Railway Accident Investigation Unit Ireland

INVESTIGATION REPORT

Collision of an RRV Dumper with a member of Iarnród Éireann infrastructure maintenance staff, Tivoli, Cork, 6th July 2022

RAIU Investigation Report No: 2023-R003

Published: 7th June 2023

Report Description

Report publication

Where the report has been altered following its original publication, details on the changes will be given.

Report structure

The report structure is written 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

For further information, or to contact the RAIU, please see details below:

RAIU
2nd Floor, 2 Leeson Lane
Dublin 2, Ireland.

email: info@raiu.ie
website: www.raiu.ie
telephone: + 353 1 604 1050

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. During an investigation, if the RAIU make some early findings on safety issues that require immediate action, the RAIU will issue an Urgent Safety Advice Notice outlining the associated safety recommendation(s); other issues may require a Safety Advice Notice.

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 consider 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.

Contents

Summary

1 On the 6th July 2020, there were four separate worksites within a *T3 Possession* in which engineering works on the Cork-Cobh-Midleton lines was being undertaken. The work being carried out in worksite one entailed *track panel* relaying and steel bridge repairs between Woodhill and Tivoli.

2 There were thirteen items of hired plant and machinery in the worksite, including six Road Rail Vehicle (RRV) Dumpers, which were used for drawing stone from a lineside stockpile at Tivoli access point on the Cobh side of the Up Line. On completion of the loading movement the RRV Operators (RRVOs) awaited directions from the Person In Charge (PIC)-RRV to tip the stone over the course of the track relaying works.

3 During the works, two RRV Dumpers, located on the *Up Line*, were laden with stone ballast with the buckets facing Cobh. The RRVOs configured the driving positions of the RRV Dumpers for the reversing movement. The *directional lights* were configured to white lights on the Cobh end (direction of travel) and red lights at the Cork end.

4 Engineer 1, who was on site supervising the works, was coming to the end of his shift and was giving an update briefing to Engineer 2 who had arrived on site for the late shift. After discussing an unforeseen issue in relation to soft ground conditions, Engineer 1 agreed to remain on site in order to discuss the matter further with their Regional Manager, who had arranged to visit the site.

5 Engineer 1 decided to make a number of work-related phone calls on his company issued mobile phone and moved to a *position of safety*, walking from the *Down Side* to the *Up Side cess,* close to the leading RRV Dumper.

6 While on the Down Side, Engineer 2 requested the PIC-RRV to move the two stone laden RRV Dumpers a short distance along the Up Line towards Cobh to allow the placement of track panels on the Down Line. The PIC-RRV walked towards the leading RRV Dumper observing that the line ahead was clear before shouting and indicating by hand hand due to the noisy environment to the leading RRVO to move in the direction of Cobh.

7 The RRVO checked his reversing camera monitor located at 90° to his driving position on his right-hand side before looking through the rear windscreen over the RRV Dumper bucket laden with stone, before slowly moving forward.

8 At approximately the same time Engineer 1 (located on the Up Side cess) decided to return to Engineer 2 (located on the Down Side). Engineer 1 walked a few metres in the cess, before the terrain got difficult, and crossed into the *five foot* a few metres ahead of the leading RRV Dumper.

9 Engineer 1 continued to walk for a few metres in the five foot, in the direction of Cobh on the Up Line, before feeling something striking his back. Engineer 1 turned around and realised it was the RRV Dumper and instinctively decide to “go to ground” and lay as flat as possible in the five foot, knowing the RRV Dumper was going to travel over him. The RRV Dumper had travelled approximately twelve metres from its stationary position at this time.

10 The RRV Dumper slowly travelled over Engineer 1, with Engineer 1 sustaining a cut to his nose and minor abrasions to his arm.

11 The RRVO was unaware that he had struck and travelled over Engineer 1 until he was alerted by another member of staff. The RRVO then brought the RRV Dumper to a stop, clear of Engineer 1.

12 All work on site was stopped and medical attention was given by staff on site before an ambulance crew attended the scene and advised Engineer 1 that he did not have to attend the hospital.

