultant CAWS interventions and the necessity to remain focused on the driving activity in such circumstances.

787 The RAIU found that Driver P618 had become distracted and preoccupied by thinking of future movements on the approach to Pearse, leading to him losing situational awareness.

SAS SPAD at Signal DN201, Howth (Dublin), 21st April 2015

788 At approximately 23:34 hrs on the 21st April 2015, train F010, the empty 23:40 hrs Howth to Fairview Depot departed Howth from Platform 2 and stopped at Signal DN201 which was displaying a red aspect. The distance travelled by the train was 190 meters. The driver (Driver F010) had engaged the running release of the ATP when departing the platform. When the train was stopped at Signal DN201, Driver F010 kept the power control lever de-pressed preventing the ATP from engaging.

789 After twelve seconds Driver F010 moved the train forward, with the running release engaged and passed Signal DN201 at danger without authority. The train speed increased to 17.5 km/h and a penalty brake application was made, however, the train passed Signal DN201 at danger without authority. The CTC Signalman, on the activation of the critical alarm, contacted Driver F010 to bring the train to a stop and Driver F010 stopped the train.

790 At the time of the SPAD Driver F010 had nearly fourteen years of driving experience and was categorised as a Category U Driver. Driver F010 was previously classified as a Category A Driver as a result of a SPAD at Signal CY71 in Connolly in 2007.

791 IÉ assigned an SRR of 12 to the SPAD. The OOR, published in April 2015, identified the immediate cause of the SPAD as "the driver, while stopped at signal DN201, became distracted by activity outside cab, failed to check the aspect in the signal and drove the train past the signal at danger without authority".

792 Contributory factors were identified as:

- The Drivers use of the running release to pull up to signal and not disengaging it when at the signal;
- Driver stated that he was preoccupied with leaving Howth ahead of time with a view to getting to Howth Junction ahead of E713, 23:35 Malahide to Connolly.

793 As a result of the SPAD the driver was categorised as a category A driver with a four year development and support plan put in place. Drivers were also re-briefed on the existing operation of the ATP procedures following this occurrence.

794 The RAIU found that Driver F010 had become distracted and preoccupied as he was attempting to arrive at Howth Junction ahead of a slow moving train from Malahide; this lead to a loss of situational awareness.

SOY SPAD at Signal BR31, Bray (Dublin), 28th April 2015

795 On the 28th April 2015 two train units, Units 8309 and 8304, were to couple from the south end of Bray Station to another unit, Unit 8331, on the middle line to form a six unit set for the continuation of the 16:00 hrs passenger service from Greystones to Malahide, due to depart Bray at 16:10 hrs.

796 However, due to a coupler fault on Unit 8331, the Station Controller made the decision to run unit 8331 around from the North to South end of the other two units and couple to the rear. This movement required the driver, Driver F114, to drive Unit 8331 northwards from its current location on the middle line, and pass Signal BR29 which was situated on the Up Line; then move Unit 8331 past Signal BR31 and onto Platform 2 on the Down Line.

797 However, due to a fault with Signal BR31 the Signaller was unable to clear Signal BR29 to a proceed aspect. As a result, the Signaller authorised Driver F114 to pass Signal BR29 at danger and proceed to Signal BR31 and to contact the Signaller when he was at Signal BR31. However, Driver F114 did not stop the train at Signal BR31, and passed it at danger, and continued and stopped on Platform 2.

798 At the time of the SPAD, Driver F114 had fourteen years of driving experience and was categorised as a Category U Driver at the time of the incident. Driver F114 had two previous operational safety related occurrences, both SPADs, in Bray, namely: a SPAD at Signal BR40 in 2005 and a SPAD at Signal BR41 in 2009.

799 IÉ assigned an SRR of 16 to the SPAD. The OOR, published in April 2015, identified the immediate cause of the SPAD as the “Driver failed to check the aspect in signal BR31 during the movement and subsequently passed it at danger without authority”

800 Contributory factors were identified as:

- A fault with signal BR31 resulted in signal BR29 being unable to display a proceed aspect for movement. This required the signalman to issue an instruction to driver to pass signal BR29 at danger with authority and to stop at BR31;
- Driver and signalman did not fully follow safety critical communication protocols as message was not repeated back to signal man to demonstrate understanding;
- Driver performed move infrequently, doing so only once in previous ten years.

801 As a result of the SPAD driver was categorised as a category B driver and placed on a two year development and support plan. “Shunt of the month” briefing was introduced to advise drivers of unusual shuts in the area.

802 The RAIU found that Driver F114 had lost situational awareness as he did not see shunt Signal BR31; although Driver F114 was familiar with the area, he had not carried out this particular movement for some time.

SAS SPAD at Signal RL543, Enniscorthy (Wexford), 9th June 2015

803 On Tuesday the 9th June 2015 an On-Track Machine (OTM) 703 (Ballast Regulator), train ID Y632, was being operated by two BBRI OTMDOs. The OTM was on a scheduled transit shift from Kildare Depot to Enniscorthy Station where it was to be stabled in the siding to facilitate engineering works later that night. When the OTM arrived into Enniscorthy Station the driver (Driver Y632) stopped the OTM in rear of Signal RL546 at the station platform (see Figure 101 A), changed ends and contacted the Rosslare Line Signalman to advise and obtain the signal to proceed into the siding.

804 The Signalman then signalled the OTM into the siding and Driver Y632 stopped the OTM approximately 18 m in rear of Signal RL543 and advised the Signalman he was in clear and safe (Figure 101 B). He changed from Cab B to Cab A (facing Signal RL 543) with the intention of stabling the OTM in rear of Signal RL544 which was at the opposite end of the siding and also the last movement of the day; however, he did not relay this intended movement to the Signalman.

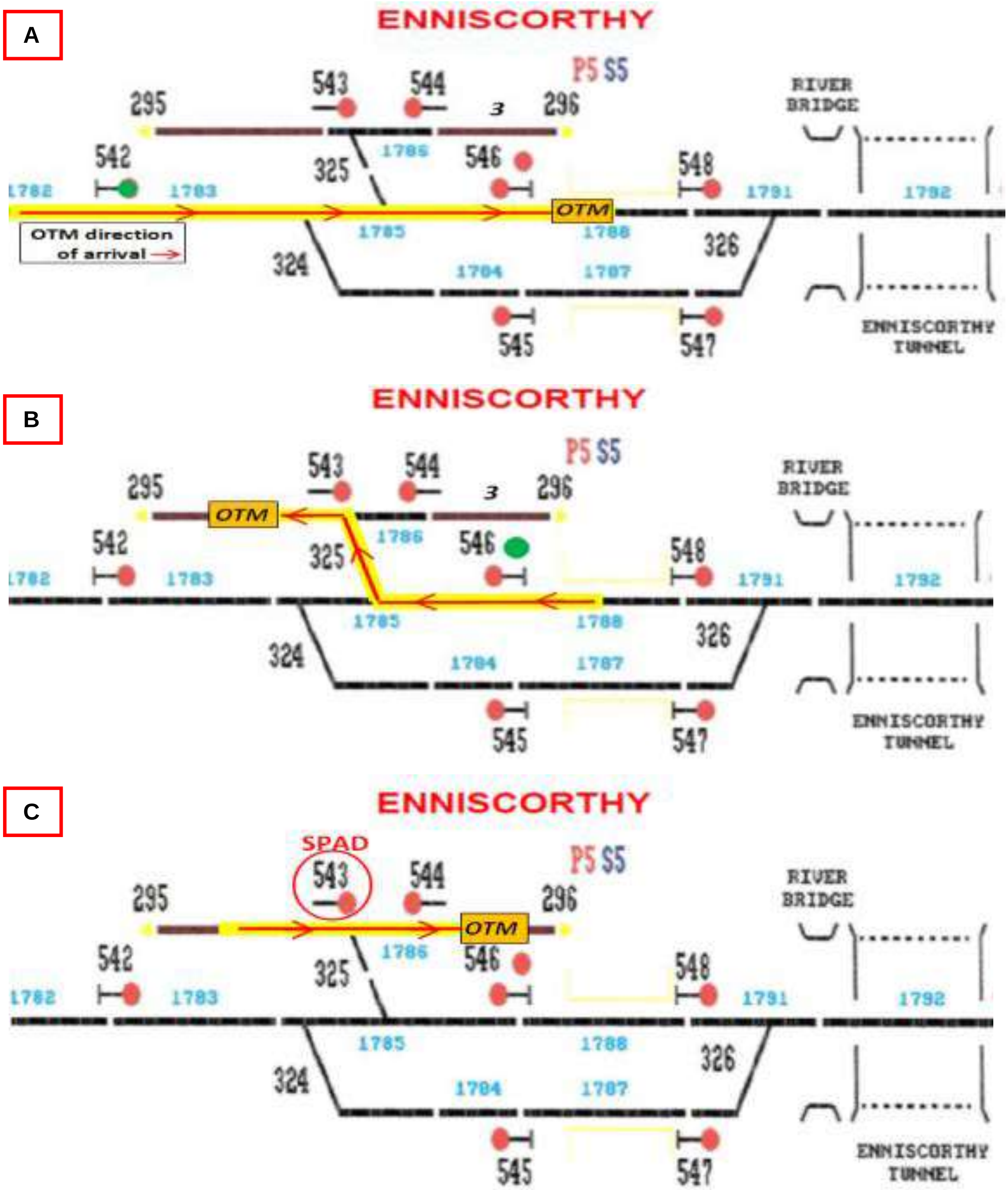


Figure 101 – Sequence of movements for the OTM (taken from IÉ/BBRI Report)

805 From Cab A Driver Y632 observed the points ahead moving to the normal position and assumed this was for his intended route. Driver Y632 checked Signal RL543, thought he saw a proceed aspect, and moved the OTM to the opposite end of the siding and passed Signal RL543 at danger in the process (Figure 101 C). The Signalman then contacted Driver Y632 to query his movement and it was confirmed that the OTM had passed Signal RL543 at danger without authority.

806 At the time of the SPAD, Driver Y632 had five years of driving experience and was assessed and competent under the relevant BBRI CMS. Driver Y632 had no previous recorded safety related occurrences.

807 The SPAD was assigned an SRR of 0. The IÉ-IM / BBRI report of investigation 'SPAD involving On-track Machine (703 Ballast Regulator) at Signal RL543 in the siding at Enniscorthy 9th of June 2015', published on the 14th September 2015, found that the immediate cause of the SPAD was "Train Y632 passed Signal RL543 at Danger after the Driver failed to check the signal". Causal factors were identified as "The Driver observed the points returning to normal and then drove the OTM to the opposite end of the siding passing Signal RL543 at Danger without authority"; and "The Driver did not request Signal RL543 from the Signalman during the communication. Although the Signalman repeated back the message to confirm the OTMs position in the siding, the Driver continued the call in a form of words which did not clearly indicate his intentions and the Signalman did not realise or query what he meant by this. As a result a clear understanding was not reached". No underlying causes were identified.

808 As a result of the SPAD BBRI took a number of actions, namely: placing Driver Y632 on a 'corrective action plan' in accordance with BBRI requirements after a medical examination; scheduling Driver Y632 for attendance at a safety critical communications.

809 The RAIU found that Driver Y632 had an incorrect expectation Signal RL543 was displaying a proceed aspect. This incorrect expectation was as a result of strong sunlight shining onto the signal at the time (and into the face of the Driver Y632); this meant that Driver Y632 did not request the signal from the Signalman. Driver Y632 was also distracted at the time of the incident as a result of changing pay conditions being enforced at the time[19]. Poor communications also contributed to not gaining a clear understanding of the movement to be undertaken.

SAS SPAD at Signal MN143, Maynooth (Kildare), 23rd June 2015

810 On Tuesday 23rd June 2015 Driver P665 signed on duty with the required rest from his previous shift, in Connolly at 11:00 hrs; he operated the 16:44 hrs passenger service from Connolly to Maynooth without incident. On arrival at Maynooth, Driver P665 shunted the train into the siding to allow two other passenger services to travel through Maynooth.

811 When the trains had past, the Clonsilla Signalman requested the route from the siding to the Up Platform in Maynooth Station, so Driver P665 could operate the 17:42 hrs passenger service from Maynooth to Pearse Station (Train P665). This movement required Trap Points 266 to reverse to

[19] These changes to pay conditions were beyond the control of BBRI; and have now been resolved.

allow the train to exit the siding and Points 265 to reverse to route the train across from the Down side to the Up side and Signal MN143 to clear to a proceed aspect.

812 However, the Clonsilla Signalman was unable to make the route as 265 points were flashing out of correspondence on the control panel; as a result the Clonsilla Signalman cancelled the route and normalised Points 265 and noticed that track circuit 884 now showed occupied. The Clonsilla Signalman now thought there was a track fault, as Train P665 was still being displayed in rear of Signal MN143. As a result the Clonsilla Signalman contacted Driver P665 and instructed him not to move his train as there were problems with the points and track faults in the area; and arranged for staff to be dispatched to scotch and clip Points 265.

813 However, when staff arrived to scotch and clip Point 265 they informed the Clonsilla Signalman that Train P665 was on Points 265 heading towards the Down platform. The Clonsilla Signalman then contacted Driver P665 to ascertain the exact location of Train P665 and Driver P665 informed him that Train P665 was at 263A points. The Clonsilla Signalman then realised that Signal MN143 was passed at danger without authority.

814 At the time of the SPAD, Driver P655 had fourteen years of driving experience and was classified as a Category U Driver. Driver P665 had one previous recorded safety related occurrence, a SPAD at Signal SL724 in 2007.

815 IÉ assigned an SRR of 16 to the SPAD. The OOR, published in June 2015, identified the immediate cause of the SPAD as "The driver failed to observe the aspect in signal N143. When points 266 moved, the driver did not check the signal before moving his train".

816 A Contributory factor was identified as:

- Driver's over reliance on past experience led him to anticipate a proceed aspect when he saw points move, driver did not practice good self-checking skills prior to moving train.

817 As a result of the SPAD driver and signal man have been issued with development and support plans. Fitment of DRA to rolling stock will help prevent this type of SPAD in future. Trend analysis of SPADs in area was conducted and resulted in DTE shifts being altered to cover high risk periods (83% of SPADs occurred between 17:20 and 20:45).

SAS SPAD at Signal CY69, Fairview (Dublin), 25th June 2015

818 On the 25th June 2015, the driver (Driver F040) passenger service from Howth to Fairview (Train F040) had completed the passenger service and was required to carry out a shunt movement to move the train to Siding 4 in Fairview Yard and stop of the train at stopblock CY99.

819 Driver F040 had moved Train F040 (four-piece DART unit) to stopblock CY90 where he was required to change ends and continue the shunt into Siding 4.

820 Driver F040 saw that Signal CY71 was displaying a yellow aspect and without checking shunt Signal CY69, which was located 15-20 feet in front of the train, Train F040 past Signal CY69 at danger. The signalman contacted Driver F040 to stop the train, and Driver F040 followed this instruction.

821 Driver F040 had fourteen years of driving experience and was classified as a Category U Driver at the time of the SPAD. He had previously been reclassified as a Category B Driver as a result of a SPAD at Signal CY25 (Connolly) in 2009.

822 IÉ assigned an SRR of 0 to the SPAD. The OOR, published in June 2015, identified the immediate cause of the SPAD as the driver "….failed to check signal CY69 prior to starting the train to ascertain its aspect".

823 Contributory factors were identified as:

- Driver "reading through" to signal CY71 observing it was displaying a proceed signal;
- Driver did not apply self-checking skills and error prevention techniques prior to moving the train.

824 As a result of the SPAD driver was placed on a driver development and support plan. The chief traction executive issued a SPAD notice in relation to this occurrence.

825 The RAIU found that Driver F040 had lost situational awareness at the time of the SPAD, although familiar with the movement, which he carried out routinely, he forgot to check shunt Signal CY69 prior to moving his train. Driver F040 may have also had an incorrect expectation that he was clear to proceed as by the time he normally changes ends he has the proceed signals to complete the movement.

Analysis

Review of factual information related to Category A SPADs

<u>Driving experience of drivers involved in a Category A SPAD</u>

826 In relation to years driving experience and the occurrence of Category A SPADs from January 2012 to June 2015, the graph shows that SPADs are most likely to occur with drivers with between three and five years of driving experience, see Figure 102.

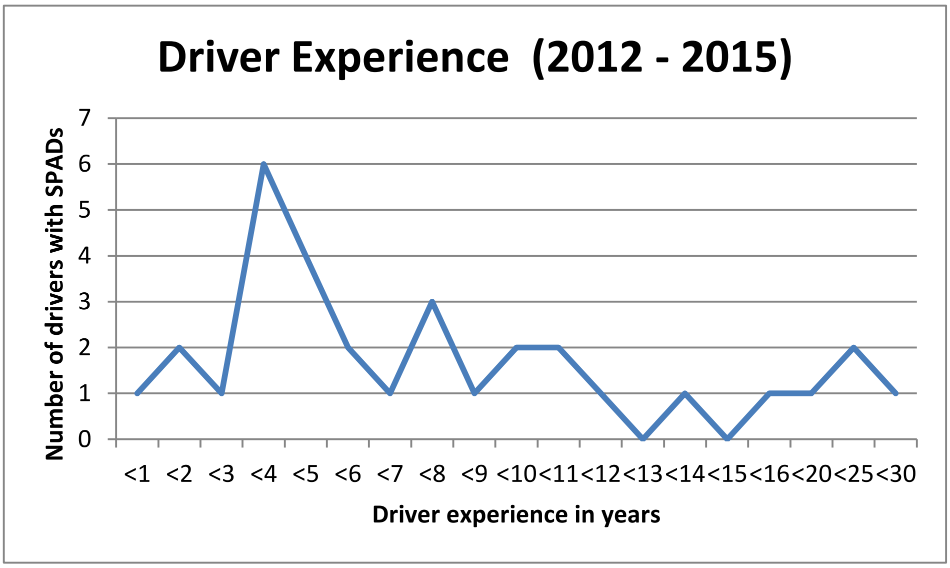


Figure 102 – Driving experience & the occurrence of Category A SPADs (2012 – 2015 (June))

827 However, if the years are plotted individually i.e. for 2012, 2013, 2014 and 2015 (to June),see Figure 103, the graphs show that in:

- 2012 – The occurrence of SPADs occur with drivers with less than seven years driving experience and greater than twenty years driving experience;
- 2013 – There is no clear trend in the occurrence of SPADs with driving experience;
- 2014 – There is a number of SPADs occurring with drivers with three to eight years driving experience;
- 2015 – To date, there are a number of SPADs with drivers with less than five years driving experience, eight to ten years driving experience and sixteen to twenty years driving experience.

