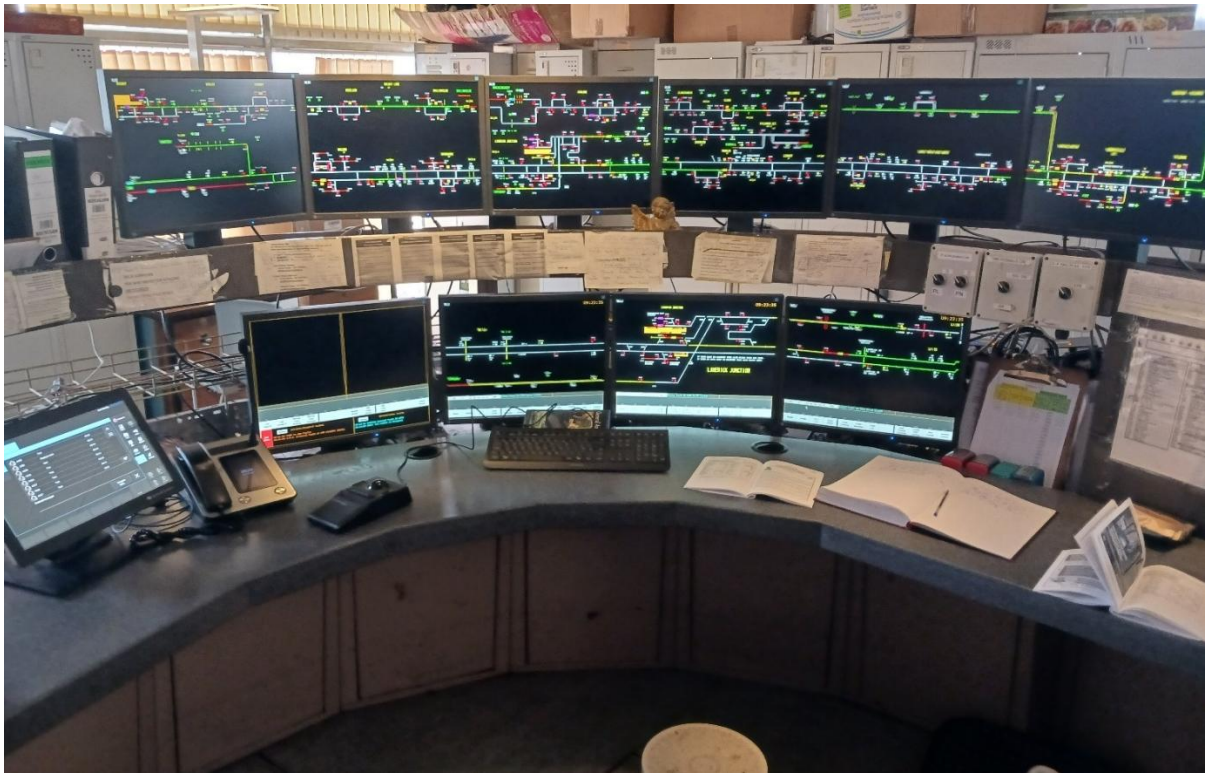
Railway Accident Investigation Unit Ireland



INVESTIGATION REPORT

Operational Irregularity between Ballybrophy and Lisduff, Co. Laois, 28th March 2024

RAIU Investigation Report No: 2026-R001

Issued: 11/03/2026

Report Description

Report publication

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This report is written to conform as closely as possible to the structure set out in the "Commission Implementation Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be followed for railway accident and incident investigation reports" having regard to "Directive (EU) 2016/798 of the European Parliament and of the Council of 11 May 2016 on railway safety".

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.

Further information

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Preface

The RAIU is an independent investigation unit within the Department of Transport which conducts investigations into accidents and incidents on the national railway network including the Dublin Area Rapid Transit (DART) network, the LUAS light rail system, heritage and industrial railways in Ireland. Investigations are carried out in accordance with the Railway Safety Directive (EU) 2016/798 enshrined in the European Union (Railway Safety) (Reporting and Investigation of Serious Accidents, Accidents and Incidents) Regulations 2020; and, where relevant, by the application of the Railway Safety (Reporting and Investigation of Serious Accidents, Accidents and Incidents Involving Certain Railways) Act 2020.

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 or tramline safety regulation or the management of safety.

On notification of an incident or accident, the RAIU make some early findings on safety issues that require immediate action, the RAIU may issue an Urgent Safety Advice Notice (USAN) outlining the associated safety recommendation(s); other issues may require a Safety Advice Notice (SAN). In some instances, after the issuance of an USAN/ SAN, further investigation report is not warranted.

The RAIU may investigate and report on accidents and incidents which under slightly different conditions might have led to a serious accident.

The RAIU may also carry out trend investigations where the occurrence is part of a group of related occurrences that may or may not have warranted an investigation as individual occurrences, but the apparent trend warrants investigation.

The RAIU investigation shall analyse the established facts and findings (i.e. performance of operators, rolling stock and/or technical installations) which caused the occurrence. The analyses shall then lead to the identification of the safety critical factors that caused or otherwise contributed to the occurrence, including facts identified as precursors. An accident or incident may be caused by *causal, contributing* and *systemic factors* which are equally important and should be considered during the RAIU investigation. From this, the RAIU may make 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.

Summary

Between 13:35 hours (hrs) and 13:40 hrs on the 28th March 2024, the Controlling Signalman and Communications Signalman for the Mainline Central Traffic Control (CTC) Workstation both signed on duty.

At approximately 13:45 hrs, a signalling fault occurred affecting Signal PL280 (near Portlaoise), also in the same Mainline CTC Workstation control area; this required trains to be authorised passed Signal PL280 at danger.

At 14:00 hrs, the 13:00 hrs Dublin Heuston to Cork passenger service (Train A214), travelling on the *Down line* between Ballybrophy and Lisduff, County Laois, activated a *hot axle box detector* (HABD); the Controlling Signalman and Communications Signalman heard the associated alarm.

The Controlling Signalman contacted the driver of Train A214 (Driver A214) via the train radio and instructed them to stop. Drivers are required to inspect their train on receipt of a HABD activation; to do this Driver A214 requested *signal protection* on the *Up* and Down line to allow safe examination of the train.

At 14:01 hrs, during this call, the Controlling Signalman looked at the Mainline CTC Workstation screen to see if signal protection could be granted and saw that the 12:25 hrs Cork Kent to Dublin Heuston passenger service (Train A215) was approaching on the Up line and advised Driver A214 that signal protection could not be given. The Controlling Signalman instructed Driver A214 to contact Mainline CTC once Train A215 had passed by Train A214. Driver A214 then left the main section of the driving cab to obtain a *Track Circuit Operating Device* (T-COD), a device that can be placed on the line to provide protection by operating *track circuits* i.e. simulates the presence of a train.

At 14:04 hrs, Driver A214 contacted Mainline CTC again with the Communications Signalman answering the call. Driver A214 questioned if Train A215 had already passed their train, Train A214, using the phrase “Did that train pass Lisduff yet? The one on the Up road?” (meaning the *Up line*).

During this call, the Controlling Signalman informed the Communications Signalman that the signal protection had been put in place (*reminder appliances* applied) on the last controlled *stop signals* behind Train A215, using the words “signal protection both roads there”. The Communications Signalman then granted signal protection to Driver A214, after incorrectly concluding that Train A215 had passed Train A214.

At 14:06 hrs, Driver A214 alighted from the driving cab and placed the T-COD on the Up line; as a direct consequence Train A215 received an *abnormal Continuous Automatic Warning System* (CAWS) *downgrade* on the train's in-cab display.

On receiving the abnormal CAWS downgrade Driver A215 initiated a brake application and stopped approximately thirty seconds later near to the 70 ¾ mile post (MP). Driver A215 then contacted Mainline CTC and reported the abnormal CAWS downgrade to the Communications Signalman; reporting that they could see a green aspect ahead (Signal CLX UD).

Believing that Train A215 had passed Train A214 and seeing the next signal on the display (Signal BYR489 (and not Signal CLX UD which is not displayed on the Mainline CTC Workstation)) was showing a proceed (in this case green) aspect, the Communications Signalman advised Driver A215 that the relevant signal ahead was showing a green aspect and that they had authority to proceed. Driver A215 then questioned this instruction as they could see Train A214 stopped ahead and a person on the Up line, asking if they may be someone checking their train and if they had placed a T-COD which could account for the CAWS downgrade.

The Communications Signalman then asked Driver A215 if they had passed the Down train (Train A214), to which Driver A215 confirmed that they had not.

At this point, it became apparent to the Communications and Controlling Signalman that Train A215 was on the same *signal section* which signal protection had been granted to Driver A214. The Communications Signalman then instructed Driver A215 that they were not to move and advised that they would call them back.

The incident was caused by the Communications Signalman on the Mainline CTC Workstation granting signal protection to Driver A214 without correctly establishing the location of Train A215.

The RAIU have identified the following causal factors (CaF) which resulted in the error:

- CaF-01 – The poor application of safety critical communications protocols between the Driver A214 and the Communications Signalman resulted in a failure to reach a clear understanding, over whether Train A215 had passed Train A214;
- CaF-02 – CTC Signalmen have interpreted the IÉ-IM Train Signalling Regulations and General Instructions (SGIs) for signal protection as permitting signal protection to be granted with a train still within the signal section, provided the train has passed the person/ location where protection is required;

- CaF-03 – During the process of granting signal protection to Driver A214 (using the interpretation outlined in CaF-02), both signalmen failed to see, or process, on the Mainline CTC Workstation display that Train A215 was still approaching Train A214's location.

The following contributory factors (CoF) were identified:

- CoF-01 – The poor application of safety critical communications protocols between the Controlling Signalman and Communications Signalman led to the Communications Signalman believing it was safe to grant signal protection (using the interpretation outlined in CaF-02), when the Controlling Signalman said that the reminder appliances for signal protection had been applied;
- CoF-02 – The location of Signal CLX UD and Signal CLX DD and their aspects are not shown on the Mainline CTC Workstation display, meaning the Communications Signalman and Driver A215 referenced the signal ahead being green, but both were in fact discussing different signals (i.e. Driver A215 was looking at Signal CLX UD and the Communications Signalman was looking at Signal BYR 489);
- CoF-03 – The Communications Signalman was distracted by the failure of signalling equipment at Portlaoise when arranging signal protection for Train A214.

The following systemic factors (SF) were identified:

- SF-01 – The text in SGI (Section 11) meant that the instructions could be misinterpreted, allowing for signal protection to be granted with a train still within the signal section, provided the train has passed the person/ location where signal protection was required;
- SF-02 – The IÉ Rule Book does not assign the role of lead responsibility for safety critical communications, to ensure protocols are used, communications are structured correctly and, above all, making sure a clear understanding is reached;
- SF-03 – The current simulator provision for IÉ signalmen does not permit the training or assessment of signalmen under realistic conditions due to its restricted capability;
- SF-04 – The system design of the CTC Mainline Workstation, with the double manning arrangement, increased the likelihood of operational error when dealing with Driver A214, as both Signalmen were involved in arranging the signal protection for Driver A214.

As a result of these factors, the RAIU also made the following safety recommendations:

- Safety Recommendation 2026001-01 – IÉ-IM and IÉ-RU should formally review the instructions, training and competency management of Safety Critical Communications to ensure clear responsibilities and a clear understanding is reached at all times, with specific emphasis on adopting the concept of lead responsibility;
- Safety Recommendation 2026001-02 – IÉ-IM should amend SGIs (Section 11) to clarify the conditions which must be met before granting signal protection with particular reference to the presence or absence of trains in the signal section;
- Safety Recommendation 2026001-03 – IÉ-IM should conduct a risk assessment of double manned signalling workstations to determine if there are any additional risks from having two persons operating the one workstation, with a view to identifying additional control measures to mitigate any identified risks;
- Safety Recommendation 2026001-04 – IÉ-IM should consider the inclusion in Mainline CTC training and briefing materials information on the holding track feature and the associated risk of overlooking a genuine track circuit occupation or fault.

Contents

RAIU Investigation and its context

Decision & motivation to investigate this occurrence

1 On the 28th March 2024, the RAIU on-call investigator received a notification of an operational irregularity between Lisduff and Ballybrophy on the Cork mainline.

2 The RAIU conducted a preliminary examination and the RAIU's Chief Investigator made the decision to conduct a full investigation into the incident, given its impact on railway safety (*Article 20* (2)(c) of Directive (EU) 2016/798, Article 20, Obligation to Investigate), as under slightly different circumstances the incident may have led to serious accident with the potential for a fatality or serious injuries, due to the risk of Driver A214 being struck by Train A215.

Scope & limits of investigation

3 The RAIU have established the scope and limits of the investigation as follows:

- Examine the processes and procedures around granting signal protection where personnel require to work on the line;
- Establish the sequence of events leading up to, during and after the incident;
- Identify any other precursors which led to the incident;
- Establish, where applicable, causal, contributing and systemic factors;
- Examine the training and competency of staff involved in the incident;
- Examine the work environment of the Mainline CTC.

Technical capabilities & investigation methods

4 The RAIU's Chief Investigator allocated RAIU Senior Investigators, trained in accident investigation, to conduct this investigation, as appropriate.