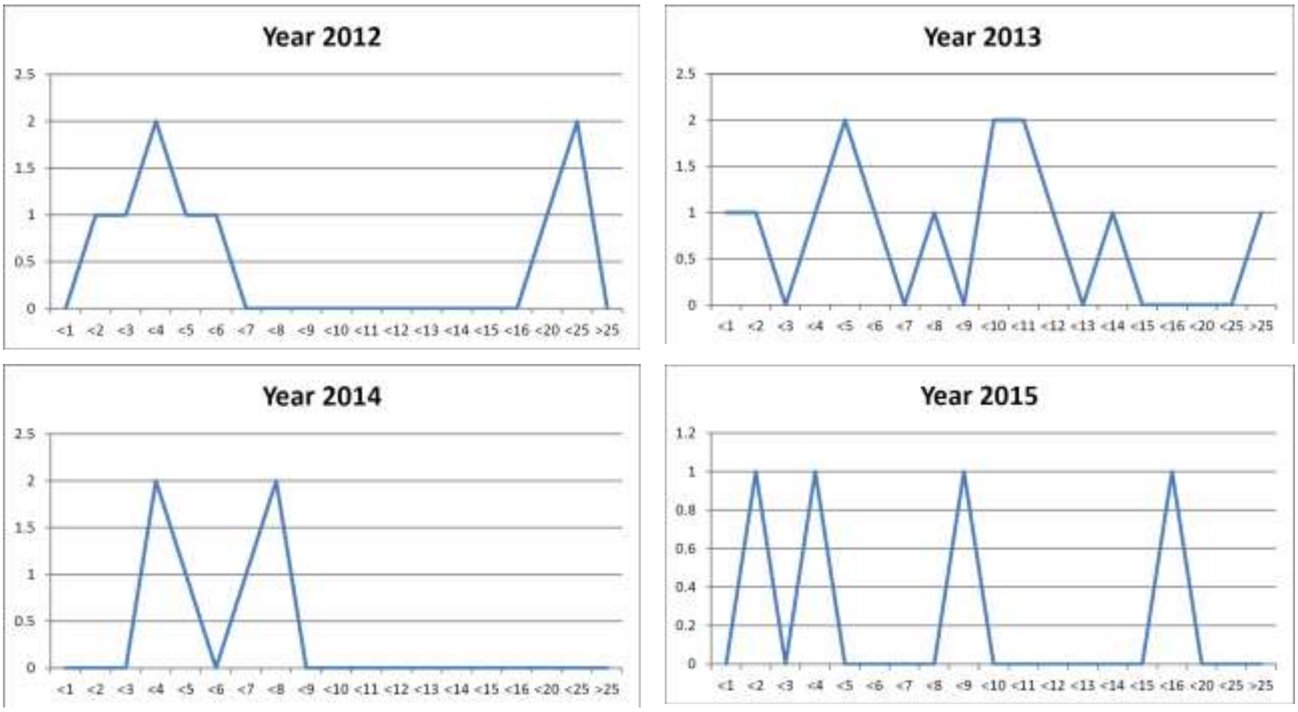


Figure 103 – Annual figures for the occurrence of SPADs and driving experience

828 Some of the variables which are likely to have contributed to the changes in the annual graphs are as follows:

- There was a large recruitment of drivers in 2008, which may account for the SPADs occurring with more inexperienced drivers in 2012;
- There was a focus on SPAD prevention of PQA drivers in 2012, which may account for the distribution, in terms of years of driving experience, of SPADs in 2013;
- There was a re-training of all drivers with EPTs in 2014, which may account for the distribution of SPADs in 2015.

<u>Profile history of drivers and the occurrence of Category A SPADs</u>

829 In relation to the classification of drivers in terms of categorisation the drivers are placed in certain categories dependent on the type of recorded safety critical operational occurrences, as set out in the appendix of OPS-SMS-3.2 (paragraph 129). Some of the drivers involved in the SPADs were newly qualified drivers, and as such were PQA drivers.

830 In terms of the review of the forty-one IÉ drivers involved in the Category A SPADs investigated by the RAIU, the findings are as follows (see Figure 104 for diagrammatical illustration):

- 85% of the drivers were Category U (78%) or PQA (7%) drivers at the time of the occurrence;
- 15% of drivers involved in the SPADs were classified as a Category A,B,C or D Driver at the time of their respective SPAD as a result of a previous operational occurrence.

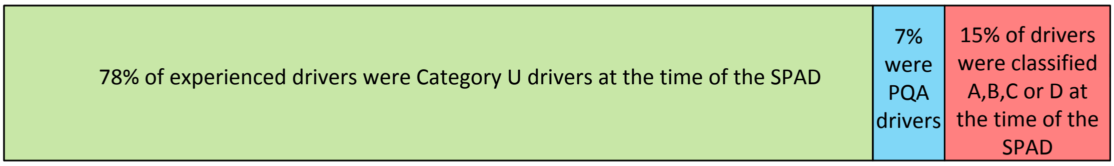


Figure 104 – Driver profile at the time of the drivers' respective SPADs

831 In terms of driver profile history and the re-classification of drivers (see Figure 105 for diagrammatical illustration):

- 61% of drivers had never been reclassified from Category U (i.e. they never had an operational occurrence) prior to their respective SPADs. 54% of these drivers were experienced drivers and 7% of the drivers were PQA drivers (i.e. newly qualified);
- 39% of drivers had been reclassified at some stage during their driving history. As mentioned above, 15% were classified as a Category A,B,C or D Driver at the time of their respective SPAD. 24% had been classified as a Category A,B,C or D Driver at some time previous in their driving history.

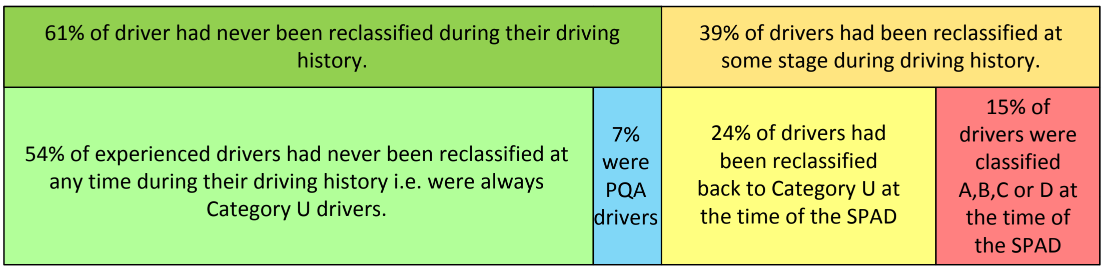


Figure 105 – Driver profile history

832 In terms of previous operational occurrences, the findings are as follows (see Figure 106 for diagrammatical illustration):

- 22% of drivers involved in a SPAD had been reclassified at some stage during their driving history as a result of a SPAD (7% had been involved in two or more SPADs);
- 17% of drivers involved in a SPAD had been reclassified as a result of another operational occurrence type.

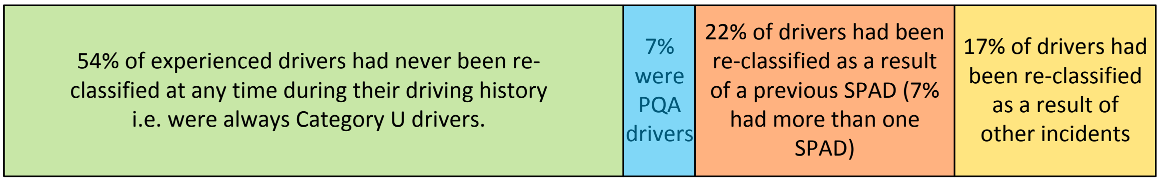


Figure 106 – Classification as a result of operational occurrences

833 In summary, this shows that over one-in-five drivers who has been involved in a SPAD, has been involved in a previous SPAD.

<u>Times of Category A SPAD occurrences</u>

834 In relation to the time of day in which Category A SPADs occur, this investigation plotted the available time of the SPADs from 2012 – 2015 (end of June 2015); this plotting shows that there are a number of peak times when SPADs are more prevalent, i.e. between 06:00 hrs and 08:00 hrs, and between 17:00 hrs and 20:00 hrs.

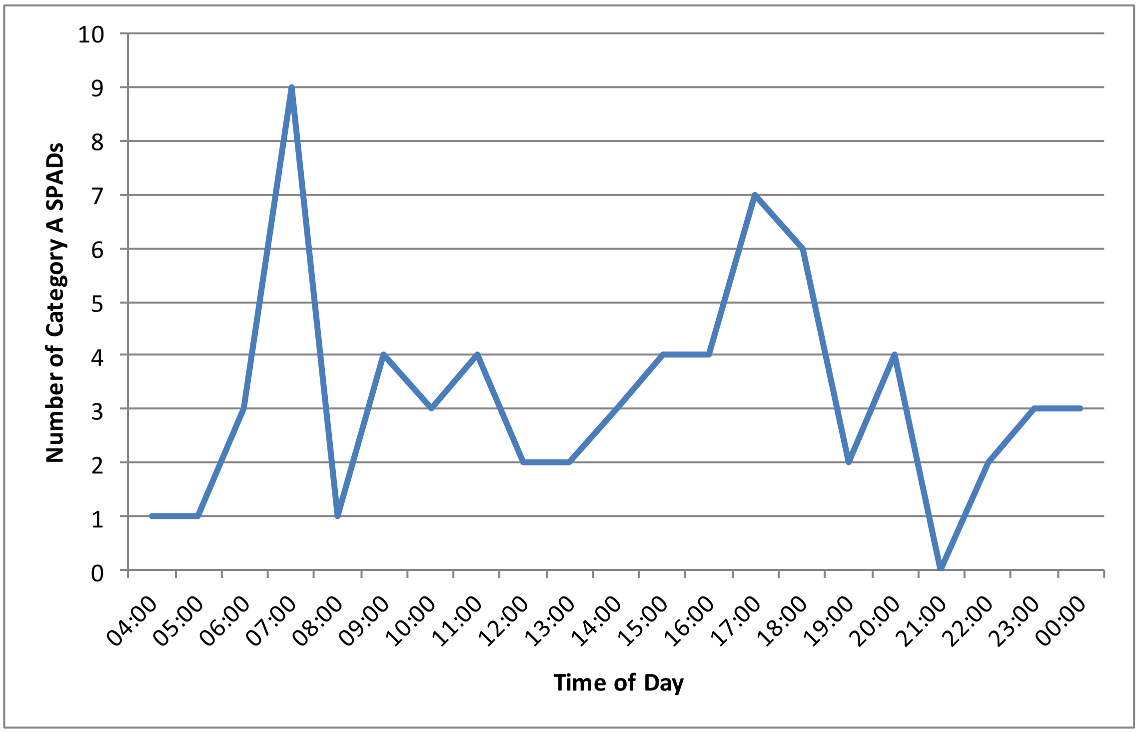


Figure 107 – Time of day for Category A SPADs 2012 – 2015 (to June)

835 More recently, in 2015, the occurrence of a SPAD was more prevalent at the later peak time (17:00 hrs to 21:00 hrs), although it should be noted that there has been no significant change in timetabling of trains or rostering of drivers, see Figure 108.

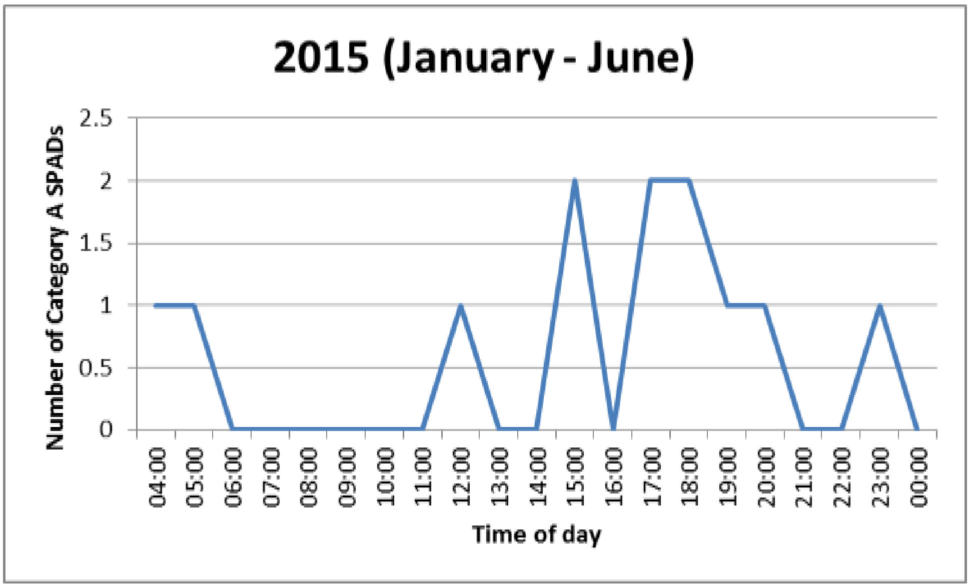


Figure 108 – Time of day for Category A SPADs showing annual changes

Driving time prior to the occurrence of a Category A SPAD

836 Plotting the time spent driving, in thirty minute intervals, prior to the Category A SPAD event, for SPAD events between 2012 – 2015 (end of June 2015) the graph indicates that the most SPADs occur within the first thirty minutes driving, and are most prevalent within the first hour of driving, reducing slightly for the second hour of driving, and then decreasing significantly after two hours driving, see Figure 109.

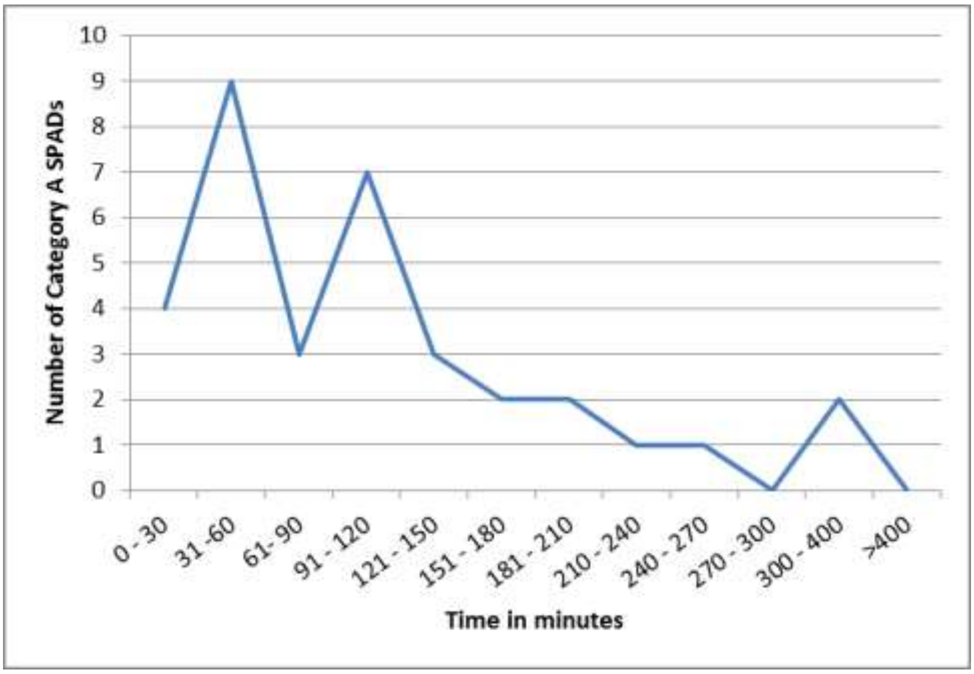


Figure 109 – Driving time and Category A SPADs (2012 – 2015 collectively)

837 However, the number of SPADs occurring within the first two hours has decreased over the years, and more recently, there is no apparent trend in terms of the occurrence of a Category A SPAD and driving time, see Figure 110.

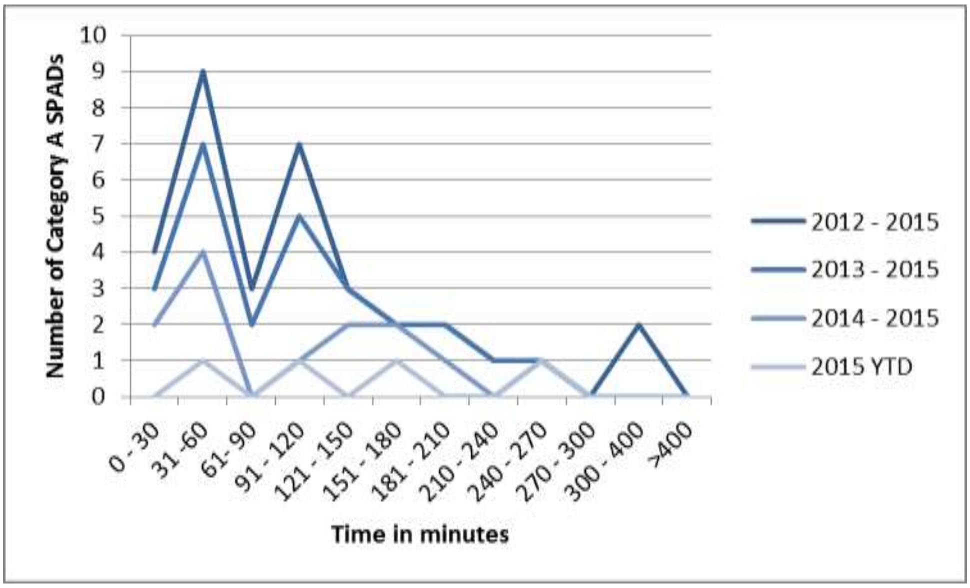


Figure 110 – Driving time prior to the occurrence of Category A SPADs (showing annual changes 2012 – 2015)

<u>**The effect of annual leave / rostering arrangements on Category A SPADs**</u>

838 The RAIU has reviewed all the annual leave arrangements in relation to SPADs which occurred between 2012 and 2015 (first six months). There were three instances of annual leave recorded directly before the day of the SPAD (between one and five days) and two instances of single days leave in the week leading up to the SPAD.

839 There were two instances of annual leave booked to commence the day after the SPAD; and there were two other instances of one-two day annual leave days booked to be taken within three days of the day of the SPAD.

840 In relation to annual leave and the occurrence of SPADs, there was only one instance where scheduled annual leave was contributory to the occurrence of the SPAD.

Human factor contributory factors related to Category A SPADs

Category A SPADs during normal train operations

841 This section will review the eleven incidents outlined above (paragraphs 516 - 593), in conjunction with the SPAD at Millstreet on the 8th December 2013 (Part 5), to identify any common human factors related to the causation of SPADs for this event types. The RAIU findings are as follows:

- The loss of situational awareness was a contributory factor in 67% of the SPADs;
- Distraction and/or preoccupation was a contributory factor in 67% of the SPADs;
- Incorrect expectation was a contributory factor 58% of the SPADs;
- Poor communications was a contributory factor in 17% of the SPADs[20].

842 In terms of the loss of situational awareness, in the majority of cases this was found to be as a result of simply ‘forgetting’:

- Their exact location in terms of the next signal (looking at the wrong signal/ thinking that the signal is further away/ being distracted (sunlight));
- The aspect of the previous signal (as a result of a previous distraction);
- Their surroundings (non-CAWs areas/ possession arrangements/ size of their train).

843 In terms of distraction and/or preoccupation, these were found to be as a result of:

- Passengers incidents – through passengers taken ill or left on the train at the time of departure from a station;
- In-cab distraction – through another person being in the cab or problems with train equipment;
- Line side features – through the location of an increased speed board after a fixed yellow signal;
- Personal issues – through drivers thinking about events in the personal lives i.e. holidays.

844 In terms of incorrect expectation, this was generally as a result of individual experiences previously experienced by the drivers i.e. over-familiarisation with the route and the signalling sequences.

845 In relation to poor communications, these instances of SPADs were related to poor communications with the relevant signalmen, leading to an incorrect expectation.

[20] The combined percentages do not total 100%, as generally, SPAD incidents have more than one contributory factor.

Category A SPADs during degraded train operations

846 This section will review the six incidents outlined above (paragraphs 594 - 634 and 693 - 700), in conjunction with the SPAD at Gortavogher on the 19th December 2013 (Part 6), to identify any similar factors into the causation of SPADs for these event types.

847 In terms of the SPADs during degraded train operations, the review by the RAIU found that the actions of other parties (i.e. Signalmen, LCCOs, Pilotmen and Guards) were the major contributory factors in the majority of SPAD incidents (five of the seven outlined in this report). The actions of the other parties included:

- Controlling signalman providing drivers with incorrect information in relation to approaching faulty level crossings and during WSLP;
- Pilotmen not instructing drivers correctly about obeying signals after entering WSLP sections;
- Guards incorrectly instructing drivers;
- Controlling signalmen incorrectly applying the Rule Book as a result of lack of understanding of the Rule Book;
- Lack of route knowledge of the part of the signalmen;
- Poor communications from the signalman to the drivers (although, it should be noted that both parties come to a clear understanding of actions to be taken).

848 In terms of the contributory factors affecting the drivers, the RAIU found that:

- Incorrect expectation was a contributory factor in 88% of the SPADs;
- Loss of situational awareness was a contributory factor in 25% of the SPADs;
- Distraction was a contributory factor in 13% of the SPADs[21].

849 In terms of incorrect expectation on the part of the drivers, this was largely due to an incorrect expectation being reached as a result of poor communications/ instructions from other operational staff (e.g. signalmen, guards, etc.).

850 In terms of loss of situational awareness, these were as a result of external factors (weather) and loss of situational awareness resulting initially from a number of external distractions (wheelchair passenger, irate passengers and fire).

[21] The combined percentages do not total 100%, as generally, SPAD incidents have more than one contributory factor.

851 Also contributory to the SPADs was that, in some cases, drivers did not apply correct defensive driving techniques (through not driving slowly towards signals they knew were at danger or faulty level crossings).

852 Also, of note during the RAIU review, was the fact that the internal IÉ reports into the incidents, focused primarily on the actions of the drivers (driver actions were generally found to be the immediate causes of the SPAD). This will be further reviewed in Part 11 of this report.

Category A SAS & SOY SPADs

Introduction

853 This section will review the SAS and SOY SPAD incidents outlined above (paragraphs 652 - 825), in conjunction with the SAS SPAD at Muine Bheag on the 9th April 2013 (Part 7), to identify any similar factors into the causation of SPADs for this event types. As the event types are slightly different, these will be reviewed separately in terms of human factor contributory factors (i.e. as SAS SPADs and as SOY SPADs).

Contributory factors in relation to SAS SPADs

854 In terms of the contributory factors related to SAS SPADs, the RAIU found that:

- Incorrect expectation was a contributory factor in 65% of SAS SPADs;
- Loss of situational awareness was a contributory factor in 53% of SAS SPADs;
- Distraction and preoccupation was a contributory factor in 53% of SAS SPADs.

855 The RAIU also found that poor communications with other operational staff was a contributory factor in 12% of SAS SPADs.

Contributory factors in relation to SOY SPADs

856 In terms of the contributory factors related to SOY SPADs, the RAIU found that:

- Distraction was a contributory factor in 90% of SOY SPADs;
- The loss of situational awareness was a contributory factor in 70% of SOY SPADs;
- Incorrect expectation was a contributory factor in 50% of SOY SPADs.

Contributory factors in relation to SAS and SOY SPADs

857 In terms of distraction and/or preoccupation, these varied from, distractions:

- Before service (lost keys);
- At platforms (passengers and late running of trains);
- External factors (weather conditions and fires);
- In-cab distractions (phone calls, looking for phones);
- Line side features (e.g. through the location of an increased speed board after a fixed yellow signal).

858 In terms of incorrect expectation, this was generally as a result of individual experiences previously experienced by the drivers i.e. over-familiarisation with the route and the signalling sequences.

859 In terms of the loss of situational awareness, in the majority of cases this was found to be as a result of simply 'forgetting':

- Their exact location in terms of the next signal (looking at the wrong signal/ thinking that the signal is further away/ being distracted (sunlight));
- The aspect of the previous signal (as a result of a previous distraction);
- Their surroundings (non-CAWs areas/ possession arrangements/ size of their train).

860 All cases of poor communications in these instances of SPADs were related to the relevant signalmen.

Use of EPTs to manage human factors

861 The RAIU found that the vast majority of the drivers involved in Category A SPADs, irrespectively of the event type, didn't apply any form of EPTs to manage their situational awareness, incorrect expectation or distraction/preoccupation. A very small minority of drivers, had in the past applied some EPTs, however, they either did not apply them at the time of the SPAD incident or the EPTs they applied were ineffective at managing these human factor errors.

862 As a result, where drivers were affected by these human factors, they were then unable to refocus after distraction, avoid incorrect expectation or maintain situational awareness as they had not developed appropriate EPTs. This was as a result of drivers receiving inadequate training in EPTs and the lack of a suitable form of assessment in terms of EPTs.

863 The RAIU found that, post incident, the majority of drivers had developed some form of EPTs, which they found to be very effective in the management of distractions, incorrect expectations and situational awareness, and consider that if they had applied these EPTs on the day of the SPAD incident, the SPAD would not have occurred.

Conclusions

Review of factual information related to Category A SPADs

Driving experience of drivers involved in a Category A SPAD

864 In relation to years driving experience and the occurrence of Category A SPADs from January 2012 to June 2015, SPADs are most likely to occur with drivers with between three and five years of driving experience (paragraph 826). There are some annual variations which are likely the result of new recruitments, training and the introduction of more stringent EPTs training (paragraph 828).

Profile history of drivers and the occurrence of Category A SPADs

865 In relation to the profile of drivers, a quarter of the drivers involved in SPADs reviewed by the RAIU (Category A SPADs from January 2012 – June 2015) had been previously had another Category A SPAD (paragraph 831); while nearly 40% had been involved in a safety related occurrence that required that the driver be reclassified (paragraph 831). However, at the time of their respective SPADs, nearly 80% of drivers were Category U Drivers (requiring no additional supervision or monitoring) at the time of the SPAD.

866 The fact that a quarter of drivers involved in the SPADs reviewed by the RAIU, had previous SPADs, indicates that the current DD&SS system is ineffective at correcting the drivers behaviour in the long term[22].

867 In addition, the Category U Driver profile is not a true reflection of the driver's profile, given that a driver with multiple SPADs (in the incidents reviewed by the RAIU, some drivers had two previous SPADs) can be re-classified a Category U Driver after a period of time; and a driver with no previous operational incidents is classified as a Category U Driver; this is not an accurate reflection of the drivers history[23].

[22] The ineffectiveness of the DD&SS for the correction of drivers' behaviour in the long term warrants a safety recommendation, see Part 14.

[23] The classification and reclassification of drivers does not provide a true reflection of the driver's history, and as a result warrants a safety recommendation, see Part 14.

Times of Category A SPAD occurrences

868 In relation to the time of day in which Category A SPADs occur, the RAIU indicates that SPADs are more prevalent in the afternoon or evening time (paragraphs 834 - 835), however, the RAIU could not determine why this is the case[24].

Driving time prior to the occurrence of a Category A SPAD

869 SPADs are more likely to occur within the first thirty minutes driving, and are most prevalent within the first hour of driving and reducing over the following hours (paragraph 836); the RAIU could not determine why this is the case[25].

The effect of annual leave / rostering arrangements on Category A SPADs

870 Only one occurrence of a Category A SPAD was directly related to annual leave, which resulted in a distraction for the driver (paragraphs 838 - 840)[26].

Human factor contributory factors related to Category A SPADs

871 The RAIU found that loss of situational awareness, distraction and/or preoccupation and incorrect expectation were the main contributory factors associated with the causation of SPADs. The occurrence of these human factors varied related to event type, for example:

- Loss of situational awareness, distraction and/or preoccupation, and incorrect expectation where all major contributory factors in SPADs occurring during normal train operations (paragraph 841);
- Incorrect expectation was the major contributory factor in SPADs occurring during degraded train operations, which was generally as a result of inputs from other operational staff, such as signalmen (paragraph 848);
- Incorrect expectation, distraction and/or preoccupation, and loss of situational awareness where all major contributory factors in SPADs occurring during normal train operations (paragraph 854);

[24] The prevalence for the occurrence of SPADs in the afternoon/evening should be further reviewed by IÉ, as a result, this warrants a safety recommendation, see Part 14.

[25] The prevalence for the occurrence of SPADs at the start of the drivers shift should be further reviewed by IÉ, as a result, this warrants a safety recommendation, see Part 14.

[26] Although the driver was affected by his annual leave arrangement, the RAIU do not consider it reasonable to change annual leave arrangements for drivers, and instead the distraction of annual leave should be managed through proper EPTs. The introduction of adequate EPTs warrants a safety recommendation, see Part 14.

- Distraction, loss of situational awareness and incorrect expectation were all major contributory factors in the occurrence of SOY SPADs, with distraction being a contributory factor in nearly all SOY SPADs (paragraph 856).

Use of EPTs to manage human factors

872 Irrespective of the different human factor contributory factors or event types, the RAIU found that the vast majority of the drivers involved in Category A SPADs, did not apply any form of EPTs, or applied incorrectly applied EPTs, to manage these human factors (paragraph 861). As a result, the drivers were unable to refocus after distraction, avoid incorrect expectation or maintain situational awareness as they had not developed appropriate EPTs (paragraph 862). This was as a result of drivers receiving inadequate training in EPTs and the lack of a suitable form of assessment in terms of EPTs.

873 The RAIU found that, post incident, the majority of drivers had developed some form of EPTs, which they found to be very effective in the management of distractions, incorrect expectations and situational awareness, and consider that if they had applied these EPTs on the day of the SPAD incident, the SPAD would not have occurred (paragraph 863).

PART 9 – SPAD MANAGEMENT

Evidence

Calculating the SRR

Introduction

874 Part 3 of this report outlines how IÉ calculate the SPADs on the IÉ network, based on the SRRT developed by the UK's RSSB. This section will review that current system and discuss any findings from audits, etc.

IÉ Internal Safety Audit

875 A safety audit carried out by the IÉ's Safety Audit Unit, and published in June 2012, entitled 'SPAD Management Operations', makes a number of findings in relation to calculating the SRR, including that the audit identified that:

- Only the RU CTE has been calculating the SRR for all SPAD incidents since 2008, and is currently the only member of IÉ staff trained in doing so;
- There a number of Category A terms used, when referring to SPADs, providing the following example "A collision on the running line is categorised as 'A', whilst a collision on other than a running line is categorised as 'B'. SPADS are included in this classification table, with those in the High Risk categorised as 'A', etc". It also notes that the RSSB describe these categories as: Not Significant – Low Risk; Potentially Significant – Medium Risk and Potentially Severe – High Risk.

876 Based on these findings, IÉ's Safety Audit Unit identified the following actions to be undertaken:

- Arrange to train additional staff in the Operations Department to operate the SRRT – at the time of publication of this report, this action remains outstanding;
- Review the descriptive structure for the Categorisation of SPADs to provide clarity. Currently, Category A SPADs are subdivided into three categories, A, B & C – this review was carried out by the Operations Safety Steering Group, which determined that no change was necessary.

877 Also of note from this audit report, is in relation to SPAD Trends, where the report notes that "whilst the number of SPADs continues to fall year on year, the Network Wide Risk Model (NWRM) [2010] pointed out that the average risk ranking was beginning to rise in 2009".

RSC review of compliance in terms of calculating of the SRR

878 On receipt of IÉ's OOR in relation to the SAS SPAD at Signal MW826, Mallow, on the 16th May 2014 (paragraphs 742 - 748) on the 17th September 2014, the RSC carried out a preliminary *Post Incident Inspection* (PII) in relation to the SRR carried out by IÉ, where the RSC reviewed standards, procedures, guidance documents and training records associated with assigning SRRs to SPADs. The RSC were in communication with IÉ (IÉ-RU Chief DTE and IÉ-RU Safety Compliance Manager) in late 2014 and 2015 in relation to the SRRs.

879 Part of this process, involved corresponding and meeting with the RSSB (the creator of the original SRR Tool) who found that the SRRs had not been calculated in line with the SRRT, with SPADs generally received lower scores.

880 The completion of the preliminary PII on the 17th June 2015 concluded that a full PII was not warranted, however, the RSC made a number of recommendations in relation to the SRRT, namely:

- IÉ-RU should finalise the document so that 'IÉ's SPAD Risk Ranking Methodology Handbook, Version 1 October 2008' is not being utilised in a draft version;
- IÉ-RU should identify and arrange training for a sufficient number of persons in the use of the SRRT (SPAD Risk Ranking Tool) software, in accordance with clause 3.2 of the IÉ SPAD Risk Ranking Methodology Handbook;
- IÉ-RU should source the services of an external reviewer, e.g., company/consultant or other Railway Organisation with which IÉ-RU has ties, to undertake a review of a sample number the SRRs on an ongoing basis. Such a review would give confidence that the SPAD handbook and the principles contained therein are being applied correctly in conjunction with the SRRT.

881 The preliminary PII was then forwarded by the RSC to IÉ on 22nd June 2015 under cover of a letter from the Commissioner, which included the following:

"The deficiencies identified and the manner in which SPAD risk ranking is carried out in IÉ is of serious concern to the RSC. Therefore, the RSC is of the opinion that this matter requires prompt attention and recommends that IÉ management undertake a 'critical review of the management of SPADs' as a matter of urgency. Such a review should include a time line of actions to be taken to address all issues identified during the review, and inter alia take account of:

- The points identified in this letter, the attached PII and associated documents in regard, to:
  - SPAD risk ranking, methodology, competence of persons involved, etc.,
  - Respective role and duties of the IÉ-IM, including interfaces with all RUs, and
  - The role and duty of IÉ-RU in managing its own SPADs;
- The 2012 IÉ Safety Audit Unit (SAU) report of the 'Audit on SPAD Management Operations';
- Safety recommendations contained in any report (or draft report) of investigations into SPADs carried out by the RAIU;
- A review, on exactly the same basis as in the UK, of each of the risk ranking scores of the ninety Category 'A' SPADs that have previously been determined using the SRRT, and a re-run of the NWRM using the re-calibrated SPAD risk ranking scores;
- The adoption of a 'Just Culture' (no-blame culture) to improve safety reporting, as identified in the Ladbroke Grove Rail Inquiry Part 2 Report and in the European Railway Agency (ERA) 'Application Guide for the design and implementation of a Railway Safety Management System'.[27]"

882 In direct response to this letter from the RSC, IÉ commissioned safety consultant AD Little[28] to review the IÉ SRRs and the SRRT.

Arthur D. Little review of the SRRT

883 As mentioned above, based on the findings of the RSC, IÉ commissioned Arthur D. Little to conduct a review of the management of SPADs, with the key focus being on the use of the SRRT; this review included the re-assessment of ninety SPADs.

884 Arthur D. Little, calculating independently, calculated the same scores as IÉ in 72% (of the 90 SPADs reviewed) of SPADs; found that a further 22% were over-estimated by IÉ; and that 6% (5

[27] Developing and Improving Safety Culture in the Organisation, (2013_12_19_ERA_GUI_SMS_Saftey Culture_1)

[28] AD Little, Management of SPAD Event, Independent Review, Report to Iarnród Éireann, October 2015

SPADs) were underscored by IÉ. In relation to the SPADs reviewed by the RSC, Arthur D. Little found that the IÉ SRRs had "good agreement" with the independently scored SRRs.

Review of IÉ SPAD investigation reports by the RAIU

Introduction

885 The RAIU reviewed reports from the forty-five SPAD incidents from 2012 to mid-2015, the RAIU made a number of findings in relation to the reports in terms of time taken to conduct the review or investigation, consistency in terms of investigation conducted, and quality of reports (in terms of accuracy).

Issuing the remit

886 The term 'category' is used for both the type of remit to be issued, e.g. Category A Remit Investigation, and the same term is used for the classification of SPADs e.g. Category A SPAD. It is also noted, that the term 'category' is also used for the classification of drivers e.g. Category A driver. As a result, there can be a Category A Remit, for a Category A SPAD, involving a Category A Driver.

Time taken to conduct the reviews/investigations

887 In relation to reportable railway incidents[29], Section 54(5), 'Investigations by railway undertakings', of the Railway Safety Act 2005 states that "A railway undertaking shall in an expeditious manner carry out an investigation under subsection (1)[30] and shall, as soon as practicable but in any event not later than 6 months after the date of the incident, prepare a report on its findings".

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[29] 52.—(1) In the event of a railway incident, the railway undertaking concerned or, if the incident involved more than one railway undertaking, the railway undertakings concerned, shall—

(a) in the case of loss of life or injury to a person or in other cases as may be specified from time to time by the Investigation Unit, send to the Investigation Unit by the quickest practicable means (or within such timeframe as may be specified by the Investigation Unit) notice of the incident, including brief particulars and details of the location of the incident and of any loss of life or personal injury, and

(b) as soon as practicable send a written report to the Investigation Unit, in such form and containing such particulars as may be specified from time to time by the Investigation Unit, of the loss of life, injury, condition or incident.

[30] Subsection (1) states: "It shall be a duty of a railway undertaking to carry out an investigation into a reportable railway incident in order to establish the cause of such incident and to assess what, if any, action can be taken by the railway undertaking to avoid railway incidents in the future or otherwise for the improvement of railway safety".