5 During the investigation, the RAIU collated evidence through the submission of Requests for Information (RFIs) to the IÉ-IM Safety Department, the IÉ-RU Safety Department and site visits. Related to this investigation, the RAIU collated and logged the following evidence:

- Reports and statements written by personnel involved in the incident;
- Forward-Facing Closed-Circuit Television (FFCCTV) from the cab of Train A215;
- Photographs taken of the Mainline CTC Workstation;

- Interviews undertaken with relevant parties;
- Safety critical communications recordings from the incident;
- Extracts from the *Train Register Book*;
- Signalling Scheme Plan for Lisduff and Ballybrophy *interlockings*;
- General Appendix – Section J In Cab Signalling; version 9.0, 15th November 2021;
- IÉ Rule Book – Issued on the 19/07/2021;
- Professional Signallers Handbook, Issue 2, 2022;
- Voice data recorder communications between the Mainline CTC Signalmen and Drivers A214 and Driver A215 and other staff present;
- Training and competency records;
- Training course materials;
- IÉ-IM General Appendix;
- IÉ-IM interlocking data logger records and replays;
- Signalling Scheme Plan – Lisduff & Ballybrophy Interlockings;
- IMO-SMS-030, CMS[1] Signallers, Level Crossing Controllers and Gatekeepers, Issue 1 2018;
- IMO-SMS-033 CMS Safety Critical Communications, Issue 2, issued 2018;
- I-TEL-3115 Calibration Procedure for Phoenix MB Type Hot Axle Box Detector, version 7.0, 2020;
- Operations SMS 3.1 Competence Management Drivers version 2.0, operative from 09/02/2024;
- RU-SMS-010 Safety Critical Communications (issue 1.02, 09/12/2022);
- Train Signalling Regulations and General Instructions to Signalmen (SGI) (Issue 2.1, 2021).

[1] Competency Management Systems (CMS) is the assessment framework for safety critical roles comprising of assessment criteria and the requirements for assessment.

6 In addition, research, instructions and guidance, from the United Kingdom (UK), was reviewed on railway safety critical Communications, the documents considered are as follows:

- Research carried out by the Railway Safety and Standards Board (RSSB)[2] for programme T1078 “Developing a safety critical communications training programme”;
- The Rail Industry Standard (RIS) RIS-8046-TOM, Spoken Safety Critical Communications, issue 2, published in 2019 by the RSSB.

Communications & evidence collection

7 Communications were conducted through established processes (such as RFIs).

8 Relevant stakeholders were issued the draft investigation report for comment; comments were reviewed and responses on their comments returned. In this instance the stakeholders were: IÉ-IM, IÉ-RU and the Commission for Railway Regulation (CRR)[3].

9 All relevant parties co-operated fully with the RAIU investigation; with no difficulties arising.

10 It should be noted that the internal IÉ-IM report was published beyond the required six months, on the 9th December 2025[4].

[2] RSSB is a not-for-profit company owned by major railway industry stakeholders. Their core purpose is to actively help the industry work together to drive improvements in Great Britian’s rail system.

[3] The CRR is the National Safety Authority (NSA) for the Republic of Ireland and is responsible for the regulatory oversight of the Safety Management System (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.

[4] Under the “Investigations by railway undertaking” section of the Railway Safety Act 2005, it states that a railway undertaking shall, in an expeditious manner, carry out an investigation and shall, as soon as practicable but in any event not later than six months after the date of the incident, prepare a report on its findings. Where the railway undertaking is of the opinion that the report cannot be completed in six months, the railway undertaking shall notify the CRR together with its reasons for reaching such opinion and shall provide an indication of the revised period for the completion of the report.

Description of the occurrence & background information

Description of the occurrence type

11 The incident involved an operational irregularity involving signal protection. In terms of categorisation, the EU Agency for Railways categorisation for this occurrence is an: Incident – Traffic Operations and Management (TOM).

Date, time and location of the occurrence

12 The incident occurred at approximately 14:00 hrs on the 28th March 2024 between Lisduff sidings and Ballybrophy Station in County Laois; the nearest townland is Errill. The location is approximately 70 miles and 880 yards (113.4 kilometres (km)) from Dublin Heuston on the Cork mainline, 2 miles (3.2 km) from Lisduff sidings (see Figure 1).

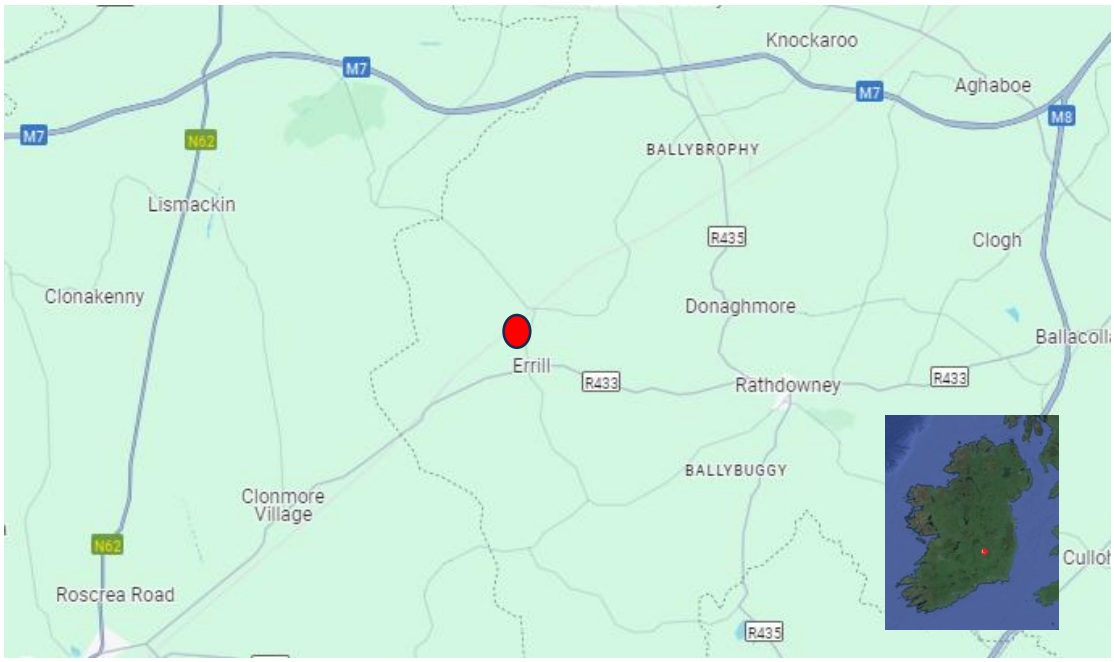

Figure 1 – Map of the location of the incident

Background to the occurrence

13 Immediately prior to the incident, trains were operating normally between Lisduff and Ballybrophy.

14 The weather at the time of the incident was dry and sunny; the weather was not contributory to the incident.

Deaths, injuries & material damage

15 There were no injuries or damage as a result of the incident.

Other consequences as a result of the incident

16 As a result of the incident, the cumulative delay to Trains A214 and A215 was fifty-two minutes.

Parties, roles and duties associated with the incident

Parties directly involved in the incident

IÉ-IM

17 IÉ–IM is the infrastructure manager who owns, maintains and operates the railway infrastructure in Ireland and operates under a Safety Authorisation certificate issued by the CRR. The IM Safety Authorisation is issued in conformity with Directive (EU) 2016/798, S.I. No 476 of 2020 and Commission Regulation (EU 2018/762). The authorisation was renewed on the 24th March 2022 for a period of five years.

18 The IÉ-IM department involved in the incident and relevant to this investigation is the IÉ-IM Operations Department – which operates the signalling system and monitors the operation of the network and provides the first level of response to incidents. The IÉ network is controlled from CTC in Dublin and several other local signalling control locations.

IÉ-RU

19 IÉ-RU is the railway undertaking who owns, maintains and operates mainline and suburban railway services in Ireland and operates under a safety certificate issued by the CRR. The RU Safety Certificate was renewed on 23rd March 2023 for a period of five years (valid at the time of incident). The IÉ-RU employed the drivers and maintained the rolling stock involved in the incident.

Roles directly and indirectly involved in the incident

20 The IÉ-IM roles directly involved in the incident are as follows:

- The Controlling Signalman – A CTC Mainline Signalman who operates the signalling controls on the workstation. First qualified in September 2022 and certified competent under IÉ-IM's competence management system;
- The Communications Signalman – A CTC Mainline Signalman who makes and receives telephone and radio calls, records items in the Train Register Book and assists the Controlling Signalman. First qualified as a signalman in January 2024 and certified competent under IÉ-IM's competence management system;
- Waterford and Tralee Line Signalman – The CTC Signalman operating the Waterford and Tralee Workstation, located immediately adjacent to the Mainline Workstation. This role combines the duties of the Controlling Signalman and Communications Signalman.
- Traffic Regulator – A role maintaining oversight of train service punctuality operations and service recovery.
- Duty Manager – A CTC management team member rostered on duty to manage CTC's activities and staffing issues including incident response.

21 The IÉ-RU roles directly involved in the incident are as follows:

- Driver A214 – Who is certified competent under IÉ-RU's competence management system and issued with a valid train driving licence and Complementary Certificate. Driver A214 had been qualified for over twenty years at the time of the incident;
- Driver A215 – Who is certified competent under IÉ-RU's competence management system and issued with a valid train driving licence and Complementary Certificate. Driver A215 had been qualified for approximately two years at the time of the incident.

Rolling stock

22 Train A214 and Train A215 were both operated by Class 201, seven Mk4 carriages and a *Control Car*.

23 The maximum permitted speed of the combined locomotive and coaching stock train formation is 100 mph mile per hour (mph) (160 kilometres per hour (km/h)).

Figure 2 – Class 201 Diesel Electric locomotive and Mk4 coaches

24 The Class 201 locomotive and Mk4 control cars are not equipped with automatic train protection but are fitted with CAWS.

25 CAWS works by repeating the aspects shown by the lineside colour light signals on an Aspect Display Unit (ADU) inside the driver's cab (see Figure 3). 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. CAWS is further discussed in paragraph 64.

Figure 3 – CAWS ADU

Infrastructure

General description of the railway infrastructure

26 The railway at this location consists of a double track line between Lisduff and Ballybrophy. Each line is signalled for movements in one direction.

27 The maximum permissible speed on the Up line where the incident occurred is 90 mph (145 km/h) for passenger trains and 50 mph (80 km/h) for freight trains.

28 The infrastructure and all passenger trains using it are also equipped with CAWS.

29 There is no train protection system installed on the Cork mainline.

Hot Axle Box Detectors

30 A HABD is installed near to the 68 ½ mile post (near Ballybrophy) on both the Up and Down lines.

31 There are thirty-two HABDs on the network spread over twenty-four locations, with some locations with multiple lines, having more than one[5].

32 In the three years prior to the incident there were no confirmed hot axle box or genuine bearing failures on the entire IÉ network detected by HABDs out of sixty-five activations occurring during normal operations.

[5] HABDs on the IÉ-IM network are supplemented by acoustic bearing monitoring equipment which can detect bearing failure at an earlier stage.

Signalling & Communications

General description of signals & communications

33 The line between Lisduff and Ballybrophy is fitted with *two aspect signals*. Trains are signalled under *Track Circuit Block* regulations and train detection is achieved by track circuits.

34 The means of communications between train drivers and signalmen is through train radio.

Relevant Signals

35 Two aspect *stops signals* can display either red or green (R/G). The *repeater* or *distant signals*, located before a stop signal in the direction of travel, display a yellow or green (Y/G) and give advance warning of the aspect of the stop signal. The colour light stop Signals LF485, LF486 and BY489 each have an associated two aspect repeater signal on approach (Signals LFR485, LFR486 and BYR489) which can display Y/G aspects (see Figure 4).

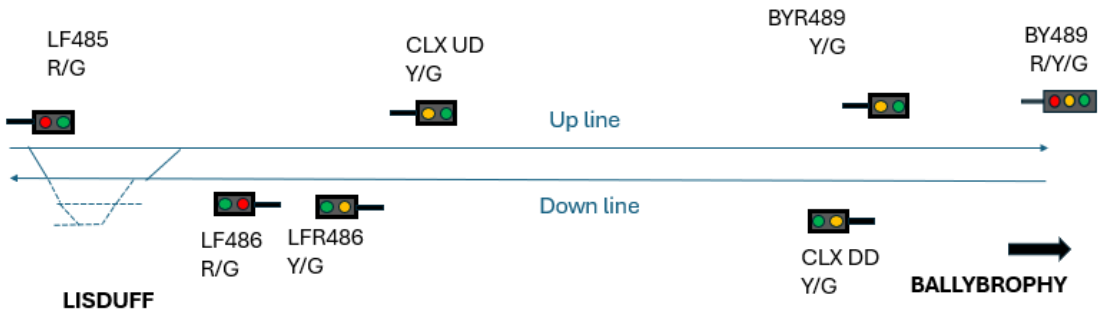

Figure 4 – Signalling layout (some Lisduff signals omitted for clarity)

36 In addition, there is another two-aspect repeater Y/G Signal (CLX UD and Signal CLX DD) signal before BYR489 and LFR486 *repeater signals* respectively, in each direction, (see Figure 4). These previously acted as distant signals for a now abolished level crossing at Coolowley and are effectively redundant; but were retained due to their integration into the CAWS circuitry[6].