888 This is transposed into IÉ document, OPS-SMS-2.4, Accident and Incident Investigation, which provides milestones for investigations, stating that the investigation "must not normally exceed 6 months". This appears to be for all accidents, and not particular to 'reportable railway incidents' under the Railway Safety Act 2005. It should be noted, that as SPADs do not fall under the category of reportable railway incidents, they do not fall under the requirements of the Railway Safety Act 2005.

889 In terms of the 'Five Working Day Panel Review' it was found that the reports into the reviews were published approximately five months (long-running reviews of over one year were excluded from this average). There were two 'Five Working Day Panel Review' reports which remained in draft, these drafts were approximately two years old.

890 In terms of 'Reports of Investigations', whereby a full investigation has been carried out, the average time from incident date to publication is seven months, with 40% of the reports not being published for over six months.

891 On the introduction of the OOR format, in place of the 'Five Working Day Panel Review' these reports were initially completed within four months, however, this time has now increased to an average of six months. Of note, is the fact that the OOR determines whether a full investigation needs to be carried out, and this full investigation may, therefore, not commence until six months after the SPAD event.

Type of investigation carried out

892 Since the introduction of the OOR template in December 2013, the template appears to be consistently used, despite not being directly referred to in any IÉ standards or procedures (namely OPS-SMS-2.0). However, there was one incident did not use this new OOR template, and in its place used a '5 Day Incident Review' (5-DIR) template was issued in draft in October 2014 (it is unclear whether this review is actually complete).

IÉ review/report conclusions

893 The IÉ reviews/reports generally use the terms 'immediate cause', 'causal factors', 'underlying factors'; or in some cases use 'immediate cause', 'contributory factors', 'underlying factors'. Assuming that the terms are consistent with the terms used by the RAIU (as set out in the glossary of terms (Part 15)), and assuming that causal factors and contributory factors are similar, in that they relate to "actions taken by persons involved or the condition of rolling stock or technical installations" and that underlying factors should relate to "skills, procedures and maintenance" it is clear that IÉ are, in some cases, using the terms incorrectly. For example, the reviews/reports continuously place the actions of drivers in all three causes/factors, i.e. the direct actions of the driver are assigned the immediate cause, the contributory (causal) factor and the

underlying factor. This was found to be the case in approximately one third of the underlying factors identified.

Quality of IÉ Investigation Reports

894 The RAIU reviewed all the reviews/investigation reports associated with the SPAD incidents from 2012 – mid-2015. Although the RAIU acknowledge that there were a large number of reports and inaccuracies and omissions can occur; the inaccuracies and omissions noted below, by the RAIU, have a considerable bearing on either the drivers, the causes of the incident and the credibility of the investigation reports as a whole. It is also noted, that some of the statements made in the reports appear to be in contradiction with the actions taken after a SPAD event.

895 In relation to the report of investigation into the SPAD at Millstreet, 8th December 2014 (Report No. R0401-2014-18) the report states that “Following the SPAD, when the driver makes a shunt movement back behind TL223, the stopping of the train past the signal is a significant distance. Either the driver was not sure of the location of the signal or has difficulty judging the length of a 4 coach train”. During the RAIU investigation, the RAIU have noted that management in IÉ consistently state that Driver A303 did not know where signal TL223 was located. However, the RAIU did not find this to be the case and the “significant distance”, taken by the driver, was to ensure that the driver had cleared the signal.

896 The report continues “The investigation panel therefore consider that the driver’s competence and confidence in route knowledge over the Tralee route is also a factor in the SPAD occurring”. However, it is noted, by the RAIU, that Driver A303 was returned to driving duties on the 20th December, twelve days after the incident. Given the serious nature of the SPAD, and this statement from the IÉ report, it is questionable why the driver was returned to driving duties in such a short period of time, if IÉ consider that there were short falls in his competencies.

897 Two OORs (SPAD at Signal CY26 Connolly, 3rd April 2014, R0903-2014-34 and the SPAD at Signal CE482 Glounthaune, Cork/Midleton Line, 27th June 2014, R1301-2014-53) attribute contributory factors to the SPADs incidents to be as a result of personal issues. The RAIU review of the incident found this not to be the case. The RAIU cannot fully establish the reason for the inclusion of these statements in the reports, however, it appears to be the case that drivers were required to “come up” with a reason for the SPAD or be faced with other disciplinary actions, such as further medical testing or removal from the driving grade.

898 In relation to omissions, the RAIU found that the IÉ reports failed to identify a number of causes to SPADs in their reports, for example in relation to the SPAD at Signal CY33 passed at danger without authority, 11th September 2014, Connolly Station, E221. The report did not identify that a

driver's holiday was a contributory factor to the causation of a SPAD, despite the driver freely stating that this was the largest contributory factor to him having the SPAD.

899 Contributory to the inaccuracies and omissions in these reports may be as a result of drivers not being provided with draft copies of reports and are therefore unable to comment on the reports prior to internal publication. The RAIU investigation found that only a very small minority of the drivers were in receipt of the reports, while another minority of drivers had been shown the reports by their respective DTEs.

Recommendations

900 There also appears to be little effort in terms of reviewing SPADs by event type to determine any trends into the occurrence of SPADs. This results in recommendations being localised e.g. a recommendations may be made in relation to the updating of the local route risk assessments. For example, in the case of SOY SPADs a number of recommendations have been related to the updating of route risk assessments for trains departing on a yellow signal for the local area, rather than a network wide review of reasons drivers are having SOY SPADs.

901 In addition to this localised approach to recommendations, there also appears to be an overreliance on the introduction of IÉHS in relation to the management of SPADs, this is particularly noted for ORRs published in 2015, whereby, the introduction of the IÉHS is accepted as sufficient for the prevention of future SPADs, despite IÉHS not likely to be introduced for a number of years.

Proactive management of SPADs in IÉ

Introduction

902 Although the initial proactive management in terms of the prevention of SPADs is through the selection, training and competency management of drivers and other operational staff, and technical installations such as the DRA; this selection of the reports reviews the data management of SPADs in terms of future prevention of SPADs and the near-miss reporting of SPADs.

SPAD Database

903 In terms of the SPAD database, IÉ appear to have numerous databases where information on SPADs is collated. As part of the RAIU investigation, the RAIU submitted requests for information in relation to SPADs. The information returned to the RAIU was sometimes conflicting i.e. some of the databases provided to the RAIU omitted some of the Category A SPADs from the databases. In addition, the RAIU were not provided with any database where the immediate cause,

contributory factors or underlying factors were collated; or where the recommendations were collated as part of SPAD databases.

Recommendations

904 Recommendations as discussed above (paragraphs 900 - 901) as a means for the proactive prevention of SPADs; however, it is noted that the recommendations appear to be localised and there is an overreliance on the introduction of IÉHS for the prevention of SPADs, despite being a long term solution.

Near-miss reporting of SPADs

905 The RAIU requested all the near-miss SPAD reports on the IÉ network. There was only one near-miss SPAD report in 2013 at Tullamore Station

906 The reasons for the lack of near-miss reporting of SPADs, by drivers, will be discussed in 'Part 10 – Management of Drivers'.

Analysis

Calculating the SRR

907 IÉ have a system for the calculation of the SRR, using the SRRT, which is set out in 'Part 3 – Introduction to SPADs on the IÉ Network' (paragraphs 58 - 60) which has not been formalised. However an IÉ internal audit (paragraphs 875 - 877), a review of compliance by the RSC (paragraphs 878 - 881), and the review carried out by the RAIU, have identified a number of issues related to the SRRT, namely that:

- The SRRT remains in draft format (paragraph 880);
- The RU CTE is the only IÉ member of staff trained to calculate the SRR (paragraph 880);
- There is some confusion related to the use of the term "Category" as it is used for a number of different reasons related to SPADs e.g. Category A SPAD for a high risk SPAD, Category A remits for the investigation of SPADs, etc. (paragraph 886).

908 The 'underscoring' identified by the RSC, has been reviewed independently by safety consultants Arthur D. Little, who found IÉ's SRR calculations to be robust.

Review of IÉ SPAD investigation reports by the RAIU

909 From the review of SPAD investigation reports undertaken by the RAIU, the RAIU made a number of findings in relation to the reports, as follows:

- The time taken to complete investigation reports regularly exceeds the six months milestone requirement set out in IÉ's 'Accident and Incident Investigation' document, OPS-SMS-2.4, with some reports exceeding the one year milestone period (paragraphs 887 - 891);
- Some of the documents remained in draft format (paragraph 891);
- A new template, the OOR template, introduced in December 2013 does not appear to be formalised in any IÉ documentation, and on at least one occasion, IÉ have reverted back to the older 5-DIR template (paragraph 892);
- There is a lack of consistency with the investigation terms (immediate cause, contributory factors, underlying causes, etc.); and they are often misused (e.g. direct driver actions are assigned to all factors and causes to an incident), see paragraph 893;
- There are assumptions made, which have led to inaccuracies in reports (paragraphs 894 - 899);
- Recommendations are often localised, and over-reliant on long term solutions (paragraphs 900 - 901).

910 These factors have to be considered when reviewing the frequency of SPADs, and the methods employed by IÉ may mean that current system of investigating SPADs is not effective in the prevention of SPADs, and only effective at managing localised issues related to SPADs.

Proactive management of SPADs in IÉ

911 There are a number of SPAD databases, which are incomplete or missing key information in relation to the SPAD event. There is no near-miss reporting of SPADs (with the exception of one near-miss SPAD event). And, as mentioned above, the recommendations from internal IÉ investigations are localised and reliant on long term SPAD solutions (paragraph 903).

912 As a result, the proactive management of the prevention of SPADs is insufficient in preventing or reducing the number of SPAD events on the IÉ network.

Conclusion

913 IÉ engaged safety consultants Arthur D. Little to review the SRRT for the calculation of SRR, the overall review found that the system used by IÉ is robust, paragraph 907.

914 In terms of IÉ's collation of SPAD event information, the databases provided to the RAIU are inconsistent, sometimes inaccurate and not complete (as they generally do not include any findings from IÉ reports).

915 In terms of the internal investigation of SPADs on the IÉ network, a large number of the reports take an excessive amount of time to complete (exceeding their own requirements of six months); while some reports remain in draft format. The reports indicate that there is a lack of consistency in the investigative terms used, resulting in the frequent misuse of common investigation terms. In addition, a number of report findings are inaccurate; while recommendations are consistently localised and over-reliant on long term solutions. These factors may have contributed to IÉ not showing any decline in the frequency of SPADs.

916 Drivers on the IÉ network generally do not report near miss events (only one near miss SPAD has ever been reported in IÉ). If an adequate near miss reporting system was adopted it could be used as a tool by IÉ in relation to the proactive management of the prevention of SPADs; however, as this is not occurring, there is no early detection for the early identified of SPADs by certain drivers or at certain signals on the IÉ network.

PART 10 – MANAGEMENT OF DRIVERS & OTHER STAFF POST INCIDENT

Evidence

General description

917 As outlined in the part above, the management of SPADs, does not directly contribute to the occurrences of SPADs on the IÉ network. However, the RAIU made significant findings in relation to the management of drivers, after SPADs, as part of the investigation which warrant further investigation.

918 The first part of the report will review how drivers are relieved from driving duties after a SPAD incident, this information is taken from IÉ reports of investigation and accounts of the drivers.

919 It will also review OPS-SMS-3.2 in relation to how drivers are managed directly after the incident and in the weeks and years following the incident. OPS-SMS-3.2 includes details on:

- Purpose of Driver Development and Support System;
- Driver Profiles;
- Incident requiring change of Driver Profile;
- Minimum number of additional assessments;
- Driver Development & Support System.

920 This information was taken from accounts given by drivers. As part of this investigation, the RAIU have formally interviewed the vast majority of drivers involved in SPADs from 2012 to mid-2015. The RAIU found that all drivers were co-operative to the RAIU investigation and assisted the RAIU as requested.

Relieving drivers of driving duties

921 Section 9.1.2 of OPS-SMS-2.0, 'Employees to be immediately relieved from duty' provides information on when an employee should be relieved from duty immediately. It was not found that any of the drivers involved were under the influence of drugs or alcohol, medically unfit or suffering from fatigue. Although it was noted that one driver was not subject to any drugs and alcohol testing as a result of some confusion in relation to whether the incident was a SPAD (paragraph 639).

922 It is evident, from the driver interviews carried out by the RAIU, that in all cases drivers are shocked by the SPAD incident, and in some cases 'shocked to an extent which could significantly impair their judgement' (paragraph 78); a term used by IÉ to decide whether a driver should be

immediately relieved from duty. Some of these drivers were not immediately relieved from duty, and the District Managers allowed some drivers continue with movements after a SPAD. In the majority of cases there were no further incidents following the SPAD, however, there were a number of cases where drivers conducted unauthorised movements after the SPAD, for example, after the SPAD at:

- Signal XE010DS, Longpavement Level Crossing, 9th April 2012, the driver propelled his train after the SPAD to look at the signal (paragraph 520);
- Signal SL817, Boyle, 18th January 2015 (paragraph 766 - 776), the driver carried out an unauthorised movement after being requested not to move his train until authorised by the signalman;
- Signal CL102, Clonsilla, 15th May 2015, the driver was requested to return the train to the platform at 25 mph (40 km/h), however, he approached at a faster speed.

923 In addition, after the occurrence of some of the SPADs, it would have been apparent to IÉ that the incident was 'very serious' e.g. SPAD at Millstreet Station on the 8th December 2013, as two trains stopped 175 m apart on the same platform. However, IÉ allowed the driver continue with shunting movements after the SPAD (paragraph 262).

Relieving other operational staff from duties

924 The RAIU also interviewed a number of signalmen, EOs and LCCOs in relation to the investigation. It was found that all drivers (which the exception of the driver of the SPAD at Signal XX062, Shanclough Level Crossing on the 15th January 2015) were relieved from driving duties. However, in relation to other operational staff (such as the LCCOs, EOs and PICs), these staff are not always stood down after an incident. This is particularly relevant in the cases of SPAD during degraded train operations, where the RAIU found that the actions of other operational staff were nearly always contributory to the SPAD occurring (paragraph 847); and in SOY SPADs where the PIC has also been contributory to the SPAD occurring through giving the 'Ready to Start' signal. As a result, some of these staff are not subject to any form of retraining.

RAIU Interview Findings

General description

925 As mentioned previously, the RAIU carried out a number of formal interviews with drivers in relation to their relevant SPADs, as part of the interview process drivers were invited to discuss the immediate and long term repercussions of the SPAD. This section of the report will discuss the:

- General treatment of drivers during five day review panel/ inquiry;
- Sanctions and suspensions imposed on the drivers;
- Driver profiles and the DD&SS.

General treatment of driver during the investigation process

926 All drivers interviewed by the RAIU understood the potential severity of SPADs, some drivers felt physically ill after having the SPAD and described the SPAD as the worse experience of their lives (personally or professionally).

927 The RAIU review of the incidents found that the drivers had been subject to varying treatment by IÉ as a result of the SPAD incidents.

928 The RAIU review of the incident found that majority of drivers (63% of those interviewed) felt they were not treated fairly or with respect. Some drivers were required to sign in every day that they were rostered and sit in the drivers mess area for six to seven hours every day with no contact from management staff; these drivers found that this was demoralising, humiliating and degrading and that is seriously affected their confidence.

929 Where drivers were interviewed as part of the internal investigation process, some were subjected to lengthy interviews by up to eleven management staff. Some of the drivers felt “ambushed” by this process and it was stated by some of the drivers that during this process the felt bullied, threaten and belittled.

930 Some of the drivers were accused of purposely having the SPAD for some other gain e.g. one driver stated that IÉ had accused him of having the SPAD on purpose to have extended annual leave, two drivers stated that IÉ accused them of having the SPADs on purpose to avail of early retirement. The RAIU did not find that any driver purposefully had any of the SPADs involved.

931 While 63% of the drivers felt they were not treated fairly or with respect, the remainder of the drivers (37%), who had similar SPADs in terms of severity (SRR) were not subject to this

treatment and were only required to write a statement and were returned to driving duties within days (in some cases, less than five days).

932 In addition, some drivers were lead to believe, by their DTEs or more senior management that another incident would result in them being removed from the driving grade and/or IÉ.

Sanctions and suspensions imposed on drivers

933 Some drivers were subject to sanctions, whereby, they were suspended without pay, during the five day panel review process; other drivers had their weekly hours cut. In one instance, where a driver attempted to appeal the suspension, his suspension was successfully reduced (from five days to three days), but he received a final disciplinary warning. Some of the actions taken against some drivers appeared quite punitive.

Driver profiles and DD&SS

934 In relation to the DD&SS, the RAIU found that:

- The majority of drivers did not know what profile driver they were categorised as;
- None of the drivers were aware that the DD&SS was a driver development and support system plan. All drivers referred to the DD&SS as being “put on the standard”;
- The majority of drivers considered the two year, and sometimes four year DD&SS length too long;
- A minority of drivers (30%) accepted the DD&SS. These drivers were generally found to be the newly qualified drivers as the additional monitoring and downloads were similar to what they were already subject to;
- All drivers stated that they did not have any issues with the additional monitoring or downloads; however, the majority of drivers (67%) were unhappy with the DD&SS overall. The consensus with the drivers, and other management staff interviewed by the RAIU, was that the DD&SS was used as a disciplining tool.

Near-miss reporting

935 The RAIU also asked if they would report a near miss SPAD. Some drivers stated that they had a near miss SPAD, where some emergency action was required to stop the train prior to a red aspect, and they did not report it. In addition, drivers stated, that after being subject to the DD&SS they would not report any near miss event for fear of further sanction. Near miss reporting in discussed further in ‘Part 11 – Additional Observations’ of this report.

Analysis

Relieving drivers of driving duties

936 It was found that drivers were normally allowed to carry out train movements after the occurrence of a SPAD, based on a conversation with the relevant District Manager (or Acting District Manager). It is apparent from discussing SPADs with drivers that having a SPAD was a shocking event for drivers, and in some instances drivers carried out unauthorised movements after the SPAD event (paragraph 922). It is the opinion of the RAIU that after the SPAD event, drivers agree to carry out the movements after the SPAD, as they are trying to recover the situation, despite in some situations the drivers being very distressed by the occurrence of the SPAD.

937 In addition, the RAIU found that the driver of the SPAD in Millstreet on the 8th December was authorised to carry out a number of train movements after the occurrence of the SPAD, despite the incident being ‘very serious’. This was despite the fact that another driver was available to carry out the movements, as both trains were stopped on the platform at Millstreet Station (paragraph 923).

Relieving other operational staff from duties

938 The relieving of other operational staff appears to be inconsistent, whereby some operational staff are stood down, while others remain at their post. This is of particular concern where the operational staff were later found to have been contributory to the SPAD occurring (especially in the case of SPADs during degraded train operations or SOY SPADs). As a result, these operational staff were sometimes not subject to any form of redevelopment (paragraph 924). In addition, the differing treatment of drivers from other operational staff further emphasises the perception of some drivers that drivers are the only ones blamed.