[6] Signal CLX UD and Signal CLX DD are not shown on the Mainline CTC Workstation display. At other locations, white icons are used indicate signals which exist but are not controlled by the signalman at that location.

37 For Up direction movements, there is a long signal section of over six miles (9.6 km) between stop signal, Signal LF485, on approach to Lisduff and the next stop signal, Signal BY489, on approach to Ballybrophy Station (see Figure 4)[7]. For Down direction movements there is also a long signal section of over five miles (8 km) between stop signals BY488 and BY490 and the stop signal LF486 which protects Lisduff.

Mainline CTC Workstation

Control areas for Mainline CTC Workstation

38 The Mainline CTC Workstation control area extends between:

- West of Inchicore (Dublin) to the North of Cork on the Cork Mainline;
- Cherryville Junction to north of Athy on the Waterford Line;
- Portarlington to east of Ballinasloe on the Galway Line;
- Athlone to south of Knockcroghery on the Mayo Line;
- Limerick Junction to Tipperary on the Limerick / Waterford Line;
- Limerick Junction to southeast of Limerick on the Limerick Line and;
- Mallow to east of Banteer on the Tralee Line.

39 The control area comprises of fourteen remote interlockings, using both relay and computer-based logic.

[7] Signal LF487 on the exit to Lisduff Down Goods loop also permits movements onto the Up line in the Up direction. It was, however, not relevant to the train movements in this investigation and is omitted from the diagrams.

General description of the Mainline CTC Workstation

40 The complete control area for the Mainline CTC Workstation is displayed on the overview screens at the higher level (see Figure 5). At the lower level, the detail view screens display a more detailed view of part of the control area (see Figure 5), which is selected by the signalman when needing to carry out a specific task in that area. The detail view is magnified on the lower screens and has additional information such as point end numbers and track circuit numbers.

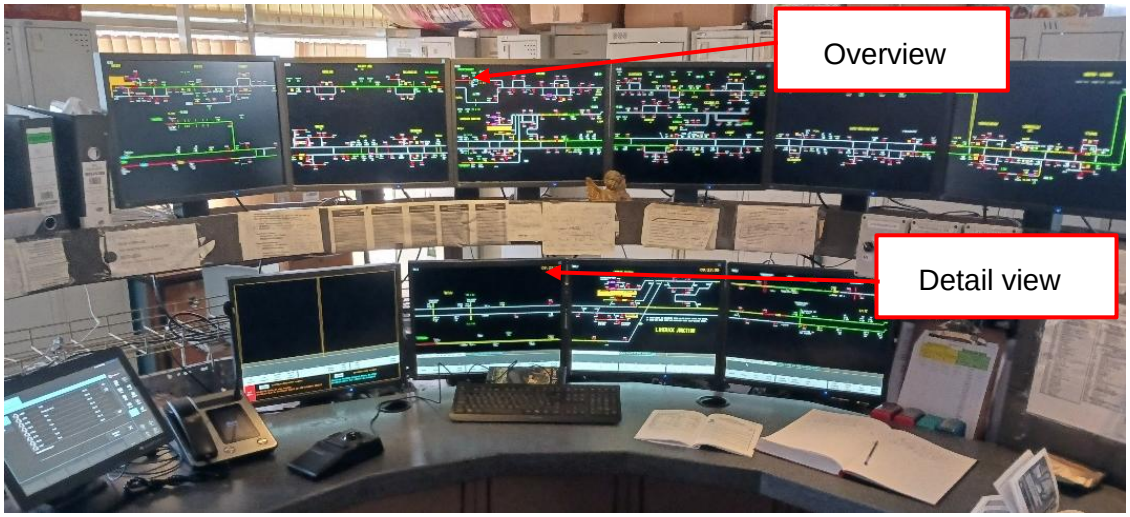

Figure 5 – Mainline CTC Workstation

41 To the right of the display screens is the HABD display screen (see Figure 6). If any of the HABDs are activated the relevant detector turns to red on the display and an audible alarm is sounded. The signalman must acknowledge the alarm to silence it and then apply the relevant operational rules (these operational roles are discussed in paragraphs 62 and 63).

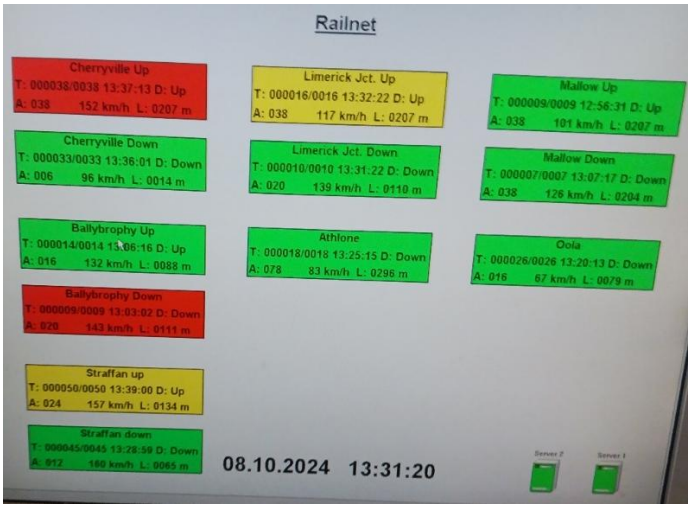

Figure 6 – HABD display screen

Signalman's Mainline CTC Workstation Display

General description

42 *Controlled signals* on the workstation display are shown as icons, with the icon colour replicating the signal aspect[8] (see Figure 7).

43 In terms of track sections, the location of trains on the workstation display are shown in red with the associated train ID e.g. A214 (see Figure 7). Where a route has been called ahead of a train to the next stop signal or beyond, this is shown as yellow or green on the workstation display dependent on the signal aspect, as shown in Figure 7. Track sections which are unoccupied are shown as white.

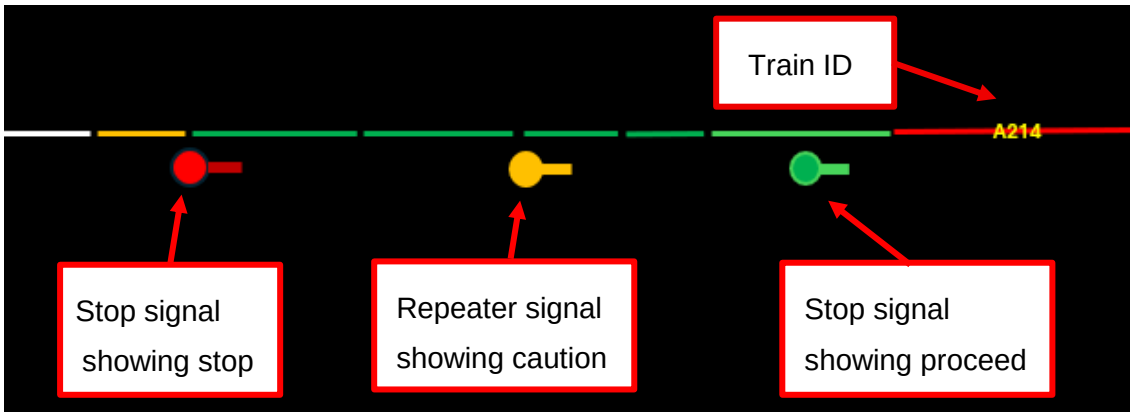

Figure 7 – Example of the workstation display showing a route set to a stop signal in a two-aspect area with a repeater or isolated distant signal.

44 The track sections shown on the workstation display are not drawn to scale; as a result, the duration of track section occupations can vary with: the length of the track section; the speed of trains; and, signal aspects being displayed to drivers. Signalmen are able to determine if trains are on time by selecting the train ID and view the working timetable timings on the workstation display; and, with experience, signalmen also become familiar with normal occupation time of track sections and therefore are able to gauge the approximate progress of trains.

[8] Signal icons that are displayed as white are not controlled by the signalman and normally are *automatic signals* or signals protecting level crossings (which are controlled locally or at level crossing control centres elsewhere).

45 In long track sections, where the distances between successive stop signals may be several kilometres, multiple track circuits may have to be combined together to provide detection through one track section[9]. To maintain the train detection principle, information from each track circuit is effectively transferred back to the first track circuit within the track section[10]. This allows the multiple track circuits, to act as one and be shown on the workstation display as only a one-track section.

The Holding Track Feature

46 When the signalling was upgraded with CAWS in the 1980s, additional track sections were created by dividing the existing track sections. These facilitate the ADU inside the driver's cab repeating the signal aspects (see paragraph 25). These upgrades resulted in a "holding track" features being introduced to the signalling system in some locations; in simple terms, the holding track feature displays that a track section is occupied, when it is in fact, unoccupied but an associated track section is occupied.

47 In terms of the Lisduff to Ballybrophy section, when CAWS was introduced, additional track sections were provided between Signal BYR489 and Signal BY489, to enable the repeating of these signals on the driver's ADU; these also improved the ability to determine more accurately the location of trains on the Mainline CTC Workstation.

48 When a train passes Signal LF485 and enters Track Section T381, Track Section T381 will be seen to be occupied (red), as normal. As the train enters into Track Sections T383, T385, T387, they will be seen to be occupied when the train is in the respective track sections (and unoccupied (white) as the train clears them), as normal. However, Track Section T381 continues to be seen as occupied (holding track feature[11]) as the train passes through these track sections. Track Section T381 can remain showing occupied, until the train clears Track Section T387[12].

[9] Track circuits were used between Ballybrophy and Lisduff for train detection, but at other locations axle counters are increasingly used, including for long sections.

[10] This allows some economies to be made in trackside cabling back to the interlocking.

[11] The operation of these indications reflects the original design of the interlocking where multiple track circuits were combined as a track section (paragraph 46).

[12] Track Section T387 is the *overlap* for Signal BY489.

49 Figure 8 illustrates this track holding feature (Track Section T381 is showing as occupied (red) while Track Sections T383, T385, T387 are showing unoccupied (white) for a situation where a train (A215) is in Track Section T389, after travelling from the direction of Lisduff.

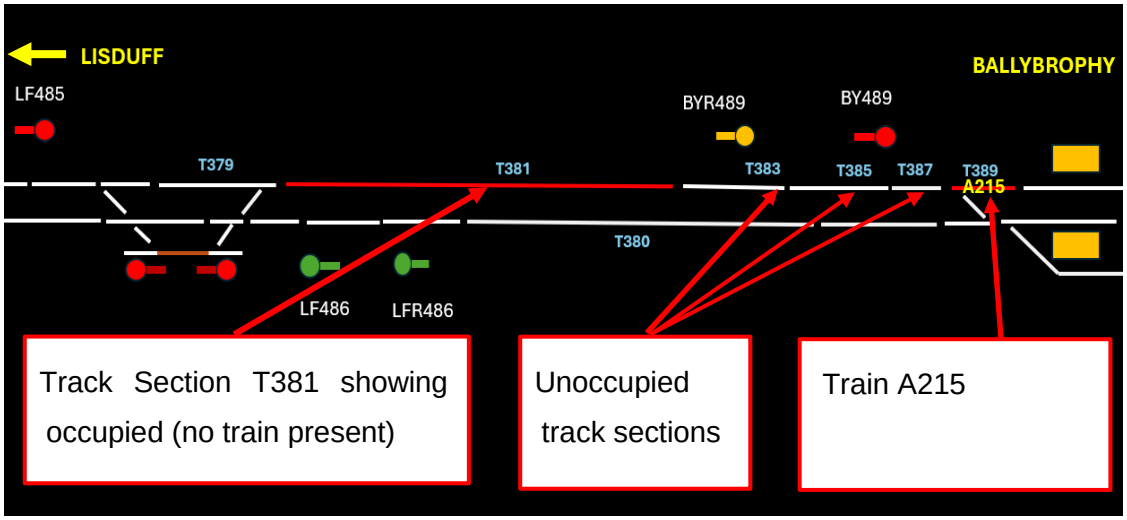

Figure 8 – The holding track feature

50 This means that Track Section T381 can show occupied for an extra ninety-five seconds or more after a train has passed clear of Track Section T381[13], making it show occupied for at least 270 seconds, in total, for each train[14].

[13] Calculated using track section occupation times extracted from a datalogger of a non-stop train passing through Track Sections T381 to T389.

[14] The extended occupation of track section behind a train creates a visual indication for a short period of time that would normally be consistent with a train detection fault, a T-COD being applied or a train having become divided.

Operations

Signalman rostering and resourcing

51 The Mainline CTC Workstation is normally double manned between 06:48 hrs and 22:00 hrs. The normal arrangement is for one signalman to be the Controlling Signalman and for the second signalman to be the Communications Signalman. The purpose of the double manning arrangement is to manage the workload on the workstation. The division of tasks is not defined or formalised in instructions; and as both signalmen are equally qualified it is normal practice to swap roles at the mid-point of the shift.

52 The Mainline CTC Workstation is co-located within the same room as the Waterford and Tralee Workstation which is normally single manned, as was the case at the time of the incident. The Traffic Regulator and Duty Manager are located elsewhere within the same building.

Operating Rules and Procedures

General description

53 The operation of the signalling system is subject to the rules and instructions in: The SGI; General Appendix and the IÉ Rule Book. These cover both ordinary signalling of trains and degraded working and emergency arrangements.

54 The Professional Signallers Handbook also applies to all signalmen and contains professional signalling techniques and competence and states that it is “designed to provide signallers with the knowledge and skills required to apply the highest standards of professionalism”. It also states that the instructions within the handbook amplify core rules and competence standards and must be considered mandatory.

55 The rules and procedures relevant to the incident for drivers are also contained in the IÉ Rule Book and in the General Appendix.

Rules and instructions on communications

56 Section A, IÉ Rule Book, Part 3.0 – Communications, contains instructions in relation to communications which apply to both signalmen and drivers. Clause 3.1, Basic Principles, states:

- Messages concerning safety must be properly understood by both parties, whether by radio, telephone or face to face;
- This includes all messages concerning train movements or safety of the line;
- You must ensure that:
  - you are speaking to the correct person;
  - that person understands correctly who and where you are;
  - your message is correctly understood before ending the conversation
- Take extra care if you are unfamiliar with the accent or dialect of the person to whom you are speaking.

57 Clause 3.2, What You Must Do When Using The Radio Or Telephone, contains instructions on how to deliver communications, stating that you must “speak with a natural rhythm, slightly more slowly but at the same volume as in normal conversation” and “divide the message into short phrases”.

58 Clause 3.3, What You Must Do To Ensure Your Message Is Properly Understood, contains the following instructions:

- First, say who you are and where you are;
- If you are a signalman, give the name of the signal box where you are located;
- If you are a driver, give the identity and location of your train;
- Give your radio call number or telephone number as appropriate;
- Check you are speaking to with the correct person at the right place;
- Give your message clearly, slowly and concisely;
- Do not use the phrase “not clear” when intending to say that a line is blocked;
- Ask the person receiving the message to repeat it to you;
- Do this at the end of the message, or as necessary during the message if it is complicated;
- Do not assume anything to have been understood until correctly repeated to you.

59 The IÉ Rule Book does not assign a responsibility to any role to lead in safety critical communications.

60 The Professional Signallers Handbook which is issued to only IÉ-IM signalling staff also contains Key Principle 4, Maintaining a Professional Approach and Taking the Lead (see extract in Figure 9), identifies the signalman as being a leading role for implementing operating procedures with “Lead the command of operating procedures” being one of the main points to be considered in asserting your position. It also states: “Being a good communicator: You will be expected by those who deal with you to take the lead on most occasions. This will include being assertive and in command of many situations you will face. Remember, you are the focus point of all railway operations in your area”.

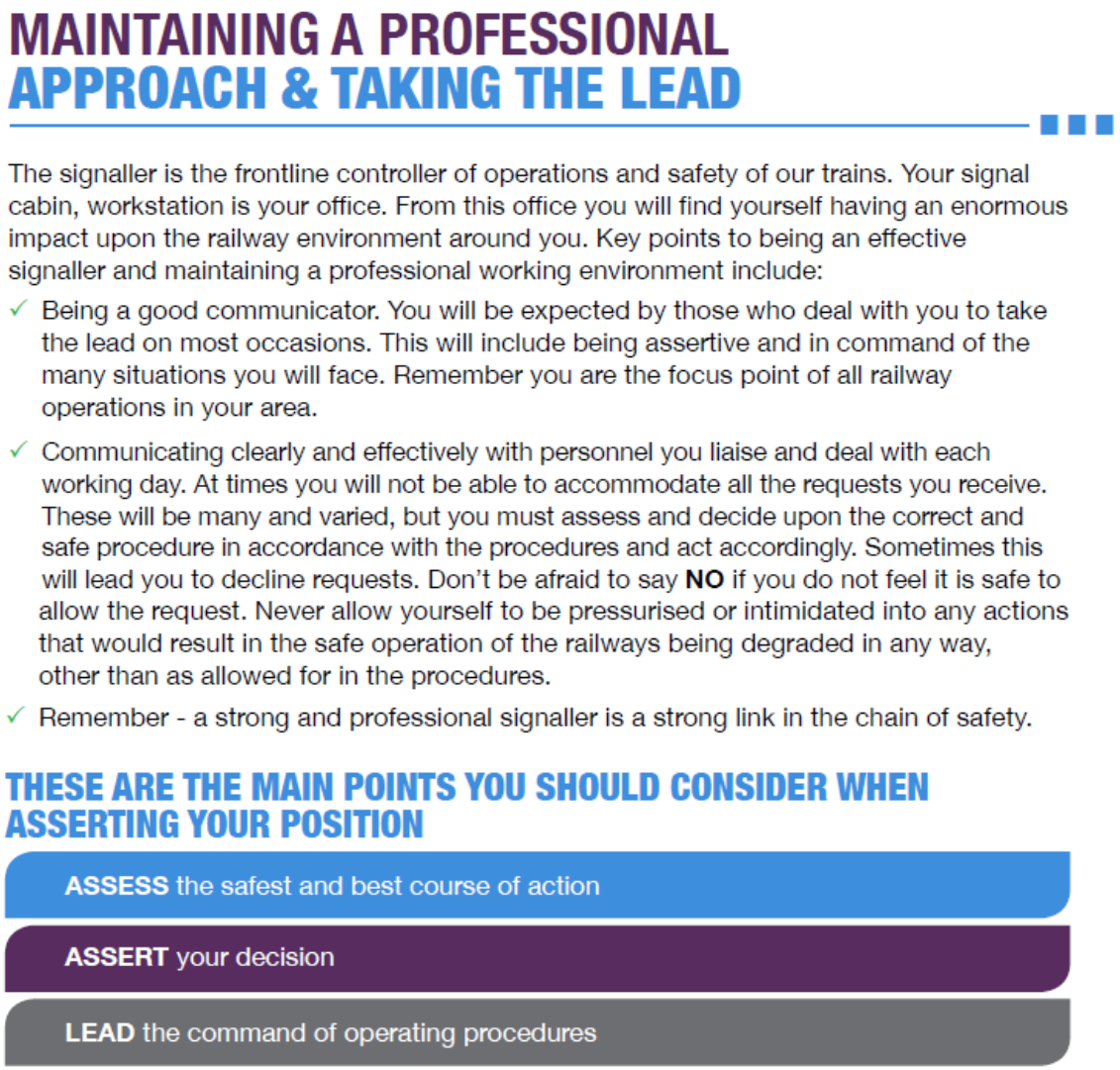

Figure 9 – Extract for the Professional Signallers Handbook

61 Safety critical communications are further discussed in paragraph 101 to 106 in relation to RSSB Communications research and training.

Instructions for a HABD activation

62 The signalman's immediate actions for a HABD activation are contained in IÉ-IM General Appendix (Part 3, Section 3); the relevant actions are as follows:

- You must immediately arrange for the train to be stopped;
- If possible, send the HOT BOX message to the driver of the circumstances and say what is required;
- Advise the driver of the circumstances and say what is required;
- Advise the driver the location of the suspected defective axle stating how many axles back from the front of the train;
- Advise the driver to examine the complete train, paying attention to the suspected axle where indicated;
- Make sure the driver fully understands these details;
- On a double or multi-track line provide signal protection in accordance with SGI, Section 11, Safety of Persons Working on Near the Line, before examination starts.

63 The driver instructions for an HABD activation are also contained in the General Appendix (Section B, Part 3, Section 3). These state that when a driver becomes aware that the train has a potential hot axlebox, the driver should bring the train to a controlled stop.

Actions to be taken for CAWS Downgrades

64 In the event of an abnormal CAWS downgrade, the IÉ General Appendix, Section J, In Cab Signalling (Section 4.3.1) states: "When an abnormal downgrade is received, you must bring the train to a stop immediately and then communicate with the signalman and carry out his instructions".

Instructions on arranging signal protection

65 For drivers, the IÉ Rule Book Section H, Clause 3.6.10, If you need to work on the outside of your train because of a failure or irregularity, requires that the driver arrange with the signalman for the passage of trains to be stopped on the adjacent line(s), if required, before starting work and then place a T-COD on the lines concerned to supplement the signal protection[15].

[15] The driver must tell the signalman when working may resume and remove the T-COD(s).

66 Section 11, Safety of Persons Working on Near the Line, of the SGI details the rules and process for arranging signal protection. These apply when work is to be done on the outside of a train stopped on a running line because of a failure or exceptional incident but the driver or guard considers that this cannot be done safely with trains running on the adjacent line(s). Section 11.2, instructions to be observed, requires the following:

- Ascertain the exact location of the work and the line(s);
- Make sure the necessary signal protection is provided (including where necessary, that to be provided by another signalman);
- Give an assurance to the person requesting protection that normal working will not be resumed until that person informs you it is safe to do so;
- Record details in the Train Register Book; this includes when signal protection is granted, which signals are used for protection and the time when normal working is resumed.

67 Signal protection for a section of line is reliant on one or more controlled signals being maintained at danger; a reminder appliance must be applied to prevent the signals being accidentally cleared. The instructions for the use of a reminder appliances are contained in the SGI, Section 6.2, When Reminder Appliances Must Be Used, includes using these on signals where the normal passage of trains is stopped.

Training, Assessment and Competency Management of Signalmen

Training Modules

68 Signalmen are trained internally by IÉ-IM. Training is divided into Module 1: induction and foundation training and Module 2: workplace practical experience and training. These are described in IMO-SMS-030, CMS Signallers, Level Crossing Controllers and Gatekeepers (to be referred to as IMO-SMS-030 for the remainder of this report).

69 Module 1 is delivered at Inchicore Training Centre by trainers who are currently or previously competent as signalmen. Training follows lessons plans which typically involve going through the IÉ Rule Book, SGIs, General Appendix and safety critical communications training materials (as discussed in paragraphs 53 to 67). The training materials do not reference the concept of signalmen leading communications as contained in the IÉ-IM Professional Signallers Handbook.

70 The Module 2 training is undertaken in the workplace in the 'live' environment with a mentor signalman both demonstrating and supervising the trainee. For each trainee signalman a 'CTC Signalman's Training Schedule' is completed with trainee's experiences during each week of workplace training. Trainees are permitted to carry out progressively more activity and more complex tasks over their training period.

71 The Module 2 training also uses a simulator for demonstrating and carrying out procedures. The training simulators replicates an *Emergency Control Panel* (ECP) which can be configured to represent one of several ECP control areas. These do not replicate the full control area of the Mainline CTC Workstation. Simple scenarios can be created for faults and degraded working but there is limited scope to add normal issues such as other faults and intervening for late running services and facilitating maintenance access requests into the same scenarios. There is no defined training schedule or plan which requires the use of simulator sessions within the Module 2 training.

72 The holding track function and the hazard of it masking other unusual occurrences is not included in the training materials, although signalmen and assessors are aware of the systems behaviour[16].

[16] The holding track function and the hazard of it masking other unusual occurrences is not included in the training materials, although signalmen and assessors are aware of the systems behaviour. The RAIU consider this to be an additional observation, AO-01 (paragraph 169), which warrants a safety recommendation, Safety Recommendation 2026001-04 (paragraph 182).

Assessment and Competency Management

73 During the Module 2 training period, the trainee signalman is assessed by multiple assessors before being finally qualified by a CTC Traffic Executive. Section 7.2 of IMO-SMS-030 states that the "trainee must be assessed on all the performance criteria and underpinning knowledge requirements relevant to the work and location the trainee will be required to perform when qualified".

74 The CMS for signalmen is defined in the document IMO-SMS-030. Newly qualified signalmen are placed on a Post Qualifying Assessment (PQA) cycle lasting one year with a minimum of four assessment events and a summary assessment.

75 Experienced signalmen are assessed over a longer two-year cycle with four workplace assessments at six monthly intervals, an interim progress assessment at eleven/ twelve months and a summary assessment at the end.

76 For assessment purposes, the technical tasks performed by a signalman are divided into seven units, with an additional unit to assess non-technical skills. Each unit has performance criteria and accompanying knowledge criteria contained in the IÉ-IM Professional Signallers Handbook (paragraph 60). Included in the seven units are: Responding and Dealing with Non-Routine Degraded Working (Element 3.2 – Safety of Personnel); and Communication (Elements 7.1 and 7.2). Non-Technical Skills are also assessed in parallel.

77 Safety critical communications is assessed separately, outlined in paragraph 80.

Safety Critical Communications

78 With specific reference to safety critical communications, one day of Module 1 is dedicated to the principles of safety critical communications, but with safety critical communications recurring throughout the course.

79 As part of the training programme, signalmen also receive the advanced safety critical communications course. This one-day course aims to give attendees further understanding of safety critical communications and how communications are graded and assessed. The course includes practical examples which trainees review and critique.

80 Safety critical communications are also assessed separately in accordance with IMO-SMS-033, Safety Critical Communications. This requires that all CTC Signalmen to be assessed three times per annum with a random download of a recorded call, with each candidate graded against scoring criteria; for each criteria they are weighted marks assigned.

81 The scoring criteria are:

- Each person identifies who they are and where they are;
- The message is given accurately;
- The call is kept brief;
- The call is clear with correct rhythm and speed;
- A repeat back of key information is given or requested;
- The phonetic alphabet is used where necessary;
- Correct use of prescribed phrases.

82 There is no scoring criteria assigned to signalmen taking the lead in communications as referenced in the IÉ-IM Professional Signallers Handbook (paragraph 60).