General treatment of drivers post incident

939 The RAIU found that the occurrence of SPADs was generally difficult for drivers (paragraph 926). The treatment of drivers, post incident, varied depending on which depot the driver was in (i.e. who their DTEs were). Some of the actions taken against some drivers appeared quite punitive.

940 Some drivers believe they were treated very poorly post incident, where they were:

- “Stood down” from duties with no communications from management (paragraph 928);
- Led to believe that they would lose their job (paragraph 932);
- Subject to sanctions (paragraph 933);
- Accused of having the SPAD on purpose (paragraph 929).

Driver Development & Support Systems

941 Few of the drivers interviewed knew what there driver profile was (i.e. classification, Category A or B for drivers with SPADs). None of the drivers interviewed by the RAIU knew that the DD&SS was in fact a driver development and support system; the drivers all referred to “being put on a standard”. As a result, the DD&SS is generally not accepted fully by the drivers; and although drivers have no issue with the additional monitoring, the more experienced drivers, with no previous operational incidents, found the standard two years was excessive.

942 Overall the drivers found that the DD&SS was used as a disciplining tool. This treatment of the drivers, led the some drivers to believe that drivers were usually first to be blamed, and in some cases drivers stated that they felt very nervous while on the DD&SS and it affected the way that they drove.

Conclusions

943 Drivers, in some cases, are permitted to make a number of movements post SPAD event in order to recover the situation. However, it is evident that SPAD events can be traumatic for drivers and although they may feel they can carry out the movements, errors sometimes occur (paragraph 936). In addition, even after ‘very serious’ incidents, drivers have been permitted to carry out train movements, despite other drivers being available (paragraph 937). In terms of other operational staff, in a lot of SPAD events, these operational staff were not removed from duties, despite it being later found that their actions were contributory to the SPAD event (paragraph 938). This variance in the treatment of operational staff, has re-enforced the perception of drivers that drivers are the first ones to be blamed. The general treatment of the drivers, post SPAD event, has also

increased this perception as it has been found by the RAIU that in some cases drivers are treated poorly, with the suggestion of further sanctions and accusations of having SPADs on purpose.

944 The above factors have resulted in drivers not reporting near miss SPADs or other incident, for fear of further sanctions; or fear of being removed from the driving grade and IÉ.

Section 4

Part 11 – Additional Observations

Part 12 – The Role of the RSC in relation to SPADs

Part 13 – Relevant actions taken or in progress

Part 14 – Safety Recommendations

RAIU
Railway Accident Investigation Unit

PART 11 – ADDITIONAL OBSERVATIONS

Evidence

General description

945 The RAIU also made a number of other general findings related to drivers as a result of the interviews which would warrant further discussion, mainly:

- Issues related to support after an injury or fatality as a result of suspected self-harm incidents;
- Introduction of the DRA on the IÉ Network;
- Absence of near-miss reporting of SPADs;
- The adoption of violations by drivers as EPTs.

Suspected self-harm incidents

946 A number of the drivers interviewed as part of this investigation had been involved in fatal incidents on the railway line as a result of individuals purposefully placing themselves in front of the moving train. The drivers who experience these incidents found the event itself to be very traumatic.

947 In certain cases, drivers were left alone on the train for long periods of time without any instruction from management (this is likely the result of trying to arrange emergency services and arrangement for the transfer of train passengers to a bus service). In addition, in some instances drivers were required to attend the Coroner's Court and were questioned by the families of the deceased, the drivers who experienced these scenarios found them to be very stressful and found that they had no support from the company when required to attend these courts. However, it should be noted that in some depots, drivers are well supported through this time.

948 Drivers involved in these incidents are initially offered six counselling sessions. Some drivers have stated that they have requested additional support from the CMO.

949 Some drivers do not consider that they need the counselling service, for example, the driver involved in the SPAD in Millstreet, 8th December 2013, had previously been involved in a fatality as a result of a self-harm incident and although attended the sessions, felt that he had sufficiently recovered. However, on the day of the SPAD, when he could not see the children on the platform, and thought he may have struck them – this was as a direct result of being involved in the self-harm incident. The driver then became highly stressed, a stress he hadn't managed to overcome when he approached and drove past a red signal;

950 The employee assistance programme on which all drivers involved in an incident such as a SPAD are referred operates on three levels:

1) A situation focused counselling programme where an employee is distressed by an event and there are no underlying causes evident, counsellors will maintain regular contact with the employee on their return to work for a short period. Counselling sessions at this level usually are done within six visits or less;
2) Where the counsellor is of the opinion that further counselling is needed or helpful, the counsellor can conduct three further sessions before referral to the Company Medical officer;
3) Where in the opinion of the Medical Officer the sessions have not resolved the problem the employee may be referred to a cognitive behavioural therapist. There is no limit to this therapy which will be overseen by the Medical Officer.

951 IÉ try to maintain a balance between a driver being fit to drive and being off work too long and the overarching principle in drivers returning to work is that they cannot be a risk to themselves or passengers.

952 IÉ believe that although they apply the highest standards in recruiting and training drivers there may be occasions when an individual may not be suited to the practical issues and responsibilities of a train driver.

Introduction of the Driver Remainder Appliance on the IÉ network

953 At the time of drafting this report, the DRA was being introduced as a SAS SPAD preventative measure. The RAIU asked drivers if they had used the DRA and how they found using it.

954 Some drivers accepted the DRA and found it useful, although some stated that they frequently forgot to set it.

955 Other drivers were concerned about disciplining actions to be taken in the event where a driver took over a service at a danger aspect, where the previous driver had not set the DRA before exiting the cab, and had a SPAD incident; some drivers felt that it would be used to further blame the drivers in the event of a SAS SPAD, with more severe consequences in terms of the DD&SS.

Near-miss reporting

956 As a general rule in incidents there are generally a number of unsafe acts, near-misses and incidents and serious incidents prior to an accident occurring, see Figure 111.

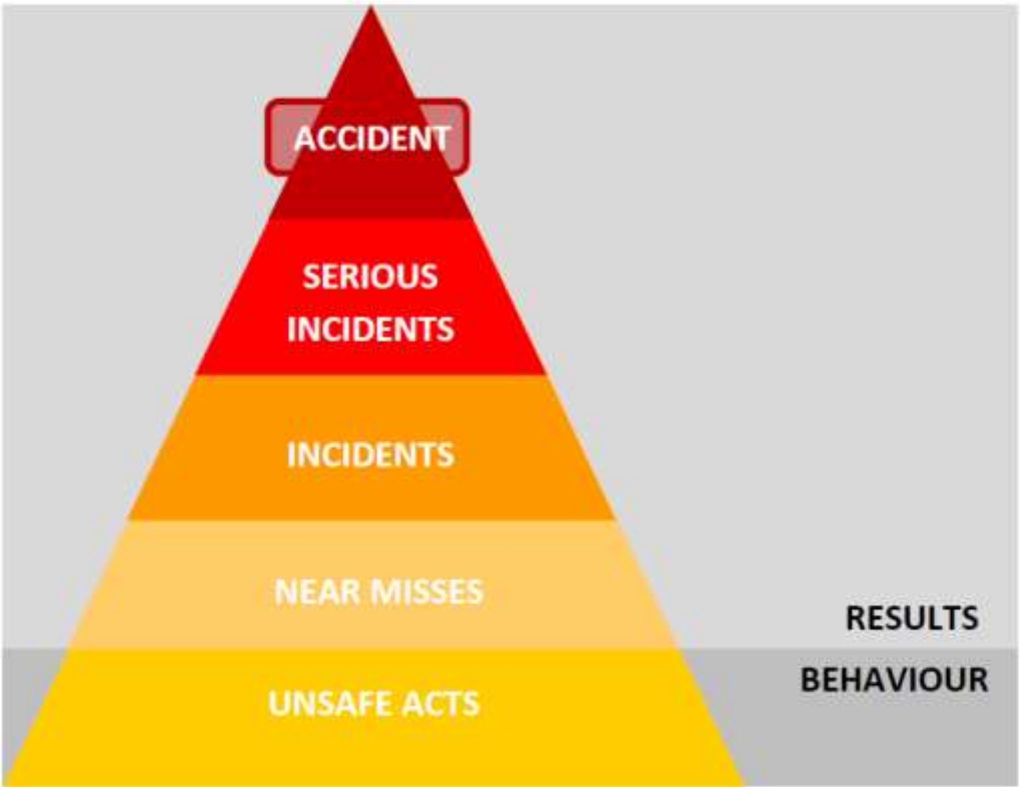

Figure 111 – Safety Triangle

957 The drivers who had experienced SPADs (2012 – 2015) were asked if they had ever taken any emergency action to prevent a SPAD or if they would report a near-miss SPAD or another operational occurrence related to their driving. Some drivers acknowledged they had a near-miss SPAD, which was prevented by the application of some immediate action. The response also indicated that near-miss SPADs would not be reported; this was due to the fear disciplining or being placed on a DD&SS.

958 The RAIU requested all the near-miss SPAD reports on the IÉ network from January 2012 to June 2015. There was only one near-miss SPAD report in 2013 at Tullamore Station.

959 The RAIU further requested the consequences for the driver of the near-miss SPAD. The RAIU found that, although the driver was not placed on a full DD&SS; he was required to: undergo corrective coaching; attend a SBUD; he was subject to an OTDR download; be accompanied by the DTE; and had to undergo a summary assessment.

960 Drivers are concerned that sanctions may be placed on drivers after an operational incident and as a result are not reporting them.

The adoption of violations by drivers as EPTs

961 As part of the investigation, the RAIU questioned the drivers in relation to their driving post SPAD incident; in particular, if had drivers adopted any form of EPTs post SPAD incident, to assist them in their driving (in particular, the management of distraction, situational awareness. A number of drivers adopted recognised EPTs, such as RTC. However, a number of drivers had adopted the use of the CAWS in non-CAWS areas, whereby drivers were enabling the CAWS (although not functioning) on passing a yellow aspect, as the CAWS displays a red aspect on the ADU inside the driver's cab (CAWS default); this is done by the drivers to act as a reminder that the next signal is at red. This action is in direct violation with the Clause 4.2.5, Section J, General Appendix which requires drivers to disable the CAWS on leaving a CAWS area.

Analysis

Suspected self-harm incidents

962 Some drivers, in certain depots, felt that they were provided with limited support, either legally or mentally when involved in a suspected fatal self-harm incident. It is clear that these incidents, impact greatly on the drivers and it is obvious that in some cases they may need more counselling sessions than the initial six counselling sessions.

963 In addition, it may not be obvious to the driver, that counselling is required (paragraph 949), and as a result, drivers should be assessed appropriately to manage any risks associated with driving after one of these incidents.

Near miss reporting

964 It is clear that a number of unsafe acts must occur prior to the occurrence of a SPAD (paragraph 956), however, drivers are not reporting these incidents, and to date, there has only been one near miss SPAD reported to IÉ (paragraph 958) which resulted in the driver being placed on a DD&SS (paragraph 959). Drivers are not reporting these incidents because of concerns of being placed on a DD&SS or other sanctions (paragraph 960).

Conclusions

Suspected self-harm incidents

965 The six counselling sessions offered to drivers are a minimum, with further sessions at the councillor's discretion and with a possible referral by the Chief Medical Officer to a cognitive behavioural therapist.

Near miss reporting

966 The absence of drivers reporting near miss SPADs (paragraph 964) results in a missed opportunity for IÉ, in that, they cannot investigate near misses prior to the occurrence of SPAD events.

PART 12 – The role of the Railway Safety Commission in relation to SPADs

Evidence

Introduction

967 As outlined in Part 1 (paragraphs 19 - 21), the RSC is the national safety authority, which is responsible for the regulatory oversight of the sector and enforcement of railway safety in the Republic of Ireland in accordance with the Railway Safety Act 2005 and Directive 2004/49/EC – the European Railway Safety Directive. Although the RSC's role is regulatory (it does not have an operational role in managing the day-to-day safety on the ground), it must ensure that the respective railway organisations are applying and complying with the SMS on which basis they have been issued with Safety Certificates or granted a Safety Authorisation.

968 This is achieved through: conformity assessment of SMS submissions; compliance supervision and enforcement. This part of the RAIU's investigation report focuses on the RSC's role in terms of supervision and enforcement through auditing of IÉ's compliance with the standards, procedures and processes embodied in its approved SMS; and inspection of railway assets to assess whether the SMS is effective in controlling the risks associated with SPADs.

969 Firstly, this part will establish the RSC's monitoring of SPAD occurrences and then establish whether any auditing in relation to IÉ's compliance with standards and procedures has been conducted in relation to SPAD events. Secondly, this part of the report will also review the role of the RSC in the inspection of railway assets to assess whether the SMS is effective in controlling the risks associated with SPADs, both in terms of signalling and rolling stock issues.

Monitoring of SPAD events

Monitoring the occurrence of SPADs

970 The RSC are monitoring the occurrence of SPADs on the IÉ network; and have been reporting on this monitoring in the RSC annual reports over the past decade (2006 – 2015 reviewed as part of this investigation). The RSC annual reports noted the following for the respective annual reports:

- RSC Annual Report 2006 – 2008: The RSC note that there was a decreasing trend in the occurrence of SPADs;
- RSC Annual Report 2009: The RSC make little reference to SPADs;
- RSC Annual Report 2010: The RSC note that there was no significant change in the number of SPADs;
- RSC Annual Report 2011: The RSC note that there is a significant drop in the number of SPADs; the RSC credits the decrease to the corrective coaching of train drivers. However, the RSC does note that, apart from the DART network, "positive train protection is not available on the remainder of the Iarnród Éireann network"; and it continues that "the safe working of trains is therefore in the hands of the train drivers and their obedience to railway signals. In this respect Ireland has remained static and, compared to the rest of the world, has actually fallen behind. It is now necessary to consider how automatic train protection might be rolled out across the Iarnród Éireann network and the implications that this has for safety investment in the railways";
- RSC Annual Report 2012: The RSC notes that there is a slight increase in the number of SPADs in 2012 and note that "the improved record attributable to systems of non-judgemental proactive monitoring, mentoring and corrective coaching of train drivers has been maintained for 2012". However, the RSC again note that "automatic train protection is not available on the remainder of the Iarnród Éireann network. The safe working of trains remains in the hands of the train drivers and their obedience to railway signals. As reported last year, it is now necessary to consider how systems of automatic train protection might be rolled out across the Iarnród Éireann network and the implications that this might have for safety investment in the railways in the current economic circumstances";
- RSC Annual Report 2013: The RSC note that the "safety performance of IÉ train operations was adversely affected by a marked increase in the number of SPAD events on running lines; up from eight events in the previous year to eighteen events in 2013. Although this is a worrying trend, it must be recognised that Automatic Train Protection (ATP) is only available on 99 track-km (4.6%) of the Iarnród Éireann network. A further 900 track-km (41.6%) of the network is equipped with a Continuous Automatic Warning System (CAWS), but the remaining 1,166 track-km (53.8%) of the network is not yet equipped with any form of driver warning or ATP system. Mindful of the factors that contributed to the fatal railway accidents which occurred at Santiago de Compostela, Spain (24th July 2013), and in The Bronx, New

York, USA (2nd December 2013), and the fact that safe working of trains on over 50% of IÉ track-km is highly dependent on strict obedience to railway signals by train drivers; the RSC will during 2014 undertake a review of the risks associated with the current IÉ signalling and telecommunications systems. This review aims to identify those areas where risk reduction measures, such as installation of ATP, are required, thereby informing prioritisation of future safety investment in Ireland's railway system". The RSC state that the rise of SPAD events is a "concern" and that the RSC "will pursue this matter further in 2014 as part of its audit of the maintenance and operation of traffic control and signalling system";

- In addition to RSC Annual Reports, the RSC produce, since 2009, an annual Railway Safety Performance report that presents in more detail statistical information and a narrative on a number of railway safety performance indicators that include SPADs.

Compliance in terms of SPADs

Compliance in terms of calculation of the SRR

971 The RSC compliance review in terms of calculation of the SRR has been previously discussed in 'Part 9 – SPAD Management' (see paragraphs 878 - 881).

Audit of IÉ's infrastructure

Audit of IÉ's maintenance and operation of traffic control & signalling system

972 As mentioned in the RSC Annual Report 2013, the RSC began an audit which focused on IÉ's Maintenance and Operation of the Traffic Control and Signalling System, in 2014 (February). The audit was undertaken to fulfil the following principal objectives of identifying:

- IÉ's compliance with the provisions of its SMS;
- The effectiveness, suitability, and sufficiency of the SMS to demonstrate compliance with the applicable Common Safety Methods (CSM);
- The extent to which the applicable actions identified for resolution by IÉ following the Safety Authorisation process and actions arising from previous audits have been progressed;
- Matters of compliance against the reference standards (legal instruments);
- Areas for potential improvement to the management systems including advising on good practice.

973 The audit was completed on the 12th June 2015, entitled "RSC Audit No. 12/14-A. An audit of - Iarnród Éireann's Safety Management System Annex II, Criterion W. Maintenance and Operation of the Traffic Control and Signalling System". The audit did not identify any *major non-compliances*, but did identify two *minor non-compliances* related to:

- The process for checking that test and measurement equipment is calibrated before use;
- The lack of clear demonstration that IÉ-SET were meeting the required 15% of compliance checks for the Radio-On board (RONBD) and CAWS/ATP equipment.

974 In addition, the audit identified ten *Actions Required*, two *Scopes for Improvements*; three *Good Practices* and one *Audit Trail* item.

Audit of IÉ's Rolling Stock Brake Maintenance and Testing Regime

975 In relation to the audit on IÉ's rolling stock brake maintenance and testing regime, the RSC stated that "The railway brake systems are fundamental to the operation of a safe railway. Trains must be able to stop in accordance with established design parameters. Train braking and signalling are not exclusive systems; they are mutually dependent on each other. In order to prevent collisions or derailments, signalling system design takes account of train braking characteristics for signal positioning and overlaps. Braking reliability must therefore be assured so as to maintain performance at a level that is not below that to which the signalling systems have been designed".