83 A score is generated for the caller and the call receiver which translates to a score between A and E which reflects the risk of an error being made from the communication, 'A' being As Low as Reasonably Practical (ALARP) and 'E' being very high risk of error. Immediate feedback is required to be given on the calls graded 'D' (high risk of error) or 'E' (very high risk of error) and corrective action taken.

84 The main voice communications are outlined in paragraphs 113 and 122, with their associated scores outlined in footnotes 18 and 20, respectively.

The Training and Assessment of the Controlling and Communications Signalmen

Controlling Signalman

85 The Controlling Signalman had qualified in September 2022 and since that point had been assessed in compliance with IMS-SMS-030.

Communications Signalman

86 The Communications Signalman had started Signalman training in July 2023, with Module 1 classroom training lasting until late September 2023. Module 2 practical training then began on the Mainline CTC and Waterford and Tralee Workstations. During the first week of the Module 2 training the Communications Signalman completed the one-day advanced safety critical communications course. During the Module 2, training records showed that the Communications Signalman had carried out signal protection on multiple occasions and experienced abnormal CAWS downgrades.

87 Between the 16th January and 26th January 2024, the Communications Signalman was assessed as part of the qualifying process; during the assessment undertaken on the 26th January 2024, the granting of signal protection was observed.

88 The Communications Signalman was qualified on the 26th January 2024.

89 After qualifying, the newly qualified Communications Signalman was placed onto a PQA competency cycle. PQA Signalmen have an enhanced assessment cycle giving a higher frequency of assessments in the first year. A formal workplace assessment was undertaken on the 19th February 2024, as required by IMO-SMS-030 which requires an assessment to be undertaken within the first month of qualifying.

90 A safety critical communications assessment was also undertaken on the Communications Signalman on the 19th February 2024, in compliance with IMO-SMS-033. This was graded as ‘B’ with feedback recorded on use of the phonetic alphabet for train IDs.

Training and Assessment of the Drivers

Training and Competency Assessment

91 Train drivers are trained internally by IÉ, with initial classroom training on rules and regulations taking place at its Inchicore Training Centre. The initial driver training programme follows session plans which provide an outline of the content and training objectives includes safety critical communications, covering communications principles and protocols in week four of the course. The training follows session plans which provide an outline of the content and training objectives and define the training materials to be used.

92 One of the session plans includes a review of the rules in Section A, 3.0, Communications, of the IÉ Rule Book; this includes a presentation on communications protocols and train driver simulators to practice safety critical communications and practice the use of the train radio equipment. The session also includes abnormal CAWS downgrades. The supporting presentation materials cover voice protocols such as commencing calls correctly, speaking slowly, repeating back messages and reaching a clear understanding.

93 Experienced train drivers are assessed on a continuous assessment cycle as defined in Ops SMS 3.1 Competence of Drivers, with multiple assessments over the two-year cycle as detailed in the Assessment Tracker (Ops SMS 3.1 Form E). The assessment criteria to be assessed against are detailed in Ops SMS 3.1 Assessment Form F completed by Assessors.

94 The assessment of communications is included by unit 5.1, Communicate safety related information by the use of in-cab and lineside equipment, there is no identified requirement in Ops SMS 3.1 to assess a hot axlebox or for obtaining signal protection through simulation or direct observation. Knowledge questions are included in the Drivers Summary Assessment Rules and Regulations Exam paper that forms part of the Summary Assessment at the conclusion of the cycle.

95 RU-SMS-010, Safety Critical Communications, is also applied to drivers and is aligned with the assessment events in Form E of Ops SMS 3.1. This document specifies the criteria against which communications are assessed and the format in which these are recorded. This document also corresponds to IMO-SMS-033 to permit a consistent scoring approach when scoring communications between IÉ-RU and IÉ-IM staff.

96 As safety critical communication monitoring assessments use actual communications as opposed to simulated scenarios, the calls graded can vary in content and complexity depending on what each driver has encountered and if the call can be located.

Training and Assessment of the Drivers

97 Both drivers involved in the incident had been assessed on the required by Ops SMS 3.1 for a PQA driver (Driver A215) and an experienced driver (Driver A214).

98 Driver A214, having been trained in the year 2000, had not received the same initial training on safety critical communications as Driver A215, but did receive an update training course on safety critical communications delivered on the 27th July 2010.

99 Driver A214 had been graded on safety critical communications on the following occasions in the last two years: 28th February 2023; 13th July 2023; 1st February 2024. On each occasion the driver scored grade A (ALARP risk of error) with no items for improvement noted.

100 Driver A215 was also last assessed on safety critical communications on the 1st February 2024.

RSSB Research and Requirements on Lead Responsibility

101 Lead responsibility is a concept used in Great Britain railway organisations where one party /role is defined as being in charge of the communication and has been defined in the RSSB rule book for over twenty years in module G1.

102 In 2016, RSSB carried out research project T1078 to expand, update and improve on the training materials on safety critical communications for the rail industry in Great Britain. This project produced a report, a set of requirements in standard (re-issued in 2019 as RIS-8046-TOM), a training package and a manual.

103 The project incorporated the importance of structuring messages in module three of the training so that actions being communicated or agreed are "remembered more easily" and that "Good safety critical communications have a four-part structure: Opening; Information; Actions; Confirmation". The principle of separating information from actions is also stated, with information coming first for context. Confirmation is achieved through repeating back information.

104 T1078 identified that whilst who has lead responsibility was well understood, better training was required on leading communications. Lead responsibility is defined in the T1078 Safety Critical Communications Manual as "This means making sure protocols are used; Making sure the communication is structured correctly; and, above all, making sure a clear understanding is reached".

105 In the RSSB Rule Book, Module G1, the signalman has lead responsibility over all other roles (including drivers) except electrical control room operators. If it is not clear who has lead responsibility, such as if two persons carrying out the same task are communicating with each other, the person who starts the conversation must always take lead responsibility.

106 The lead responsibility concept is intended to improve a clear understanding by giving a clear authority to lead the communication and challenge the other party if required regardless of seniority level or experience. This goes over and above a personal responsibility to use safety critical communications protocols[17].

[17] The Professional Signallers Handbook, Key Principle 4, Maintaining a Professional Approach and Taking the Lead, identifies the signalman as being a leading role for implementing operating procedures; however, this is not contained in the IÉ Rule Book and does not appear to be formally adopted.

Events before, during and after the incident

Events before the incident

107 Between 13:35 hrs and 13:40 hrs on the 28th March 2024, the Controlling Signalman and Communications Signalman both signed on duty at the Mainline CTC Workstation.

108 During the next twenty minutes both Signalmen undertook several tasks. A signalling fault then occurred at Signal PL280 at Portlaoise. This fault continued during the period of the incident and both Signalmen were aware that this could cause a delay to Train A215.

109 Both Signalmen were also engaged in routine activities facilitating signal protection for Signalling, Electrification and Telecommunications (SET) department staff; and, liaised with other staff over an On Track Machine about to undertake a transit move.

110 At 13:59:18 hrs Train A214 passed Ballybrophy Station in the Down direction and entered the five-mile signal section to Lisduff Sidings (see Figure 10), occupying Track Section T380. At 13:59:26 hrs the auto-route called the route beyond Signal LF486, and it cleared to a proceed aspect.

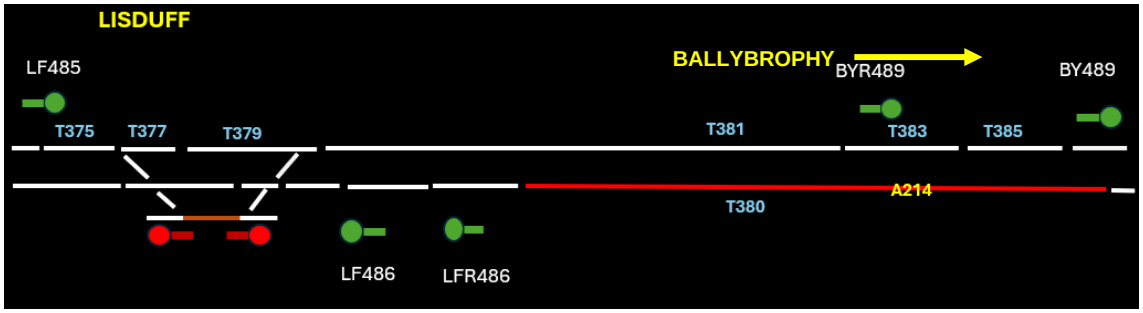

Figure 10 – Track section occupations at 13:59:18 hrs

111 At 14:00:03 hrs the Communications Signalman received a call lasting fourteen seconds from a shunter at Kildare seeking signal protection to uncouple a freight train; the signal protection was granted immediately.

Events during the incident

112 At 14:00:21 hrs, the HABD activated and sent an alarm to the Mainline CTC Workstation.

113 At 14:00:45 hrs the Controlling Signalman contacted Driver A214 and instructed the train to stop in accordance with the instructions for a HABD alarm (paragraph 62). During the call Driver A214 requested signal protection for the Up line which was declined by the Controlling Signalman as Train A215 was approaching Lisduff (see Figure 10). The call lasting forty-two seconds is transcribed below:

> Driver A214: Hello there, Driver of alpha two-one-four, the 1300 Cork to Heuston… I mean Heuston to Cork.
>
> Controlling Signalman: This is the Mainline Signalman CTC. Driver, you have just gone through Ballybrophy hot box detector, and you have set off the alarm.
>
> Driver A214: (Repeats)… I've set off the alarm...
>
> Controlling Signalman: Just give us one second…
>
> Driver A214: No bother.
>
> [Controlling Signalman and Communications Signalman converse in background]
>
> Driver A214: I remember you saying to stop there, can I get a signal protection… I'll have to check it there.
>
> Controlling Signalman: Yes… [Driver A214 interrupts]
>
> Driver A214: Can I have signal protection there please?
>
> Controlling Signalman: Yes, you have signal protection there on the Down road only in Ballybrophy at the time of one-four-zero-one and just to let you know the Up train is coming through Lisduff there…
>
> Driver A214: Coming through Lisduff, okay. I'll wait until he passes me there…
>
> Controlling Signalman: Yeah. No problem. Just wait until he's past you then give us a ring, and I'll give signal protection on both roads alright?
>
> Driver A214: Okay, no problem then, alright.
>
> Controlling Signalman: Cheers Driver, goodbye[18].

[18] In this call between the Controlling Signalman and Driver A214, both were graded an A (ALARP) against the scoring criteria in IMO-SMS-033 / RU-SMS-010.

114 Driver A214 then left the main section of the driving cab to remove the T-COD from its storage position in the internal walkway of the locomotive in preparation for placing it on the Up line. Whilst carrying out this task, Driver A214 would not have had a view of the Up line; Driver A214 estimated this took approximately thirty seconds.

115 At 14:02:02 hrs a member of SET staff calls Mainline CTC and speaks to the Controlling Signalman regarding attending site for the fault in Portlaoise; the call lasted twenty-six seconds.

116 At 14:02:18 hrs the Communications Signalman reported that the HABD display screen was showing a fault status for the Ballybrophy Down HABD.

117 At 14:02:41 hrs the Communications Signalman contacted the Traffic Regulator to inform them of the HABD activation.

118 At 14:02:47 hrs the shunter at Kildare contacted Mainline CTC and the call was answered by the Controlling Signalman. The Shunter advised that uncoupling was finished and protection was no longer required. The signal protection at Kildare was cancelled. The call last seventeen seconds.

119 At 14:02:58 hrs the Communications Signalman contacts the CTC Traffic Executive and advises them they have had a HABD alarm. The CTC Traffic Executive confirmed with Communications Signalman in the call that it was a train that activated the HABD and that it was being stopped for examination.

120 At 14:04:50 hrs Train A215 passed Signal LF485 at Lisduff and entered the signal section between Lisduff and Ballybrophy Station in the Up direction. Signal LF485 is the last stop signal on the Up line between Lisduff and Ballybrophy; Figure 11 shows Train A215 approaching Lisduff crossovers.

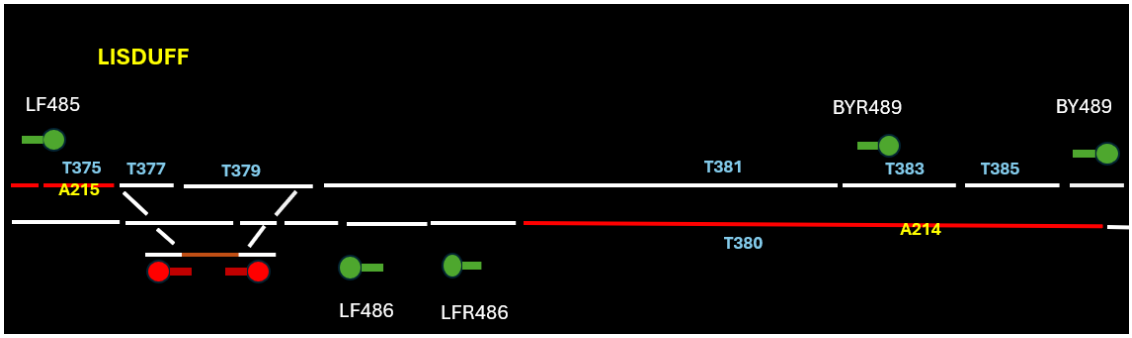

Figure 11 – Track Section occupations at 14:04:50 hrs

121 After retrieving the T-COD, Driver A214 was aware four minutes had now passed and began to question whether the approaching train mentioned by the Controlling Signalman had already passed Train A214, or if they had misunderstood the message.

122 At 14:04:50 hrs, Driver A214 contacted Mainline CTC; the call was answered by the Communications Signalman, although Driver A214 was unaware at the time they were now speaking to a different signalman (i.e. the previous call had been with the Controlling Signalman). The call lasts thirty-seven seconds and is transcribed below:

> Communications Signalman: Mainline Signalman CTC. Pass your message.
>
> Driver A214: Hello, Driver Heuston, Cork thirteen hundred alpha two-one-four… did that train pass Lisduff yet here? The one on the Up road?
>
> Communications Signalman: The train passed Lisduff, yeah?
>
> Driver A214: Yeah. Could I get the protection both roads please to carry out… er... hot box detector for the Down train 1300?
>
> Communications Signalman: So, the up train has passed you there at Lisduff yeah?... [pause] … bear with us there now…
>
> [In the background the Controlling Signalman says to the Communications Signalman: "Signal protection both roads there"[19]].
>
> Communications Signalman: Signal protection both roads there at...
>
> Driver A214: [Driver A214 interrupts the Communications Signalman] inaudible content spoken at speed] … That's no bother, I'll get back to you as soon as, thank you[20].

[19] During the call, the datalogger shows that at 14:05:18 hrs the Controlling Signalman placed a reminder appliance on Signal LF485 (the signal immediately before Lisduff in the Up direction) and immediately afterwards said to the Communications Signalman "signal protection both roads there".

[20] This safety critical communication between the Communications Signalman and Driver A214 was scored as 'D' (high risk of error) for both parties. The call was marked down for the inaccurate messaging, the message not being clear, no repeating back and incorrect use of prescribed phrases.

123 Train A215 was on Track Section T379 when signal protection was granted. The position of the Trains A214 and A215 is shown in Figure 12.

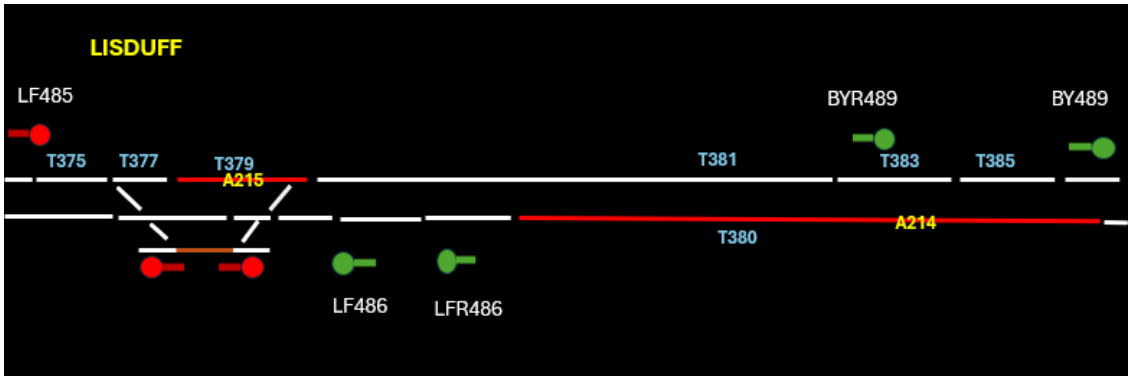

Figure 12 – Track Section occupations at 14:05:18 hrs

124 At 14:05:21 hrs, while Driver A214 was still in contact with the Communications Signalman, Train A215 passed onto Track Section T381 beyond the crossover at the north end of Lisduff as shown in Figure 13. This occurred within three seconds of the Communications Signalman granting signal protection (allowing for a delay in data processing and transmission time). Track Section T379 remained occupied for a further fifteen seconds until 14:05:36 hrs (after the call concluded) as the rear of Train A215 passed clear of it.

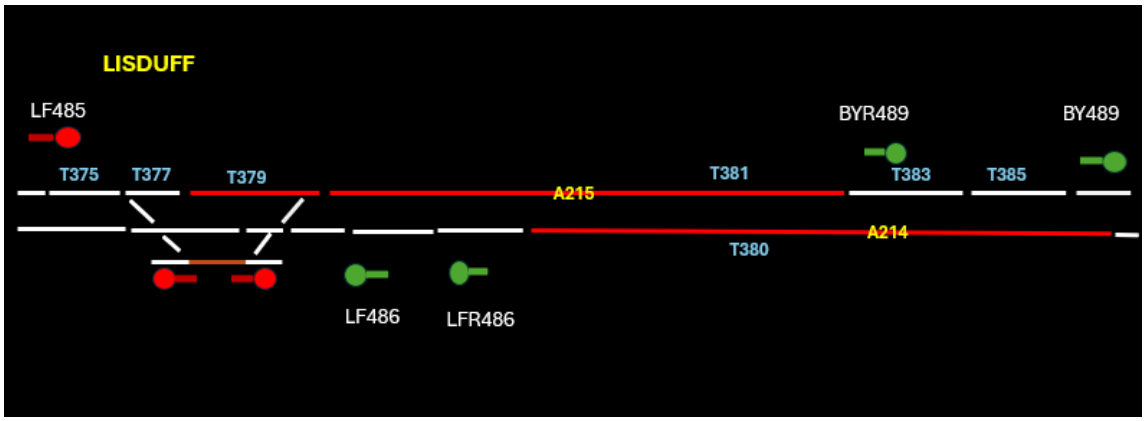

Figure 13 – Track Section occupations at 14:05:21 hrs after signal protection granted

125 At 14:05:32 hrs a Person In Charge of SET works between Limerick Junction and Charleville called Mainline CTC to give up signal protection. The Communications Signalman answered the call which lasted twenty seconds.

126 At 14:05:59 hrs the Communications Signalman answered a call from the Limerick Signalman lasting thirty-five seconds regarding an axle counter re-set.

127 At 14:06 hrs Driver A214 exited the cab and places a T-COD onto the Up line, which occupied one of five track circuits of Track Section T381. This resulted in an immediate abnormal CAWS downgrade on Train A215.

128 The Mainline CTC Workstation display remained unchanged by Driver A214's actions as Train A215 had already occupied another track circuit in Track Section T381. Train A215 was travelling at approximately 80 mph (129 km/h) at the time.

129 On receipt of the abnormal CAWS downgrade Driver A215 made a brake application and came to a stop. This location was approximately ¼ mile (402 m) from the front end of Train A214 and in sight of CLX UD signal (see Figure 14).

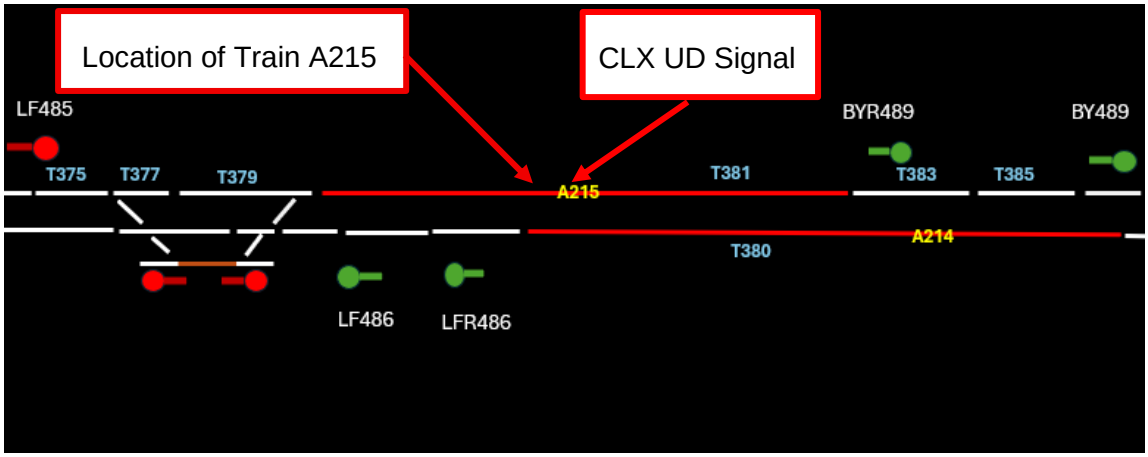

Figure 14 – Track Section occupations at 14:07 hrs

130 At 14:07:26 hrs, Driver A215 contacted Mainline CTC and the following communication took place as follows:

Communications Signalman: Mainline Signalman CTC, pass your message.

Driver A215: This is the driver of alpha-two-one-five on the Up road at the 70 ¾ milepost. Signalman, I've had an abnormal downgrade to red here. It started at the 71 ¼ and it still red here, on my CAWS. I can see the Down train ahead of me is stopped as well.

Communications Signalman: Yeah, he stopped there, he went through a hot box there. You've got an abnormal downgrade there at the 71 ¼, yeah?

Driver A215: 71 ¼ is pretty much where it started and I'm at the 70 ¾. Now I can see a green ahead of me[21], but I've still got a red in my CAWS here.

Communications Signalman: Can I take your unit number there?

Driver A215: Four-Zero-Zero-One.

Communications Signalman: Four-Zero-Zero-One. Driver, you are ok to obey lineside signals and when you get to papa-lima-two-eight-zero if you are stopped, contact us again okay?

Driver A215: Okay let me check that again. At papa-lima-two-eight-zero you want me to stop and contact you again?

Communications Signalman: If you get stopped there, contact us there. We've had a problem at that signal. Okay?

Driver A215: Can I just check with you… I'm not close to the train, but it looks like someone is out of that train and walking around it… (see Figure 15). Maybe he has a T-COD down or something like that? Do you know anything about that? Is he checking it, maybe that's why I got a downgrade?

Figure 15 – FFCCTV from Train A215

Communications Signalman: [hesitates]... Standby there…

[21] During the call the Communications Signalman and Driver A215 were referring to different signals when discussing the green signal ahead. Driver A215 is referring to Signal CLX UD. The Communications Signalman thought that Driver A215 was referring to Signal BYR489 as Signal CLX UD is not shown on the Mainline CTC Workstation display.

[The Communications Signalman then converses with the Controlling Signalman: "Does your man have anyone down with the driver with his own protection?"... "He's had an abnormal downgrade to red, but he has a green ahead of him".]

Communications Signalman: Yeah… you are okay there to obey lineside signals.

Driver A215: Okay, I'm going to obey lineside signals and If I get stopped again at papa-lima-two-eight-zero I'm going to contact you back? Is that correct?[22]

[Controlling Signalman and the Tralee and Waterford Signalmen are heard conversing in the background]

Communications Signalman: Are you past the Down train there, yeah?

Driver A215: No, the Down train is ahead of me and it looks like someone is out doing a check.

Communications Signalman: Just standby there a second…

Driver A215: Okay, thank you.

[Pause of three seconds whilst other signalmen converse in the background]

Communications Signalman: Remain there and I'll contact you back, right?

Driver: Okay, thank you[23].

131 After the call between the Communications Signalman and Driver A215, the Communications Signalman and Controlling Signalman were recorded discussing the situation with the signalman on the nearby Waterford and Tralee Workstation situated in the same room who had overheard the previous communications. The Communications Signalman re-stated the information from Driver A215 that the Down train (Train A214) was ahead of them. The Controlling Signalman then questioned the Communications Signalman if Driver A214 had said that Train A215 had actually passed clear of Train A214 or if Driver A214 had told the Communications Signalman that the Up train (Train A215) had passed Lisduff. Having confirmed that Train A215 was now stationary, the Controlling Signalman proposes contacting Driver A214 to confirm his position.

[22] The signalling fault at Signal PL280 is discussed in paragraphs 108 and150.

[23] The call between Driver A215 and the Communications Signalman was graded as A (ALARP) and D (High risk) respectively; with the Communications Signalman receiving low scores for inaccurate messaging, not being clear and only partial repeating back of key information.

Events after the incident

132 Following the incident, the Communications Signalman reported the incident to a CTC Traffic Executive.

133 After Driver A214 had completed the examination of Train A214 and returned to the driving cab, signal protection was removed and Train A214 resumed its journey.

134 Train A215 was also given permission to restart.

135 After the CTC Traffic Executive had reviewed the communications, the Communications Signalman was stood down from duty and a drugs and alcohol screening was undertaken (with tests returned negative) in line with IÉ post incident policy.

136 At the time the Controlling Signalman was not identified as having contributed to the incident and was therefore not subject to drugs and alcohol testing on the Controlling Signalman.

Previous occurrences

137 The RAIU is not aware of any similar occurrences where signal protection was incorrectly granted to a driver, placing them at risk.

Analysis

Communications

IÉ safety critical communications requirements

138 The IÉ Rule Book contains a number of safety critical communication requirements; relevant to this incident are: firstly you should say who and where you are; that you must ensure that you are speaking to the correct person; messages concerning safety must be properly understood, by both, parties before ending the conversation (paragraph 56); that you must "speak with a natural rhythm, slightly more slowly but at the same volume as in normal conversation" and "divide the message into short phrases" (paragraph 57); that you ask the person receiving the message to repeat it to you and not assume that anything is understood (paragraph 58).