976 The audit was undertaken with the assistance of UK consultant Risktec, with the following objectives; to review:

- IÉ's compliance with the provisions of its SMS;
- Any changes that have taken place since January 2007, particularly with the periodicity and content of previously established specifications for testing of brakes at maintenance depot level;
- Any divergence from the manufacturers' recommendations on the periodicity and content of brake tests on vehicles that have been delivered since January 2007;
- The adequacy of any risk assessment conducted to justify changes in the periodicity and content of specifications for the testing of brakes and the validation process applied to any such changes such that they comply with the CSMs or the Yellow Book Approach;
- The level of engineering competency, railway knowledge and appreciation of the difference in risk that has been applied in the analysis and approval of any such changes;
- The level of understanding of (a) the purpose of testing vehicle brakes at depot level i.e. the responsibility to ensure fitness for service, (b) the purpose of the brake continuity test and (c) the reasons why there are limitations on the isolation of vehicle brakes;

- The level of communication and co-operation between the mechanical engineering, safety and operations department interfaces of IÉ when changes to brake testing procedures are considered;
- Changes that have taken place in the Rule Book, General Appendix, or the Driver's Manuals in respect of continuity testing of train brakes or the rules applying to the isolation of brakes;
- The possibility that unanticipated failures may occur where there are failures to clearly delineate the organisational responsibility between the maintenance and operations departments, which could result in increased operational risk.

977 The audit, completed on the 9th December 2013, identified one major non-compliance related to brake system maintenance periodicities for Intercity DMUs; and five minor non-compliances related to:

- Previously identified minor non-compliances remaining open since 2011;
- Competency of contractors performing safety critical work on IÉ trains;
- Staff briefings on updated procedures;
- Management of engineering change;
- The absence of sufficient risk assessments.

978 The audit also identified fourteen Action Required; three Scope for Improvements, two Good Practices; and two Audit Trail items.

Audit & review of IÉ at a Strategic Management Review Level

<u>Audit of IÉ's SMS: A Strategic Management Review</u>

979 The audit, commencing in November 2014, has focused on IÉ Board and Headquarters functions in respect of strategic safety management and this document reports the audit findings. The audit was undertaken to fulfil the following principal objective of identifying the following:

- Senior management activities that ensure the effective implementation and improvement of the SMS of IÉ's RU and IM. This scope includes the processes that support the analysis and provision of data, how this is used by senior management to determine effectiveness for the SMSs, and to advise about any corrections or improvements necessary;
- IÉ's compliance with the provisions of its SMS;
- The effectiveness, suitability, and sufficiency of the SMS to demonstrate compliance with the applicable CSMs;
- Matters of compliance against the reference standards identified in the audit plan;
- Areas for potential improvement to the management systems including advising on good practice.

980 The audit entitled ‘An Audit of Iarnród Éireann’s Safety Management System (SMS), Strategic Management Review’ was published in April 2015. The RSC noted that “the audit uncovered areas which will require action to resolve, and other items which might form part of future audits”. The audit identified one major non-compliance was identified “The IM and RU Safety Managers do not attend Board meetings whilst the respective SMSs (RU-SMS-001 and IM-SMS-001) state they should. One minor non-compliance was identified, in that IÉ should ensure that “Each document forming part of the SMS in the RU should have a minimum review cycle specified for it, with the purpose of ensuring that the document contents are kept up-to-date”. Four Actions Required were identified, namely:

- Define the remit and authority of the Safety Executive Group and update the SMS in line with SMS change processes;
- IÉ should identify a series of leading indicators and task based indicators for the greatest risk areas in the NWRM to complement the reporting on SPADs;
- IÉ should separate the role of Advisory Groups from providing advice to IÉ management and independent advice to IÉ Board;
- The IM SMS (and by association the RU SMS) should prescribe by when and by whom issues raised on an Issues Log should be reviewed and the SMS updated.

981 In addition, four Scope for Improvements, one Good Practice and three Audit Trails were identified.

Review of IÉ's SMS at a Strategic Management Level: Comparison to a HRO

Summary of findings

982 In late 2014, the RSC engaged UK consultant, DNV GL, to review IÉ's SMS at a Strategic Management Level, and compare IÉ to a *High Reliability Organisation* (HRO)[31]. The study assessed IÉ's performance against five dimensions of a HRO:

- Safety leadership;
- Safety assurance;
- Safety culture;
- Safety competency;
- Safety capability.

983 The study rated these five dimensions on a scale, derived from the European Railway Agency (ERA), of:

- Ad hoc (one) – performance against the characteristics of an HRO were evident in isolated or temporary instances only;
- Initializing (two) – the organisation shows elements of performing as an HRO. These are greater than ad hoc in nature and have the potential to be organisation wide, but are likely to be at an early stage of definition or have only recently been adopted;
- Implementing (three) – the organisation is adopting or has recently adopted HRO characteristics systematically across all activities;

[31] According to the study, no definitive definition of an HRO, and its associated characteristics, has been agreed in the safety management literature, a number of common attributes have been identified, as follows:

• Sensitive to operations - Each employee (executive and operative) pays close attention to operations and maintains awareness as to what is, or is not working. There are no assumptions.

• Reluctant to accept "simple" explanations for problems – Employees resist attractive, but broad excuses when processes do not work well. Resist simplifications.

• Preoccupation with failure - Every employee at every level is encouraged to think of ways their work processes and systems might break down and affect the organisation. This sense of shared attentiveness is constant.

• Defer to expertise – Managers listen to those who have the most developed knowledge of the task at hand. Such people are positively encouraged to voice their concerns, ideas and input regardless of their position in the organisational hierarchy.

• Resilient (relentlessness) - Leaders stay the course; they are prepared in how to respond to failures. Numerous failures might occur, but catastrophe is averted by resilience and swift problem solving.

- Managing (four) – the organisation has sustained performance as an HRO across all activities;
- Improving (five) – the organisation has sustained activities as an HRO across all activities and demonstrates continual improvement in all activities.

984 The study, published in April 2015, entitled "IÉ Safety Management Systems at a Strategic Management Level, Comparison to a High Reliability Organisation" considered IÉ's ratings to be:

- Safety Leadership – Implementing (three);
- Safety Assurance – Implementing (three);
- Safety Culture – Ad hoc (one);
- Safety Competency – Implementing (three);
- Safety Capability – Managing (four).

985 In summary, the study found that "IÉ exhibits many of the features of a HRO. A number of initiatives that are currently underway can be expected to further improve this, as well as improve the performance and management of safety within IÉ. The areas where IÉ is weak centre around the area of safety culture and in particular a number of issues that arise from a mistrust between frontline staff and management, as reported by management. The study also identified that a proposed reorganisation, relating to some safety functions and activities, risked not complying with the approved SMS. In addition, the way that the affected units were consulted over the changes should have been to a higher standard than was observed to be the case".

986 As a result of the study, a roadmap was developed containing recommendations for further improving safety, the prime element of which is the appointment of a Non-executive Director to lead on safety, chair a Board safety committee and lead a programme of culture improvement.

SPAD references

987 In terms of SPADs, the study found a number of positive and negative aspects to the management of SPADs in IÉ, namely:

- The RU Director meets drivers directly to discuss SPADs to ensure drivers "know what is going on" and drivers are "getting the right messages";
- Actively challenging SPAD statistics to makes sure the reduction is sustainable and not just by chance;
- IÉ puts considerable effort into SPAD management and the reporting of SPADs (despite not being the greatest risk according to the NWRM);

- Few personnel had experience of other railways and so people's 'frame of reference' for how to operate a railway safely, is dictated by their career in IÉ; and this has led to the delay in the introduction of DRA for the prevention of SAS SPADs in preference for an investment in ATP; and the current introduction of DRA is as a direct result of the CEO's experience with DRA.

Safety culture references

988 During the RAIU investigation, interviews held with the drivers found that there was no near miss reporting, and that drivers would not report near misses for fear of sanctions. The review, conducted by DNV GL, made a number of similar findings, namely:

- There is not a culture of widespread reporting of near misses in IÉ;
- There was a "fear or repercussions and blame" associated with near miss reporting;
- Where near misses were reported, if was between the IM and RU (e.g. drivers reporting infrastructure workers and vice versa) rather than reporting oneself or one's immediate colleagues;
- The DD&SS "was seen as being a punishment following an incident and not an opportunity to learn and improve";
- The application of the DD&SS was found to be inconsistent, in that "it could take into account previous incidents on the driver's record meaning that drivers might be reluctant to report a near miss";
- There was a "lack of trust between management and frontline staff and management being seen to be involved only at times of bad news", discouraging near miss reporting.

989 Another factor related to the lack of near miss reporting was as a result of "personnel not always understanding the significance of what they witness, and the potential benefits in reporting it". The study found that the lack of near miss reporting continued, despite a number of previous initiatives being undertaken in the past with the intent of improving near miss reporting (use of a confidential reporting system, CIRA, staff briefing events, and new forms to facilitate reporting).

990 Although the study does not make any formal recommendations in relation to near miss reporting, it does encourage IÉ to adopt the following:

- Efforts need to be made to improve trust between management and the frontline if a more proactive approach is to be taken to safety management;
- Managers and leaders need to be engaged at the frontline on a regular basis and highlighting any areas of good practise they see, making a public and positive show of receiving bad news (which does not mean that an appropriate sanction should then not be applied); ensuring that

sanctions are applied in a consistent manner; and finally feeding back to the frontline how their near miss reporting has been used to improve safety;

- Providing a clear policy on the actions that IÉ will take in response to reporting an incident and near-miss;
- A form of commitment that IÉ will not implement negative sanction for any incident or near miss that is reported irrespective of what it is (bar criminal or acts of gross negligence), but that negative sanctions will be implemented for non-reporting of such events.

991 The study also suggested that the "RSC could offer, with respect to avoiding using its regulatory powers against those that report would be beneficial, as would it using its powers for non-reporting of events".

Analysis

Monitoring the occurrence of SPADs

992 The RSC have been monitoring the occurrences of SPADs in terms of number of occurrences for over a decade. When the number of SPADs increased in 2013 and the RSC undertook a PII in relation to a SPAD in 2014, the RSC took a number of actions in relation to SPADs in 2014, namely:

- Commissioned a review of the risks associated with the current IÉ signalling and telecommunications systems on the IÉ network;
- Reviewed the IÉ procedures associated with the SRRT and the assignment of SRRs, which in turn resulted in IÉ commissioning a review of their own standards and procedures.

Compliance in terms of calculating the SRR

993 As a direct result of the findings of the PII in terms of the calculation of the SRR, the RSC identified that the SRRs were being incorrectly calculated, IÉ are now reviewing their standards and procedures for the calculation of SRR and have actively engaged a specialist consultant to review this process.

Audit of IÉ's infrastructure

994 Auditing the implementation and effectiveness of Safety Management systems is a key task of the RSC. In 2013, the audit of Iarnród Éireann's Safety Management System Annex II, Criterion W. Maintenance and Operation of the Traffic Control and Signalling System, was identified following concerns raised by the RSC's Conformity Assessment Team to the RSC's Supervision Team.

Study of IÉ at a Strategic Management Level

995 The study makes a number of findings in relation to the management of SPADs, although, no recommendations or suggestions were made in direct relation to the prevention of SPADs.

996 However, the study made a number of findings related to the safety culture in IÉ which are consistent with the findings of the RAIU investigation, in that there is not a culture of near miss reporting resulting from: a lack of trust between management and frontline staff; a of fear of repercussions and blame; and the inconsistent application of the DD&SS coupled with the fact that it is seen as a punishment tool rather than a learning tool.

997 Another factor identified by the study, related to the lack of near miss reporting, is that "personnel did not always understanding the significance of what they witness, and the potential benefits in reporting it".

998 The study noted that previous initiatives introduced to encourage near miss reporting failed, and that IÉ now needed to consider adopting the following:

- Trust needed to improve between management and the frontline if a more proactive approach is to be taken to safety management;
- Managers and leaders need to be engaged at the frontline on a regular basis;
- Clear policies on the actions taken in response to reporting near-misses need to be outlined;
- A form of commitment that IÉ will not implement negative sanction for any incident or near miss that is reported irrespective of what it is (bar criminal or acts of gross negligence), but that negative sanctions will be implemented for non-reporting of such events.

999 The study also suggested that the "RSC could offer, with respect to avoiding using its regulatory powers against those that report would be beneficial, as would it using its powers for non-reporting of events".

Conclusions

1000 The RSC have collected and collated information on the occurrences of SPADs in terms of number of occurrences for over a decade, and when the number of SPADs increased in 2013, the RSC commissioned a number of reviews to be undertaken; such as in 2014 the RSC:

- Identified that the SRRs were being incorrectly calculated, IÉ are now reviewing their standards and procedures for the calculation of SRR and have actively engaged a specialist consultant to review this process (paragraph 993);
- Commenced a review of IÉ's maintenance and operation of traffic control and signalling systems (paragraph 994).

1001 In relation to IÉ's 'Strategic Management Level', the RSC also commissioned a review of the management in IÉ (paragraphs 995 - 999), and found that, there is no culture of near miss reporting resulting from a blame culture within IÉ; and the previous near miss reporting systems in IÉ failed.

PART 13 – Relevant actions taken or in progress

Relevant actions taken or in progress by IE

Introduction

1002 IÉ state that they are "seeking to continuously improve its management of SPAD risk". The following figure (Figure112) shows the significant reduction in the number of SPADs which has been achieved from 2003 to 2015 (however it is noted that there are two peaks in the numbers of SPADs in 2013 and 2015).

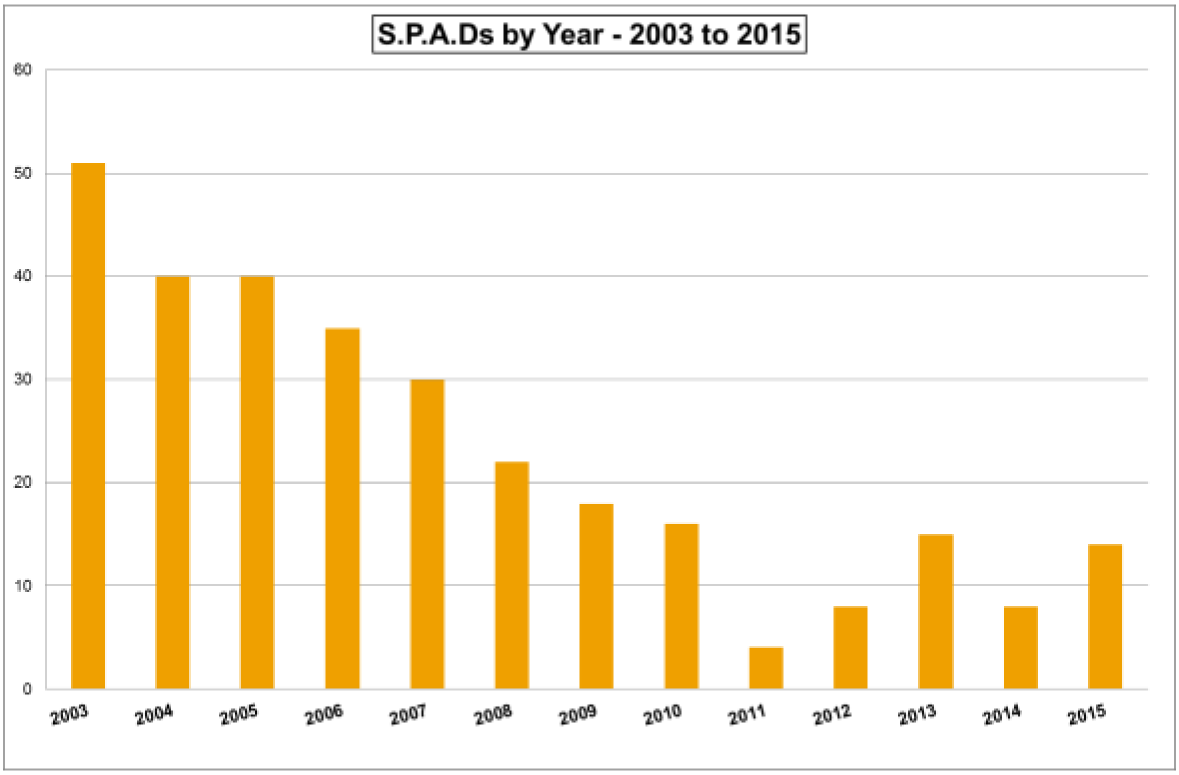

Figure 112 – SPADs by Year - 2003 to YTD 2015

Actions taken by IÉ

1003 As of the publication of this report, IÉ have stated that the following actions have been taken:

- Development of professional driving standards – A suite of standards dealing with driver selection, training ,competence assessment, development and support, route knowledge, briefing and communication of safety critical information has been introduced into IE based on best practice. A professional driver's handbook as well as a competence standard booklet has also been produced defining best driving practices and this is supplied and briefed to drivers;
- Driver recruitment and training – Improvements have been made to the selection of drivers utilising up to date psychological profiling. In regard to training the training course has been revamped and train simulators have been introduced at training centres in Inchicore and Mallow. Drivers receive a range of briefings such as human factors, non-technical skills, and safety critical communications also;
- Enhanced driver support & monitoring – Where a need has been identified post incident or through the competence management process drivers are placed on DD&SSs to ensure that any weaknesses/risks are correctly dealt with;
- Increased driver engagement – Drivers participate in central and local Operations Risk/SPAD focus groups, workshops and review groups to ensure that their views are taken on board in all the initiatives that are being developed;
- Benchmarking from UK and European rail operators – IÉ keeps in touch with best UK and world practice through the employment of a UK based industry expert who assists in the development of standards, briefings and workshops. Additionally through our workshops several UK based experts have shared their knowledge and experience of SPAD and operational risk management with management and drivers;
- Safety monitoring – Drivers are subject to monitoring of their driving performance through regular downloads and analysis of OTDRs, these check the speeds of trains, braking and defensive driving performance, etc.;
- LRA management - IÉ has introduced a range of measures for the management and communication of Low Rail Adhesion (LRA) conditions. These range from vegetation management, sanding devices on trains, spreading of Sandite and Traction Gel application. In addition all drivers receive an annual LRA briefing and communication of LRA hotspots;
- SPAD investigations – All SPADs are fully investigated. A revised data collection form has been introduced as well as an OOR form. This review takes place no later than 5 days after the incident and a key feature is that the driver involved in the incident is invited to participate in the review. The outcome of the review is recommendations to prevent reoccurrences. Both of these forms have now been revised and an enhanced process for SPAD investigation is now in place. An important aspect of this is driver involvement in the investigation process by their attendance at the review meetings;

- Human Factors/Non-technical skills - IÉ recognises the importance of ensuring that drivers are fully aware of the impact of human factors in their driving performance. Issues such as concentration, distraction, fatigue, stress, attitudes and perception etc are dealt with in training and briefing. The concept of the assessment of non-technical skills is built into the competence assessment process and Traction Executives have been trained in this assessment. IÉ employs the services of the Occupational Psychology Centre in the UK to assist with Human Factor related issues. The CMO is also involved where drivers may have psychological or other medical issues impacting on their performance;
- National Operational Risk and SPAD Focus Group - IÉ have a review process in place for SPADs and other operational occurrences. A network wide SPAD Focus Group was formed in the early 2000s that changed focus to Operational Risk & SPAD's in about 2008 to reflect the wider operational accidents and precursors. This group meets five times per annum and hold a conference/workshop annually. These meetings are attended by management and staff, including Drivers/DTEs/Signalmen from IÉ-RU, IÉ-IM and other Operating companies. From IÉ-RU train drivers and DTEs attend and recent events are discussed and actions determined. The outputs from the annual workshop assist in formulating the action plans for the following year.