139 The Professional Signaller Handbook does define a responsibility for signalmen to lead safety critical communications "on most occasions" in Key Principle 4 (paragraph 60); however, this does not appear to be adopted and practiced. It also states that leading of the communication means "being assertive and in command of the situations you will face".

140 There is no equivalent document or instruction for drivers or other grades (including the IÉ Rule Book) defining a responsibility for leading communications.

141 The monitoring and assessment arrangements contained within IMO-SMS-033, Safety Critical Communications and the IÉ-RU equivalent document, RU-SMS-010, Safety Critical Communications, do not assess signalmen on taking the lead in communications.

142 It should be noted that the concept of lead responsibility has been in Great Britain for over twenty years and contained within the rule book modules, with application to multiple roles.

Safety critical communications during the incident

Between Driver A214 and Signalmen

143 The radio communication between Driver A214 and Mainline CTC, during which signal protection was granted, did not follow the basic principles for safety critical communications defined in the IÉ Rule Book. The following issues were identified:

- The message was not adequately planned and poorly phrased;
- The communication was rushed;
- Key messages were not accurately repeated back (paragraph 121);
- Driver A214 interrupted and was leading the communication;
- Both Signalmen were not assertive in taking the lead in the communications (Key Principle 4, set out in the Professional Signaller Handbook (paragraph 59)).

144 During the incident, Driver A214 spoke to a different Signalman on each of the two calls but was not aware of this at the time. It is possible that the expectation by Driver A214 that they would be speaking to the same signalman at Mainline CTC may have influenced how they structured the call (paragraph 122).

145 It is also possible that the misunderstanding that occurred was also reinforced by the first call having concluded with the instruction for Driver A214 to call Mainline CTC back once the Train A215 had passed. Driver A214 deviated from this instruction (as they were legitimately seeking confirmation of the situation) but did not clearly communicate that why they were doing so, when opening the message (paragraphs 121).

Between Driver A215 and Communications Signalman

146 After Driver A215 brought their train to a stand and reported the abnormal CAWS downgrade and even stated that they could see another train ahead (paragraph 130), it is likely the Communications Signalman continued to believe that Train A215 had passed Train A214 because of the previous understanding reached when signal protection was granted to the Driver A214.

Between the Controlling Signalman and the Communications Signalman

147 The double manning arrangement of Mainline CTC Workstation requires effective communication and co-operation between the Communications Signalman and the Controlling Signalman to ensure safety. Where personnel overlap on tasks or jointly complete a task there is some potential for error.

148 The Controlling Signalman heard the information exchange between Driver A214 and the Communications Signalman and acted upon this in placing a reminder appliance on Signal LF485 (paragraph 122 and Footnote 19). The subsequent use of the phrase “you have signal protection there” by the Controlling Signalman (paragraph 122) potentially mislead the Communications Signalman into believing that the conditions were correct to grant the signal protection to Driver A214.

149 As the Controlling Signalman did not challenge the Communications Signalman at the point of granting signal protection over the location of Train A215 it is likely that both Signalmen then reached a common misunderstanding based on each other’s actions and what they communicated to each other.

150 At the time of the incident, the Communications Signalman was aware of the ongoing signalling fault at Portlaoise with Signal PL280 (paragraph 108) and continued to focus on this.

Signalling Regulations and General Instructions

151 Section 11, Safety of Persons Working on Near the Line, of the SGI details the rules and process for arranging signal protection when work is to be done on the outside of a train. In principle, signal protection can be granted once the signalman knows the location of the work (and the lines), provide signal protection, and assure the person requesting protection that normal working will not be resumed until that person informs you it is safe to do so (paragraph 66).

152 As a result, these instructions can be interpreted to allow signal protection to be granted, to work on a line with a train in the signal section, provided the train has already passed where the work is to take place and the exact position of the work is given.

153 At the location of this incident, there are long signal sections in both the Up and Down directions (six miles (9.6 km) and five miles (8 km), respectively); which may have resulted in the Signalmen applying this principle.

Mainline CTC Workstation

Mainline CTC Workstation display

154 When a driver seeks signal protection for a train examination or failure situation, it is the responsibility of the driver to identify which lines (other than which they are travelling upon) trains are required to be stopped (paragraph 65). On the Mainline CTC Workstation, the position of the stopped train is indicated to the signalman by track section occupations, which assists the signalman to identify the section of the adjacent line to be protected and the stop signals to be maintained at danger (paragraph 67).

155 Train A214 occupied Track Section T380 from the start of the incident when the HABD alarm sounded (paragraph 112). The position of Train A214 between Ballybrophy and Lisduff was seen and understood by both signalmen (Figure 16).

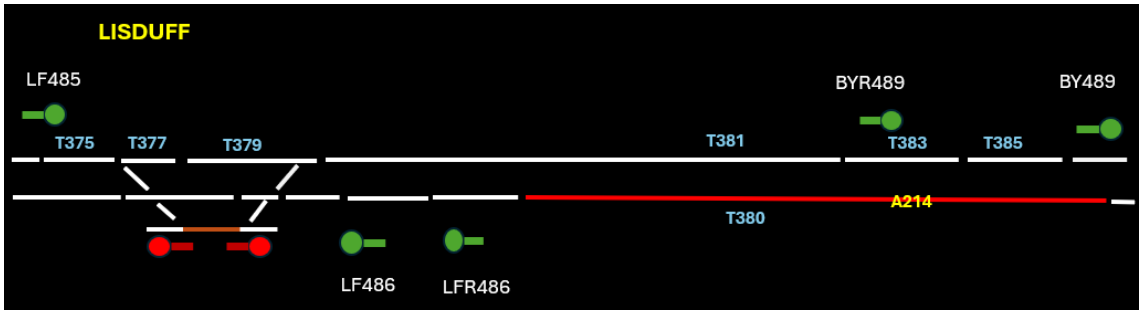

Figure 16 – Track section occupations immediately after the HABD alarm

156 At the time that signal protection was granted to Driver A214, the Communications Signalman had reached an understanding that Train A215 had passed Train A214 (paragraph 122). However, the track section indications on the Mainline CTC Workstation display would not have been consistent with this having occurred. For approximately thirty-one seconds of the call, Track Section T381 was unoccupied (as shown in Figure 12).

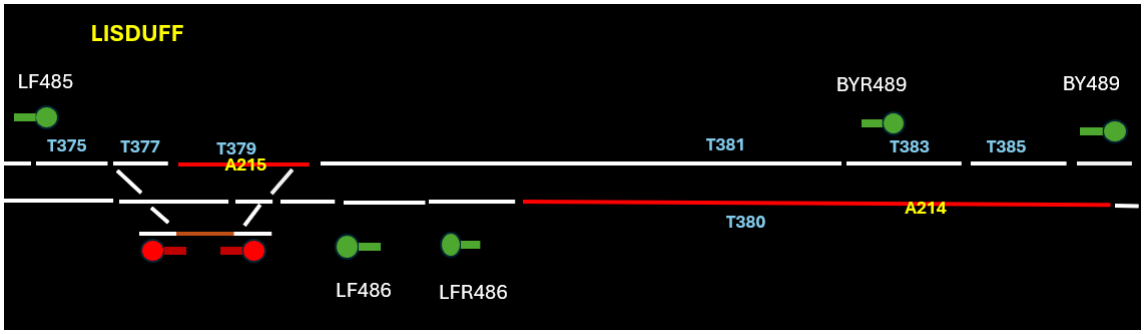

Figure 17 – Track section occupations as signal protection was granted

157 Only for the last six seconds of the thirty seven second call was Track Section T381 showing occupied, but Track Section T379 continued to remain occupied until after the conclusion of the call, showing that the Train A215 was still passing clear of Lisduff and so was unlikely to be beyond Train A214 (Figure 18).

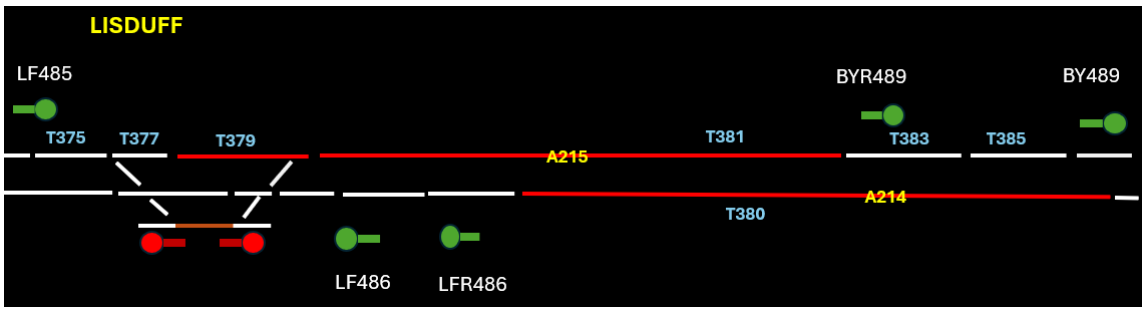

Figure 18 – Track section occupations at the conclusion of the call granting signal protection

158 It is likely that the Communications Signalman saw the position of Train A215 on the workstation display but did not process this information correctly as a result of the conversation taking place with Driver A214 and other distractions. As the Controlling Signalman placed the reminder appliance on Signal LF485 during the call at 14:05:18 hrs (paragraph 40), the Controlling Signalman was in a position to identify that Train A215 was unlikely to have passed Train A214. Had the Communications Signalman acted solely upon the information on the workstation display as the basis of whether to grant signal protection, it is unlikely that they would have made the error.

159 After Train A215 had come to a stand and reported an abnormal CAWS downgrade, it is likely the Communications Signalman continued to believe that Train A215 had passed Train A214 because of:

- The information given by Driver A215 that there were looking at a green signal, which the Communications Signalman believed was Signal BYR 489 from viewing the workstation display screen. Driver A215 was in fact viewing Signal CLX UD, which is not shown and contributed to the continued confusion (paragraphs 130, footnote 21);
- The overall length and the holding track function meant it was normal for Track Section T381 to stay occupied for an extended period, meaning that the information on the screen at this point could have been consistent with Train A215 having passed clear of A214 (paragraph 50, Figure 14).

System design of the Mainline CTC Workstation

160 The system design of the workstation resulted in the Mainline CTC Workstation being double manned to manage the workload; both signalmen are equally qualified and can therefore both carry out all duties associated with the roles (paragraph 51).

161 On the day of the incident, it is likely that the double manned arrangement was a factor to the incident, as:

- Driver A214 did not realise they were speaking to a different signalman in the separate calls (paragraph 122) which likely resulted in how Driver A214 formed their communications;
- The division of the task of signal protection between the action of placing the reminder appliances (the Controlling Signalman) and communicating it to Driver A214, where a clear understanding between the Signalmen was not reached (paragraph 149).

Training of Signalmen

162 Signalman training relied extensively upon training in the ‘live’ environment alongside a mentor signalman as there is not currently a simulator which can accurately replicate the Mainline CTC Workstation and represent the level of activity encountered (paragraph 71). As a result, the experience of degraded working and managing failures in the practical training phase is dependent on naturally occurring events. However, as this training is in a ‘live’ environment, there is a conflict between allowing the trainee to gain experience but yet minimising any delays and ensuring safety (paragraph 70).

163 The training materials were found to cover the relevant existing rules and regulations. During the Module 2 training, training records also showed the Communications Signalman had carried out signal protection multiple times. This task had also been included in assessments. The training materials or manuals did not include any reference to the hazard of holding tracks temporarily masking other causes of track section occupations.

164 During training the Communications Signalman had experienced abnormal CAWS downgrades, which were reported and treated as technical issues. This experience may have created an expectation that this incident was the same and so failed to consider that a T-COD could be the cause.

Conclusions

Causal, contributing, and systemic factors

165 The incident is summarised as the Communications Signalman on the Mainline CTC Workstation granted signal protection to Driver A214 without correctly establishing the location of Train A215.

166 The RAIU have identified the following causal factors which resulted in the incident:

- CaF-01 – The poor application of safety critical communications protocols between the Driver A214 and the Communications Signalman resulted in a failure to reach a clear understanding, over whether Train A215 had passed Train A214 (paragraph 138);
- CaF-02 – CTC Signalmen have interpreted the IÉ-IM SGIs for signal protection as permitting signal protection to be granted with a train still within the signal section, provided the train has passed the person /location where protection is required (paragraph 152);
- CaF-03 – During the process of granting signal protection to Driver A214 (using the interpretation outlined in CaF-02), both signalmen failed to see, or process, on the Mainline CTC Workstation display that Train A215 was still approaching Train A214's location (paragraph 148).

167 The following contributory factors were identified:

- CoF-01 – The poor application of safety critical communications protocols between the Controlling Signalman and Communications Signalman led to the Communications Signalman believing it was safe to grant signal protection (using the interpretation outlined in CaF-02), when the Controlling Signalman said that the reminder appliances for signal protection had been applied (paragraph 148);
- CoF-02 – The location of Signal CLX UD and Signal CLX DD and their aspects are not shown on the Mainline CTC Workstation display, meaning the Communications Signalman and Driver A215 referenced the signal ahead being green, but both were in fact discussing different signals (i.e. Driver A215 was looking at Signal CLX UD and the Communications Signalman was looking at Signal BYR 489) (paragraph 154));

- CoF-03 – The Communications Signalman was distracted by the failure of signalling equipment at Portlaoise when arranging signal protection for Train A214 (paragraphs 108 and 150).