Investment Led Technical Initiatives

Driver Reminder Appliance

1004 The DRA is a device in a driving cab to enable the driver to set a reminder when stopped at a signal that the signal is at danger. When set the DRA prevents the driver being able to take power. In its most simple form it is manually activated and automatic setting systems are considerably more complex and costly. As it is not automatic the correct use of the device must be policed for maximum effectiveness. The use of the DRA can be monitored as it is linked in to the OTDR. The manual DRA will be fitted to all driving cabs of IÉ rolling stock that do not have ATP fitted i.e. the IÉ fleet of diesel trains.

1005 The device is linked into the OTDR data recorder which will record activation of the device in accordance with accepted standards. This involved software modifications of the TELOC data recorders to incorporate the additional channel.

1006 The design and development work commenced in Q1 2015 and the project to fit Iarnród Éireann fleet of diesel trains with the DRA was completed on 8th December 2015. The DRA will be fitted to Infrastructure maintenance vehicles in 2016. The use of DRA is mandatory as described by the IÉ Rule Book.

1007 The Nexala system which is currently installed and operational on the 22000 fleet only provides the facility to gather data from the OTDR and generate a DRA usage report. It is not possible to provide usage reports to any other fleets at this time. The Nexala system is currently being installed on the 29000 fleet but will not be fully operational until late 2016.

Train Protection Strategy

1008 The IÉ Board has approved the company strategy for the introduction of a TPS and work is underway on this project**.** The main objective of TPS is to provide a technical solution for SPAD mitigation where none exists currently and to eliminate high risk SPADs on the running line that have the potential for catastrophic consequences. This involves the development and safety approval of equipment that provides existing CAWS and ATP functionality and additional safety benefits:

- Provision of ATP on DART DMU fleet;
- Provision for train stop using fixed balises on DART and CAWS areas;
- Provision for train stop in non-CAWS areas using switchable balises;
- Provision for train regulation to line speed and speed restrictions;
- Provision of a compatible equipment platform for future migration to ETCS/ERTMS;

- The TPS will replace the life expired CAWS / ATP equipment;
- The project is currently developing a prototype on-board solution for three fleets, EMU 8520, DMU 29000 and DMU 22000 (ICR);
- IEIM have carried out a review, which has shown that the currently planned action of installing this system on the trains and fitting the infrastructure with Eurobalises will provide a train-stop function, mitigating the SPAD risk;
- This system is similar to systems already in service in Europe, and will have ATP and speed supervision functionality. The technical development of the system, and its safety approval by the RSC, are well advanced and, subject to availability of funding, IE plans to introduce the system on its network as soon as practicable;
- The overall roll-out strategy will be risk-based, in order to provide the maximum safety benefit for a given installation cost during the roll-out phase, and a study is being undertaken to assess the safety benefits of various approaches;
- The design development phase of the project was funded through the Multi Annual Contract but this budget cannot extend to cover the rollout phase. The rollout phase is therefore dependent on Government commitment to provide the required funding. The roll-out of the TPS should not commence until funding is guaranteed since an incomplete project would lead to multiple types of TPS within the IÉ rail network and an intolerable risk scenario.

Management Initiatives

Current Train Operations initiatives – Operational Risk Workshops

1009 A number of Operational Risk workshops have been held to enable participants identify improvements to standards, procedures and practices that may contribute to a reduction in risks from SPADs and other operational incidents. These workshops include attendees from management, supervisory and driver grades. The output from the workshop is a number of actions to be progressed. The workshop is an opportunity to communicate improvements and to hear what further actions are needed.

DD&SS

1010 One of the key outcomes of the Risk Workshop was a clear message that the DD&SS was perceived as being punitive and not being applied consistently across the organisation. In order to achieve further buy in from drivers and improve the perception of the standard a process has been undertaken involving Drivers from all Districts as well as DTEs to revise this standard. Considerable work has been undertaken and at this stage and the revised standard was in October 2015. The improvements to the standard is in the following areas:

- Reduction in the time on Category A plans for 4 years to 3 years;
- Transfer of first time/minor incidents from Category D plans to Corrective coaching under the existing Continuous Competence standard, OPS.SMS 3.1;
- Revision of Safety Performance Review Process to ensure that it is clearer and more equitable;
- Introduction of Review Meetings involving drivers from all districts and representative of management in order to address any concerns over a lack of the consistent application of the standard.

Driver Training and Competence

1011 IÉ recognises the importance of ensuring that drivers are fully aware of the impact of human factors in their driving performance. Issues such as concentration, distraction, fatigue, stress, attitudes and perception etc are dealt with in training and briefing.

1012 The concept of the assessment of non-technical skills is built into the competence assessment process and Traction Executives have been trained in this assessment. IE employs the services of the Occupational Psychology Centre in the UK to assist with Human Factor related issues. The Chief Medical Officer is also involved where Drivers may have psychological or other medical issues impacting on their performance.

1013 Safety standard OPS SMS 3.1, Competence Management Drivers, was reviewed during 2014 and revised version in place since September 2014 Issue 1, V 1.03. It has an enhanced process for assessing drivers in non-technical skills and provides a matrix to record the various elements of train driver competencies

1014 During 2014, prior to the introduction of the revised standard, the DTEs and Driver Trainers attended workshops, facilitated by a railway industry consultant, on the application of non-technical skills. The identification of non-technical skills relative to SPAD occurrences is included in the investigation process, the driver development & support process and the continuous competency process.

1015 The Professional Drivers Handbook was revised in 2014 and Issue 4 published in November 2014 and has enhanced guidance on non-technical skills.

External Depot Review of Train Drivers Competence processes

1016 An external consultant has been engaged to review the management of driver's competence process at all the main depots and to report on findings. This review is now complete and a number of actions have been identified. Overall the report is very positive in its findings. The output from the review formed part of the agenda for the risk workshops and provided opportunity for engagement with staff in developing action plans.

External review of Human Factors

1017 IÉ-RU have engaged with Trinity College Dublin where a research fellow is undertaking a review of human factor issues that affect train driver performance and the scope of the research encompasses the occurrences of SPADs. The research programme commenced in January 2016 and is expected to take approximately one year to complete. The results of the research will inform the management of all staff into the future.

Safety Culture and Leadership

1018 A key strategic safety initiative, is a campaign with the aim of improving safety culture in the organisation, was launched in February 2015 with over 70 senior managers in attendance. The key elements of this campaign have been:

- A widespread communications campaign to engage all staff in improving our safety performance under the banner of "Accident free Depends on Me";
- Improved processes for reporting of 'close call' events in an uncensored and non-judgemental way;

- Safety leadership training for all senior management levels;
- Engagement of safety representatives from across all company functions;
- A safety award scheme to acknowledge and promote best practice
- Widespread communication of period safety performance and action plans

1019 As part of this initiative we have also reviewed and strengthened our standard for Driver Development and Support (OPS-SMS-3.2) to provide enhanced advice, support and development of drivers. The standard provides for non-punitive actions that support drivers in developing their overall competence. The process to review this standard included engagement with drivers to capture their input and ensure that it would fully reflect best practice for the development and application of such a standard.

External Review of Management of SPAD events

1020 The RSC reviewed a snapshot of 5 recent SPAD events and suggested Iarnród Éireann's hazard ranking was potentially flawed. They requested a review of the 90 SPADS that have occurred since the hazard ranking system was implemented. An external expert carried out a review of signal passed at danger investigations from 2009 to 2015. The review has found that the management of SPAD events is substantially robust and the re ranking of the SPAD events matches closely with the results previously reported by Iarnród Éireann. The report identifies a number of opportunities for improvement to further strengthen Iarnród Éireann's use of SPAD risk ranking.

1021 The user manual for the risk ranking toll has been updated and training in the use of the tool is scheduled to take place on 22/03/2016 and is being facilitated by an external provider. A number of people from both the IM and RU Safety Departments are being trained in the risk ranking process.

Expected reduction in the number of SPADs due to Technical& Management Initiatives

1022 IÉ are pursuing continuous improvement in SPAD performance and has sought other initiatives to achieve a further step change in performance including the fitment of driver reminder appliances to all fleets by the end of 2015, further management initiatives focussing on human factor elements for drivers and signallers and the introduction of Train Protection Strategy. The management initiatives will focus on the enhancement of safety culture, development of human factor elements for drivers and signallers, further improvement in the management of SPAD events and continued benchmarking against best practice in SPAD prevention strategies. These initiatives are expected to reduce the incidents of SPADs significantly and the Figure 113 below estimates the reduction over the next five years.

Year	Reduction from Technical Initiatives - DRA	Reduction from Management Initiatives	Expected SPAD Reduction	Expected number of SPADs
Current *				11
2016	35%**	5%	40%	7
2017		5%	5%	7
2018		5%	5%	7
2019		5%	5%	7
2020		5%	5%	6
* Based on average number of SPADS over last 5 years				
** Based on IÉ SAS SPAD rate of 50% and reduction rate of 70% of SAS SPADS achieved in the UK following introduction of DRA				

Figure 113 – Reduction of SPADs due to DRA

Summary

1023 IÉ have stated that "IÉ has achieved a significant reduction in the number of SPADs on the Iarnród Éireann Network from 2003 to 2015. This reduction was realised through a range of management actions including the development of professional driving standards, driver recruitment and training, enhanced driver support and monitoring, increased driver engagement and learning from UK and European rail operators. IÉ are pursuing continuous improvement in SPAD performance and has sought other initiatives to achieve a further step change in performance including the fitment of driver reminder appliances to all fleets by the end of 2015 and further management initiatives focussing on human factor elements for drivers and signallers. A 35% improvement in the SPAD rate is anticipated with the adoption of the DRA and a further 5% improvement from new management initiatives. The Board has approved the company strategy for the introduction of a Train Protection System (TPS) and work is underway on this project, once the TPS has been implemented the SPAD risk will almost be eliminated."

Relevant actions taken or in progress by the RSC

Actions taken by the RSC

Actions taken in 2014

1024 In February 2014, the RSC undertook an audit of IÉ's SMS. The audit focused on the "Maintenance and Operation of the Traffic Control and Signalling System". In September 2014, the RSC received a copy of Irish Rail's investigation report , an OOR following a SPAD occurrence at Signal MW826 at Mallow Station, which occurred on the 16th May 2014. Having reviewing the OOR, the RSC commenced a PPI Inspection into the occurrence, this involved the review and examination of all IÉ's standards/procedures relating to SPAD risk ranking and interviewing key personnel involved in SPAD risk ranking. In December 2014, the RSC met with the Safety Compliance Manager and the Chief Traction Executive to discuss the SPAD risk ranking process and concerns with had with IÉ-RU's application of the process.

Actions taken in 2015

1025 In March 2015, the RSC met with SPAD experts from the RSSB to discuss the SPAD risk ranking process and concerns the RSC had with IÉ's calculation of same. The RSC met with the Head of Safety Infrastructure and the Procedures Manager – Infrastructure to advise them of the RSC's concerns with the IÉ-RU's application of the SPAD risk ranking process. In June 2015, the RSC completed their audit, focused on the "Maintenance and Operation of the Traffic Control and Signalling System". The RSC then wrote to the IÉ Chief Executive requesting that they undertake a critical review of the management of SPADs.

Actions taken in 2016

1026 In March 2016, an RSC Inspector attended SPAD Risk Ranking Training provided by UK Consultant AD Little Limited.

Ongoing Activities

1027 The RSC meet quarterly with the respective manager's responsible for internal audit and accident/incident investigation from IÉ-RU and IÉ-IM to discuss ongoing audits and accident/incident investigations. These activities include reviewing SPAD occurrences, associated investigations and relevant audits

1028 The RSC meet quarterly with the senior executives from IÉ-RU and IÉ-IM to discuss safety performance that includes reviewing SPAD occurrences

1029 The RSC produce an annual Railway Safety Performance Review that presents and discusses accident and incident trends. This includes the presentation and discussion of SPAD occurrences

1030 The Commission produce an annual report on its activities for the Minister for Transport, Tourism & Sport and make comment on accident/incident statistics and areas of concern.

Relevant actions taken or in progress by BBRI

1031 It is BBRI's intention to support the current in-house CMS and are currently developing a new element to the drivers assessing standard which will cover the seven areas pertaining to non-technical skills as follows:

- Situational awareness – Which will focus on attention to detail, overall awareness, maintaining concentration, retain information (during shift) and anticipation of risk;
- Conscientiousness – Which will include training on a systematic and thorough approach and checking positive attitude towards rules and procedures;
- Communications – Listening (people not stimuli), clarity, assertiveness, sharing information;
- Decision making – Effective decisions, timely decisions, diagnosing and solving problems;
- Cooperation and working with others – Considering others' needs, supporting others, Treating others with respect, dealing with conflict / aggressive behaviour;
- Workload Management – Multi-tasking and selective attention, prioritising, calm under pressure;
- Self-management – Motivation, confidence and initiative, maintain and develop skills and knowledge, prepared and organised.

PART 14 – Final Conclusions & Safety Recommendations

General description

1032 In accordance with the Railway Safety Act 2005 (Government of Ireland, 2005) and the European Railway Safety Directive (European Union, 2004) and Statutory Instrument No. 258 of 2014 European Union (Railway Safety) (Reporting and investigation of serious accidents, accidents and incidents) Regulations 2014, recommendations are addressed to the national safety authority, the RSC. The recommendation is directed to the party identified in each recommendation.

1033 Actions reported that address factors which otherwise would have resulted in a RAIU recommendation:

- The project to fit the IÉ fleet of diesel trains with the DRA was completed on 8th December 2015. The DRA will be fitted to Infrastructure maintenance vehicles in 2016;
- IÉ-RU have reviewed and enhanced their training and competency management systems in relation to non-technical skills, in particular related to the adoption of EPTs by drivers. They have developed a system whereby these non-technical skills can be assessed and this is now incorporated into the suite of training and competency management operations documents. IÉ-RU have also reviewed their current system of driver profiling to ensure that a driver's classification clearly illustrates the drivers' driving history;
- IÉ-RU reviewed and enhanced their management of drivers, post SPAD event;
- IÉ-RU have reviewed their current system for the monitoring of over-speeding so that if a driver is found to be overspeeding, that this is formally recorded as an area for development for the driver;
- IÉ have reviewed their operating procedure which deals with the Supporting of Staff following Fatalities on the Line. This has been developed in conjunction with driver's representatives. It also makes provision for support in relation to attendance at Coroners courts and provides training for District Traction Executives and District Managers in providing support;
- IÉ have reviewed train despatch procedures with a view to eliminating SAS and SOY SPADs, and issued a "Professional Dispatchers Handbook" outlining good practice in dispatching techniques.

New safety recommendations

Safety recommendations associated with engineering & infrastructure

1034 The majority of train protection on the IÉ network is through basic overrun protection. To date, approximately only half of the IÉ network is fitted with a form of enhanced overrun protection. The provision of enhanced overrun protection mitigates against drivers disregarding signal aspects warning of a signal at danger and against disregarding of signals at danger by a train starting from rest. This form of protection, would have provided additional train protection in all SPAD incidents identified in this report. The absence of enhanced overrun protection results in the safety of the trains being dependent on the actions of the drivers, and places an unrealistic reliance on drivers not to commit any errors.

1035 The absence of the provision of enhanced overrun protection on single lines with crossing loops is the highest risk in relation to SPAD events. The RAIU have identified seven incidents of SPADs on single lines with crossing loops between January 2012 and June 2015. One of these SPADs was the SPAD at Millstreet on the 8th December 2013, which allowed for two trains to approach the same station platform, and only coming to a stop 175 m apart on the instruction of the signalman; resulting in the high risk of a potential head-on collision of two trains. As a result, the RAIU make the following safety recommendation (All Category A SPADs; Millstreet, CF-01):

IÉ-IM must introduce an adequate train protection systems on all of the IÉ network for the protection of trains; this system should be robust and to an acceptable standard within Europe; and have the appropriate ATP and speed supervision functionality

1036 The RAIU have identified two SPAD incidents on the DART network, namely the SPADs at Signals CY33, Connolly, on the 11th September 2014 and SPAD at Signal DN201, Howth, 21st April 2015, whereby the drivers of the trains maintained the engagement of the running release on the approach to signals displaying red aspects, thus effectively ‘overriding’ the train protection function of the ATP. As a result the RAIU make the following safety recommendation:

IÉ-IM should review the functionality of the ATP’s running release to ensure that the train protection function in relation to passing a signal at danger is appropriately maintained where drivers are approaching signals displaying red aspects. If this is not feasible with the current equipment it should be included any new train protection system introduced on the network.

1037 The driver of the SPAD at Signal CY33 (Connolly) on the 11th September 2014, reported instances of abnormal downgrades at CY26 and CY33 as a result of SET issues, as a result, the RAIU make the following safety recommendation:

IÉ-IM should review the functionality of signals in the Connolly area so that the instances of abnormal downgrades are minimised.

Safety recommendations associated with human factors

1038 The RAIU have made a number of observations in relation to the occurrence of Category A SPADs, namely in relation to the prevalence of SPADs:

- In the afternoon/evening;
- At the start of driver’s shifts;
- For drivers with 3-5 years driving experience.

1039 As the RAIU could not determine any definite causes for these findings, the RAIU make the following safety recommendation:

IÉ-RU should commission an independent review, in terms of human factors, to determine why there is a prevalence for the occurrence of SPADs: at certain times of the day; at certain times of drivers shifts; and for drivers with three-five years driving experience.

Safety recommendation associated with driver management and the DD&SS

1040 The RAIU review of the incidents found that the drivers had been subject to varying treatment by IÉ as a result of the SPAD incidents. whereby, on the occurrence of a SPAD incident, some of the drivers have:

- Been removed from the driving grade for long periods, with no communications with management;
- Been subject to sanctions (in terms of hours and pay or removal from the driving grade);
- Been subjected to inquiry processes, which have been lengthy and involved the interviewing of drivers by up to eleven members of staff;
- Been accused of having the SPADs on purpose.

1041 The placement of drivers on a DD&SS was viewed to be a punitive measure; rather than its intended function as a method of redeveloping driving skills and supporting the drivers in returning to driving duties, after a SPAD event.

1042 It has also been noted, that other operational staff had not been relieved from duty similar to drivers, despite their actions being later found to be contributory to the incident (particularly in the case of SPADs during degraded train operations).

1043 The review of the IÉ investigation reports also indicates that the drivers actions are considered to be the immediate, contributory and underlying causes to the SPAD incident, despite, this not always being the case

1044 As a result of the above, the RAIU make the following safety recommendation:

IÉ RU should review the culture within the company so that actions taken after SPAD's supports learning within the driver grades should errors occur, and that the DD&SS is used for redeveloping competence in driving skills and supporting the drivers in returning to driving duties, after a SPAD event.

Safety recommendations associated with near miss SPAD events

1045 To date, only one near miss SPAD event has been reported within IÉ, despite a number of drivers indicating to the RAIU that they have been involved in near miss SPAD events.

1046 Drivers should be able to report near misses without the fear of sanctions, as a result, the RAIU make the following safety recommendation:

IÉ-RU should introduce a near miss reporting system, whereby, drivers may report near misses without the fear of sanctions being imposed.

1047 As the previous near miss reporting system, introduced into IÉ was unsuccessful, and given that near miss SPADs are occurring, and consequences of SPADs can be serious, the RAIU make the following safety recommendation:

IÉ-IM should identify high risk signals and, where the technology exists, introduce a mechanism to monitor the approach speed to these signals; to ensure that near misses are identified and managed

Safety recommendations in relation to Traffic Regulation

1048 In relation to the dearth of information provided in the Traffic Regulator's Manual specific to the management of trains during delays, the RAIU make the following safety recommendation (Millstreet, CF-06, UC-01):

IÉ-IM should review the Traffic Regulator's Manual with a view to introducing guidance for Traffic Regulator's in terms of the management of train delays and the switching of crossing points.

1049 The Traffic Regulator was unaware that he had reduced the overrun protection for the train approaching Millstreet Station through his planned sequence of movements. There appears to be no clear training programme for Traffic Regulators, in particular, there is no training related to the dynamic risk assessments of regulating trains; only mentoring by other Traffic Regulators is provided; as a result the RAIU make the following safety recommendation (Millstreet CF-06):

IÉ-IM should review their training and competency management for Traffic Regulators so that they have the appropriate skill set in terms of identifying potential risks associated with the regulating of trains

Safety recommendations related to SPADs during degraded train operations and safety critical communications

1050 The RAIU review of SPADs occurring during degraded train operations, found that the actions of some third parties were contributory to the incidents occurring in most SPAD events. The RAIU also found that there were several instances of poor communications between operational staff during degraded train operations, and as a result the RAIU make the following safety recommendations:

IÉ-RU and IÉ-IM should carry out a review of the interfaces between different operational staff (i.e. drivers, LCCOs, signalmen and EOs) so that all operational staff can adequately manage train operations during degraded situations. Part of this review should focus on the safety critical communications between operational staff.

1051 In some cases, there is no recording of communications between safety critical staff (e.g. between drivers and signalmen, such as the SPAD at SAOIB, Limerick (Limerick), 24th September 2014). As a result, the RAIU make the following safety recommendation:

IÉ-IM should identify all locations where safety critical communications are not recorded and develop a programme of works for the introduction of recording safety critical communications at these locations.

Safety recommendations related to the LCCOs

1052 In relation to the SPAD at Signal XX098, Gortavogher, on the 19th December 2013, the Signalman and LCCO allowed the train to enter a section where it was known that there were faults at the level crossings and with no EOs in attendance. As a result, the RAIU make the following safety recommendation (Gortavogher CF-07, CF-09, CF-10, UC-03, UC-04, RC-02):

IÉ-IM should review the procedures applicable to signalman, Level Crossing Keeper, LCCO and level crossing emergency operators with particular emphasis on the actions to be taken by each when a fault is detected at a level crossing. This review should consider circumstances where a train may already have entered the affected section of line, and circumstances where the signal may be missing or extinguished.

Safety recommendations related to the placement of speed boards

1053 The RAIU have found that the placement of speed boards near signals has been a contributory factor in three SPADs reviewed during this investigation, namely the SPADs at:

- Signal CE482, Glounthaune, on the 29th June 2014 – where the driver became distracted by the speed board after departing a station on a yellow aspect, and had a SOY SPAD;
- Signal XE061, Curravorrin Level Crossing, on the 2nd October 2012 – where the driver lost situational awareness as a result of the speed board, which was placed after a signal that was only capable of displaying a yellow aspect;
- Signal GL353, Athenry, on the 10th July 2013 – where the driver became distracted by a number of events, including the speed board, and had a SOY SPAD.

1054 The RAIU also found that the placement of speed boards may have been a contributory factor to the SPAD at Signal TL223, Millstreet, on the 8th December 2013; as a result, the RAIU make the following safety recommendation (Millstreet, UC-02)

IÉ-IM, should review their procedures for the placement of speed boards and brief relevant staff to be vigilant in the placement of lineside signage with respect to the potential for obscuring of signals or otherwise unintentionally providing distractions to drivers, especially in the case where there are fixed colour light signals or they have potential to cause SOY SPADs.

Safety recommendation related to the investigation of SPAD events

1055 A review of the internal IÉ investigation methods by the RAIU found that the current system of reporting (OOR) has not yet been formalised; there is a lack of consistency in relation to the terms used in the reports and that the reports appear to take a very long time to complete, as a result the RAIU make the following safety recommendation:

IÉ-IM & IÉ-RU should review the current system of reporting SPAD events so that reports are consistent and published within a set period of time.

Section 5

Part 15 – Additional Information

RAIU
Railway Accident Investigation Unit

PART 15 – Additional information

List of abbreviated IÉ standards & referenced

OPC-SMS-028	Iarnród Éireann (2013), Traffic Regulators' Manual, Version 1.1.
OPS-SMS-2.0	Iarnród Éireann (2013), Signals Passed at Danger & Other Serious Operational Incidents.
OPS-SMS-3.0	Iarnród Éireann (2013), Driver Training, Version 2.01.
OPS-SMS-2.4	Iarnród Éireann (2013), Accident Investigation.
OPS-SMS-3.1	Iarnród Éireann (2013), Competence Management Drivers, Issue 1.
OPS-SMS-3.2	Iarnród Éireann (2013), Driver Development & Support, Issue 1.
OPS-SMS-3.3	Iarnród Éireann (2013), Route Knowledge Drivers, Issue 1.
OPS-SMS-3.5	Iarnród Éireann (2013), Safety Briefing Train Drivers, Issue 1.
IM-SMS-007	Iarnród Éireann (2013), Reporting and Investigation of Accidents and Incidents.
RU-SMS-007	Iarnród Éireann (2013), Reporting and Investigation of Accidents and Incidents.

List of abbreviations

°C	Degrees Celsius
ADU	Aspect Display Unit
ALARP	As Low As Reasonably Practicable
AO	Additional Observations
ATP	Automatic Train Protection
BBRI	Balfour Beatty Rail Incorporated
CAP	Corrective Action Plan
CAWS	Continuous Automatic Warning System
CCTV	Closed Circuit Television
CF	Contributory Factor
CIRA	Confidential Reporting System
CMO	Chief Medical Officer
CMS	Competency Management System
CSM	Common Safety Methods
CTE	Chief Traction Executive
CTC	Central Traffic Control
DART	Dublin Area Rapid Transit
DD	Down Distant (Signal)
DD&SS	Driver Development & Support System
DM	District Manager
DMU	Diesel Multiple Unit
DRA	Driver Reminder Appliance
DS	Down Signal
DTE	District Traction Executive
PCECP	Personal Computer Emergency Control Panel
EO	Emergency Operator
EPT	Error Prevention Technique
ERA	European Railway Agency
FDA	Formal Driving Assessment
GDC	Guard Driver Communication
GLS	Galway Line Signalman
HRO	High Reliability Organisation
ICCN	Intercity and Commuter Network Department
IÉ	Iarnród Éireann
IÉHS	Iarnród Éireann Hybrid System
IM	Infrastructure Manager
INT	Interim Review

kg	Kilogram
km/h	Kilometres per hour
LCCC	Level Crossing Control Centre
LCCO	Level Crossing Control Operative
LRA	Low rail adhesion
MLS	Mayo Line Supervisor
m	Metre
MMI	Man Machine Interface
MP	Mile Post
MRT	Minimum Reading Time
mph	Miles per hour
No.	Number
NWRM	Network Wide Risk Model
OCM	Operations Control Manager
OOR	Operational Occurrence Report
OPC	Operations Performance & Control
OTDR	On Train Data Recorder
OTM	On Track Machine
OTMDO	On Track Machine Driver Operator
PIC	Person in Charge
PICOP	Person in Charge of Possession
PNB	Personal Needs Break
PSR	Permanent Speed Restriction
PQA	Post Qualifying Assessment
RAIU	Railway Accident Investigation Unit
RC	Root Cause
REB	Relocatable Equipment Building
RONBD	Radio On-board
RSSB	UK Rail Industry Body
RSC	Railway Safety Commission
RTC	Risk Triggered Commentary
RU	Railway Undertaking
SAS	Start Against Signal
SAOIB	Stop and Obtain Instructions
SBUD	Safety Briefing Update Days
SCC	Safety Critical Communications
SER	Safety Equipment Room
SET	Signalling, Electrical and Telecommunications
SGI	Train Signalling Regulations and General Instructions to Signalmen

SI Units	International System of Units
SLW	Single Line Working
SMS	Safety Management System
SOY	Start on Yellow
SPAD	Signal Passed at Danger
SRR	SPAD risk ranking
SRRT	SPAD Risk ranking Tool
SSI	Solid State Interlocker
SUM	Summary Assessments
TCB	Track Circuit Block
TPS	Train Protection Strategy
TPWS	Train Protection Warning System
TRV	Track Recording Vehicle
TSR	Temporary Speed Restriction
TTC	Travelling Ticket Checker
UC	Underlying Cause
UD	Up Distant
US	Up Signal
WSLP	Working of Single Line by Pilotman
WTT	Working Time Table

Glossary of terms

Accident	An unwanted or unintended sudden event or a specific chain of such events which have harmful consequences including collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others.
Action Required	Defined by the RSC as an area where potential exists for a non-compliance to occur unless remedial action is taken or improvement is made, an isolated error that requires correction, or some other action arising from the audit.
Approach released	A signalling control system that allows a signal to be released (to a proceed aspect) for an approaching train when it has been proved to have stopped at the signal or have slowed sufficiently to observe the correct speed over the level crossing.
Audit Trail	Defined by the RSC as an area that the auditor believes should have further attention, either by inclusion in the programme for future audits (but not necessarily an external audit item) or by some other means.
As low as reasonably practicable	IÉ's I-SIG-2062 defines ALARP as the reduction of likelihood and consequences of a SPAD to a level below which the costs and/or constraints of further mitigation measures outweigh their benefit.
Axle counter	A track mounted device that accurately counts passing axles.
Authorised movement	A movement made with the authority of the signalling system or of the signalman.
Bi-directional	A track on which trains may be worked in either direction under normal signalling arrangements
Category A SPAD	Any SPAD when a stop signal and any associated preceding cautionary indications was displayed correctly, in sufficient time for the train to stop safely at the signal;
Colour light signals	Signals that convey movement authority to train drivers by means of coloured lights.
Competence	IÉ-RU defines competence as the ability to perform activities to the standard expected within employment. In relation to drivers, it includes the practical and theoretical knowledge, experience and skill required to drive trains to ensure the safety of any person who may be affected.
Competence Management System	IÉ-RU defines a CMS as a documented system by which IÉ-RU ensures, as far as reasonably practicable, that its employees consistently achieve standards of competence required for their work.
Continuous welded rail	Sections of rail that are welded together.
Contributory factors	Factors relating to actions taken by persons involved or the condition of rolling stock or technical installations.

Controlling signalman	The signalman designated to control a specific section of track.
Crossing Loop	A track used to recess passenger trains allowing other trains to pass.
Defensive driving	A method of driving, using more effective braking and judgement skills to reduce incidences on the network.
Degraded Train Operations	Train not running under normal signals or signalling arrangements (including where there is: signal equipment failure/disconnection; Single Line Working; Examination of the line (passing a signal at danger); Movements to, from and within possessions; Track circuit failure; Level crossing failure; Failure of block signalling equipment).
Distraction	Divides attention, prevents concentration.
Double block	A method of working in absolute block territory where the forward section is required to be clear before a train cab be accepted from the signal cabin in rear. Double block areas (where the signal in rear is required to be clear before a train can be accepted).
Error Prevention Technique	A term used by IÉ in relation to techniques to be used by drivers to manage distraction, refocus their attention and become aware of their surroundings and situation.
European Rail Traffic Management System	European cab-based signalling and train control system that offers significant capacity and performance benefits, as well as further enhancing safety beyond the capability of legacy ATP systems.
Extensive damage	Damage that can be immediately assessed by the RAIU to cost at least €2,000,000 in total.
Flank	Points or track circuits not in the line of route but included in its controls to remove or reduce the consequences of a SPAD.
Flank points	Points set to divert an unauthorised movement away from an authorised route, subject to the overall risk of injury or loss due to collision or derailment being reduced by doing so. The line onto which the unauthorised movement is diverted should preferably be either a siding or used predominantly for trains in the same direction.
Flank track circuits	In the absence of suitable flank points, any track circuits located beyond the protecting signal(s) on a converging line may be proved clear in the controls of routes requiring overrun protection.
Formal Driving Assessment	Driver assessments to determine is newly qualified drivers can manage distraction from cab visitors; and can manage the duties associated with route conducting/training.
Good practice	Defined by the RSC as an area highlighted which, in the opinion of the Auditor,

	is good practice within the industry.
High Reliability Organisation	An organisation that operates in hazardous conditions, where the consequence of an error could be catastrophic.
IÉ Hybrid System	As train protection system currently being developed by IÉ.
Immediate cause	The situation, event or behaviour that directly results in the occurrence.
Incident	Any occurrence, other than an accident or serious accident, associated with the operation of trains and affecting the safety of operation.
Infrastructure Manager	Organisation that is responsible for the establishment and maintenance of railway infrastructure, including the management of infrastructure control and safety systems.
Local Control	Local control, in terms of level crossings, is where a crossing is being controlled from a panel at the crossing by an Emergency Operator.
Low rail adhesion	This occurs when there reduced adhesion (or co-efficient of friction) between the rail and the wheel as a result of environmental factors, such as leaf mulch on the rail head.
Major Non-Compliance	Defined by the RSC as an area of non-compliance with an IÉ internal standard, an applicable external standard, or legislation that is evidence of a system failure.
Minor Non-Compliance	Defined by the RSC as an area of non-compliance with IÉ internal standards, an applicable external standard, or legislation that is evidence of a sporadic lapse in implementation of a system or deviation from a system.
National safety authority	The national body entrusted with the tasks regarding railway safety in accordance with European directive 2004/49/EC.
Normal operations	Train running under normal signals at permissible speed.
Occupation of Track circuits	A train section with a train in it.
Overlap	The section of line beyond a stop signal that must be unoccupied and, where necessary, locked before and during a signalled running movement on the approach to a signal.
Planned personal contact	Informal meetings between a newly qualified driver to identify any issues, provide guidance and support, build up a working relationship and to enable the driver to have confidence in approaching their DTE with personal/welfare issues or any other areas of concern or uncertainty.
Railway Undertaking	Organisation that operates trains.
Repeater Signal	A signal on the approach to the main signal to provide advance warning of the aspect being displayed by the main signal.
Ready to Start Signal	A signal given by the PIC when the PIC has checked that all doors are properly closed and that the train is safe to start.

Reversible Working	Where trains are operating on a bi-directional line in the reverse to their normal operation.
Risk Ranking	A system for measuring the severity of Category A SPADs on a scale of 1 to 28, with 1 being the lowest risk and 28 being the highest risk.
Risk Triggered Commentary	RTC involves drivers speaking aloud what they usually just think to themselves, when driving. By following this process, drivers can listen to their thoughts and the subsequent actions they are planning to do – allowing them to "sense check" what they should do next. Ideally, RTC involves not just repeating what a driver sees, but also the required action they will need to take e.g. next signal is a caution signal – slow and be prepared to stop at next signal, if required.
Rolling stock	Railway vehicles.
Route indicator	An indicator associated with a signal that shows the driver which route is set, where there are more than one route available.
Safety Authorisation	Authorisation granted by the RSC confirming acceptance of the IM's SMS; and provisions adopted by the IM for IM assets and the safe running of trains; as set out in Irish and European legislation.
Safety Certificate	Certification granted by the RSC confirming acceptance of the RU's SMS; and provisions adopted by the RU for the safe running of trains; as set out in Irish and European legislation.
Sand drag	A form of trap point, where sand is heaped onto the rails of the trap points to stop a train.
SAS SPAD	A SPAD where a stationary train starts against a signal at danger. This may be at a platform starting signal, or at any other signal at which a train is stopped.
Scope For Improvement	Defined by the RSC as an area highlighted where, in the opinion of the Auditor, system or business improvement can be achieved by the company. Typically this is phrased as a recommendation, the merits and implementation of which should be decided by the audited organisation.
Semaphore signal	A mechanical signal controlled by levers at a groundframe through wires that run from the signal to the groundframe that displays an arm horizontal or at 45 degrees to horizontal to indicate if a train has permission to pass the signal or not.
Serious accident	Any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to 5 or more persons or extensive damage to rolling stock, the infrastructure or the environment, and any other similar accident with an obvious impact on railway safety regulation or the management of safety, where extensive damage means damage that can be immediately assessed by the RAIU to cost at least €2,000,000 in total.
Shunt	Moving trains to and from sidings.
Situation	The perception of elements in the environment, within a volume of time and

awareness	space, the comprehension of their meaning, and the projection of their status in the near future
Solid state Interlocking	A microprocessor based signalling system using two-out-of-three voting to perform train detection, interlocking and control functions.
SOY SPAD	A SPAD which occurs when a train starts away from a yellow signal, but then fails to stop at the next (danger) signal.
Speed restriction	A speed restriction imposed on a particular section of track, to guarantee the safe passage of trains.
Station Works Complete Signal	A signal given by the PIC when satisfied that boarding is complete and there are no hazards; and doors are ready for closing.
Stopblock	A device used to stop the progress of rail vehicles at the end of sidings or other dead ends.
Stop signal	A signal capable of displaying a stop aspect or indication.
Root cause	Causes related to framework conditions and application of the SMS.
Track circuit block	A signalling system that uses track circuits to confirm the absence of trains in order to control the movement of trains.
Traffic Regulator	Responsible for delivering a punctual train service.
Trap points	Facing points provided at an exit from a siding or converging line to derail an unauthorised movement and so protect the adjacent running line.
Underlying causes	Causes related to skills, procedures and maintenance.
Weekly circular	A document published weekly basis, providing information about engineering works, possessions requested, changes to services and speed restrictions.
Working Time Table	Lists all trains and relevant points with times.

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