168 The following systemic factors were identified:

- SF-01 – The text in SGI (Section 11) meant that the instructions could be misinterpreted, allowing for signal protection to be granted with a train still within the signal section, provided the train has passed the person/ location where signal protection was required (paragraph 140);
- SF-02 – The IÉ Rule Book does not assign the role of lead responsibility for safety critical communications, to ensure protocols are used, communications are structured correctly and, above all, making sure a clear understanding is reached (paragraph 139 and140);
- SF-03 – The current simulator provision for IÉ signalmen does not permit the training or assessment of signalmen under realistic conditions due to its restricted capability (paragraph 162);
- SF-04 – The system design of the CTC Mainline Workstation, with the double manning arrangement, increased the likelihood of operational error when dealing with Driver A214, as both Signalmen were involved in arranging the signal protection for Driver A214 (paragraph 161).

Additional Observations

169 The RAIU made the following additional observation:

- AO-01 – The holding track function on the Mainline CTC Workstation is a known feature, but the hazard of it masking other faults and situations is not included in training or signalman's reference materials.

Measures taken and in progress by IÉ since the incident

Actions taken by IÉ-IM since the incident

170 After the incident, the Communications Signalman was stood down from regular duties whilst the incident was reviewed and further coaching and assessment took place; this was completed in May 2024.

171 As part of the signal head replacement project on the Cork Mainline, the removal of the redundant CLX UD and CLX DD signals took place in October 2024; another similar location at Bishopswood was dealt with in September 2025.

172 IÉ-IM also carried out their own internal investigation (Report of Investigation: Signal Protection irregularity following Train A214 stopped after receiving HABD alarm at Ballybrophy 28th March 2024, Report R1305-2025-49, published 9th December 2025). One recommendation was made: The IM Procedures Manager to review and amend as deemed necessary SGI 11 so as to ensure that there is sufficient instruction provided to Signallers when applying signal protection.

Measures in progress by IÉ-IM

173 IÉ-IM are undergoing a major project to migrate signalling operations to the National Traffic Control Centre (NTCC) at Heuston Station. This will bring significant changes including further centralisation of the signalling control of the network into one location, updating the control software and signalman interface. All workstations except the Central NTCC Workstation will become single manned.

174 As part of the migration to NTCC a simulator will be used to train trainee signalmen at NTCC in lieu of the current ‘live system’ training. The simulator can replicate the control areas of all the new workstations and the Traffic Management System (TMS) equipment. A duplicate TMS Simulator is also procured for Inchicore Training Centre to support signalling theory training. Post-simulation training, a probationer will be under the supervision of a ‘Mentor Signalmen’ before being deemed competent through simulator and real-time assessment. The IÉ IMO Safety Executive is in the process of writing a simulator standard and are amending IMO-SMS-030 and IMO-SMS-032 to support the new training method which is subject to safety validation in line with the introduction of the NTCC management structure in 2026.

Measures taken by IÉ-RU since the incident

175 After the incident, the communications were reviewed with Driver A214 and corrective coaching was undertaken.

Safety Recommendations

Introduction to safety recommendations

176 In accordance with the European Union (Railway Safety) (Reporting and Investigation of Serious Accidents, Accidents and Incidents) Regulations 2020), RAIU safety recommendations are addressed to the NSA, the CRR, and directed to the party identified in each safety recommendation.

Absence of safety recommendations due to measures in progress

177 The procurement of signalling simulators to support the training and assessment of Signalmen and the revision of standards, as detailed in measures taken (paragraph 174), as such a safety recommendation is not warranted for SF-03.

178 The location of Signals CLX UD and CLX DD and their aspects were not shown on the CTC Mainline Workstation display; these have now been removed (paragraph 171) and as such an RAIU safety recommendation is not warranted for CoF-02 (paragraph 167).

Safety recommendations as a result of this incident

179 The failure to apply safety critical communications protocols was identified as a factor in the incident. Although the rule book defines the need for a clear understanding, no party has a responsibility for ensuring that protocols are applied by the other and there is no hierarchy in communications between parties. In the Professional Signaller Handbook the lead responsibility is assigned to the signalman, but this is not well understood and not reflected in the rule book. It is also not communicated or trained to train drivers. If the lead responsibility of the signalman is understood by all, then this may assist in reaching a clear understanding. Consequently, the RAIU makes the following safety recommendation to IÉ-IM to address CaF-01, CoF-01 and SF-01 (paragraphs 166 to 168):

Safety Recommendation 2026001-01

IÉ-IM and IÉ-RU should formally review the instructions, training and competency management of Safety Critical Communications to ensure clear responsibilities and a clear understanding is reached at all times, with specific emphasis on adopting the concept of lead responsibility.

180 The investigation identified that the interpretation of SGI was identified as a factor in the incident. These are being interpreted as allowing signal protection to be granted with a train within the signal section, provided it has passed the location where the access to the line is required. Where track section indications do not or cannot provide a clear indication of the location of trains within a signal section safe implementation of signal protection is reliant on safety critical communications, increasing the risk of error. Consequently, the RAIU makes the following safety recommendation to IÉ-IM to address CaF-02 and SF-01 (paragraphs 166 and 168, respectively).

Safety Recommendation 2026001-02

IÉ-IM should amend SGIs (Section 11) to clarify the conditions which must be met before granting signal protection with particular reference to the presence or absence of trains in the signal section.

181 The system design of the Mainline CTC Workstation which required two operators was identified as a factor in the incident. This resulted in the task of implementing signal protection being carried out jointly by the two signalmen, requiring a high level of co-operation and co-ordination and introducing the potential for error. Consequently, the RAIU makes the following safety recommendation to IÉ-IM to address SF-04 (paragraph 168).

Safety Recommendation 2026001-03

IÉ-IM should conduct a risk assessment of double manned signalling workstations to determine if any additional risks from having two persons operating the one workstation, with a view to identifying additional control measures to mitigate any identified risks.

182 The investigation identified that whilst the holding track feature on the Mainline CTC workstation was not identified as significant factor in the incident and the behaviour of the system was known by signalmen. The risk of this feature masking a genuine fault or track circuit occupation was not included in training or briefing materials. Consequently, the RAIU makes the following safety recommendation to IÉ-IM to address AO-01 (paragraph 169).

Safety Recommendation 2026001-04

IÉ-IM to consider the inclusion in Mainline CTC training and briefing materials information on the holding track feature and the associated risk of overlooking a genuine track circuit occupation or fault.

Additional Information

List of abbreviations

ADU	Aspect Display Unit
AO	Additional Observations
CaF	Causal Factors
CAWS	Continuous Automatic Warning System
CCE	Chief Civil Engineer
CME	Chief Mechanical Engineer
CoF	Contributory Factors
CWR	Continuous Welded Rail
CRR	Commission for Railway Regulation
CTC	Centralised Traffic Control
DTE	District Traffic Executive
ECP	Emergency Control Panel
EU	European Union
FFCCTV	Forward Facing CCTV
hr	hour
HABD	Hot Axlebox Detector
IÉ-IM	Iarnród Éireann Infrastructure Manager
IÉ-RU	Iarnród Éireann Railway Undertaking
km	kilometre
km/h	kilometres per hour
m	metre
MP	Milepost
mph	miles per hour
NSA	National safety authority
NTCC	National Train Control Centre
RAIU	Railway Accident Investigation Unit

RA	Risk Assessment
RFI	Request For Information
RSSB	Railway Safety and Standards Board
SET	Signalling, Electrification and Telecommunications
SGI	Train Signalling Regulations and General Instructions
SMS	Safety Management System
T-COD	Track Circuit Operating Device

Glossary of terms

Abnormal CAWS downgrade	A change of ADU display to a more restrictive aspect which does not correspond to the aspect seen at the associated signal is termed a downgrade (e.g. in this incident, the CAWS was displaying a red (stop) aspect instead of the green (proceed) aspect shown by the signal when passed).
Accident	An unwanted or unintended sudden event or a specific chain of such events which have harmful consequences. For heavy rail, the EU Agency for Railways divides accidents into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others.
Article 20 of Directive (EU) 2016/798, Obligation to investigation	Article 20 (1) Member States shall ensure that an investigation is carried out by the investigating body referred to in Article 22 after any serious accident on the Union rail system. The objective of the investigation shall be to improve, where possible, railway safety and the prevention of accidents. Article 20 (2) The investigating body referred to in Article 22 may also investigate those accidents and incidents which under slightly different conditions might have led to serious accidents, including technical failures of the structural subsystems or of interoperability constituents of the Union rail system. The investigating body may decide whether or not an investigation of such an accident or incident is to be undertaken. In making its decision it shall take into account: (a) the seriousness of the accident or incident; (b) whether it forms part of a series of accidents or incidents relevant to the system as a whole; (c) its impact on railway safety; and (d) requests from infrastructure managers, railway undertakings, the national safety authority or the Member States.
Causal Factor	Any action, omission, event or condition, or a combination thereof that if corrected, eliminated, or avoided would have prevented the occurrence, in all likelihood.

Continuous Automatic Warning System	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 sixty seconds as the system is locked out). Acknowledgement by the driver within the first seven seconds immediately silences the tone.
Continuous Automatic Warning System Downgrade	A change of the Aspect Display Unit display to a more restrictive aspect (e.g. single yellow to red), 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.
Contributing Factor	Any action, omission, event or condition that affects an occurrence by increasing its likelihood, accelerating the effect in time or increasing the severity of the consequences, but the elimination of which would not have prevented the occurrence.
Controlled Signal	A signal capable of being operated by the signalman as opposed to only by the passage of trains.
Control Car	A control car is an unpowered coach equipped with a driving cab to enable to locomotive hauled stock to be operated in a push-pull formation.
Distant Signal	A signal which indicates the status in advance of all signals in the direction of travel at the signal box or gate box ahead.
Down Line	In this incident, trains travelling to Cork are travelling in the Down direction on the Down Line.

Down Side	Being located on the same side of the railway as the Down Line.
Emergency Control Panel	Back-up control panel for controlling train movements in the event of failure of CTC Systems
Hot Axlebox	The overheating of a load carrying axle bearing. This can be caused by inadequate lubrication or failure of components in the bearing. Modern rail vehicles have roller bearings. Hot axleboxes can result in fire, or in extreme cases, locked axle or derailment.
Hot Axlebox Detector (HABD)	A device comprising axle counters, processing equipment and infra-red detectors mounted close to the rail which monitor passing trains and alert CTC if they sense an overheating of hot axle box. If a train activates a HABD it is brought to a stand for examination or remedial action.
Incident	Any occurrence, other than an accident or serious accident, associated with the operation of trains and affecting the safety of operation. For heavy rail, the EU Agency for Railways divides incidents into the following categories: infrastructure; energy; control-command & signalling; rolling stock; traffic operations & management and others.
Interlocking	The railway signalling term given to a system composed of signal apparatus (mechanical, electrical or coded logic) that prevents trains encountering conflicting moves through only allowing trains to receive an authority to proceed, when routes have been set, locked and detected in safe combinations.
Investigation	A process 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
Journal	The bearings supporting a rail vehicle on its axles.
Milepost	A marker of distance, measured from a specified location.
Overlap	The distance ahead of a stop signal up to which the line must be clear before the signal in rear will clear.

Reminder appliance	A device or control used to remind the signalman that a particular lever, button or control must not be operated or must be used only under certain conditions.
Repeater Signal	A signal capable of showing a cautionary aspect or clear aspect and worked in direct association with the signal ahead.
Serious Accident	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. For heavy rail, the EU Agency for Railways divides serious accidents into the following categories: collisions, derailments, level-crossing accidents, accidents to persons caused by rolling stock in motion, fires and others.
Signal Protection	The use of one or more signals maintained at danger to provide protection to a person or persons requiring to work on the line.
Signal Section	A signal section is the length of railway line between two consecutive stop signals, or between a stop signal and the end of a controlled area, which is protected and controlled by the signalling system. Only one train is normally permitted to occupy a signal section at any one time unless special authority or signalling arrangements apply.
Stop Signal	Any main signal which can display a stop aspect or indication.
Systemic factor	Any causal or contributing factor of an organisational, managerial, societal or regulatory nature that is likely to affect similar and related occurrences in the future, including, in particular the regulatory framework conditions, the design and application of the safety management system, skills of the staff, procedures and maintenance.
Track Circuit	An electric device installed in running rails which detects the presence of a train.
Track Circuit Block	A method of signalling trains in a section of line where safety is ensured by the use of track circuits or other means of automatic train absence detection and without the use of block instruments.

Track Circuit Operating Device (T-COD)	A device which can be placed on the line to provide protection by operating track circuits.
Train Register Book	An official, controlled record maintained at a signal cabin, control point, or designated location, in which the signalman or authorised person must accurately and sequentially enter details of train movements and related instructions.
Traffic Regulator	The Traffic Regulator is a role in CTC with responsibility for monitoring service delivery, making train running order decisions during disruption and managing faults and has a close working relationship with the Workstations.
Train Detection	Generic term for any system that proves the presence or absence of a train on a defined section of line.
Up Side	Being located on the same side of the railway as the Up Line.

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