13 The RAIU have identified the following causal factors to the accident:

- CaF-01 – Engineer 1 did not follow the personal safety requirements outlined in the IÉ Rule Book such as maintaining vigilance (staying alert, looking up frequently); crossing in front of approaching trains and not going between vehicles;
- CaF-02 – Engineer 1 did not consider the RRVO's blind-spot or gain the attention of the RRVO despite seeing him in the cab, even though *Personal Track Safety* (PTS) Certification training highlights that RRVOs of RRV Dumpers do not have a clear view ahead due to the design of the vehicle and the load it is carrying;
- CaF-03 – Engineer 1 did not follow the risk controls for the identified hazards in Risk Assessment RA14658 such as maintaining a safe distance from RRVs; and, ensuring the RRVO had full visibility;
- CaF-04 – Engineer 1 did not look at the RRV Dumper's directional lights which were white, indicating that the RRV Dumper was about to make a forward movement;
- CaF-05 – The RRVO's view through the rear windscreen was obstructed by the RRV Dumper's bucket and load it was carrying. The reversing camera and monitor installed to improve visibility for the RRVO in reversing movement was positioned to the RRVO's right, whereby the RRVO could not see the full forward view without moving his head.

14 The following may have been a contributory factor:

- CoF-01 – RRVO did not switch off the RRV Dumper while stationary on the track as per instruction and had the directional lights set for forward movement for approximately ten minutes on instruction of the PIC-RRV. This may have given Engineer 1 the incorrect impression that the RRV Dumpers were not going to move imminently and the noise of the re-starting of the RRV Dumpers may have alerted Engineer 1 to their imminent movement.

15 No systemic factors were identified.

16 Due to a previous RAIU safety recommendation and measures taken by IÉ-IM, there is an absence of safety recommendations related to:

- *Anti-Collision Devices* (ACDs) – RAIU Safety Recommendation 2019004-03;
- RRV movements – Additional instructions have been issued to staff in relation to RRVs and their movements (Safety Notice including Briefing Note IM.BN/02/2022);
- RRV Dumper monitors – Additional monitors have been installed on all RRV Dumpers ensuring that RRVOs can now maintain an active view of the camera monitor and the line ahead while the RRV is in motion.

17 Although not causal, contributing, or systemic to the accident on the 6th July 2022, the RAIU make the following additional observations:

- AO-01 – PTS Certification training does not include guidance on the head lights and tail lights for trains ("white lights" are coming towards you, or "red lights" are travelling away from you); and, specifically, for RRVs, does not mention the configurable directional lights and the requirement to have red lights displayed at both ends when stationary;
- AO-02 – RA14658 (Hazard 4, RRV Movements) does not adequately address the risks associated with RRVs Movements in terms of requirements to switch engines off when stationary on the track (Footnote 10, paragraph 84); and, for RRVs to display red lights at both ends of the vehicle (so they always remain visible);
- AO-03 – Although the use of mobile devices is covered in the IÉ Rule Book, IÉ-IM does not have a comprehensive stand-alone mobile device policy document.

18 These additional observations warrant the following safety recommendations:

- Safety Recommendation 2023003-01 – IÉ-IM PTS Certification training should include training on the head lights and tail lights for trains ("white lights" are coming towards you, or "red lights" are travelling away from you); and, specifically, for RRV Dumper, explain the configurable directional lights and the requirement to have red lights displayed at both ends when stationary;
- Safety Recommendation 2023003-02 – IÉ-IM CCE should re-examine the risk assessment related to RRV movements, where previous control measures cannot be implemented (i.e. RRV engines cannot be switched off), alternatives should be considered;

- Safety Recommendation 2023003-03 – IÉ-IM should produce and circulate a policy document for the use of mobile phones and all handheld electronic devices for the acceptable, safe and secure use and management of these devices when working on the railway.

RAIU Investigation and its context

Decision & motivation to investigate this occurrence

19 On the 6th July 2022, the RAIU on-call investigator received a notification that a member of IÉ staff had been struck by an RRV Dumper in a T3 Possession at Tivoli, on the Cork to Cobh line on the same date.

20 The RAIU conducted a preliminary examination and the RAIU's Chief Investigator made the decision to conduct a full investigation into the accident, given the seriousness of the accident (*Article 20* (2) (a) of Directive (EU) 2016/798 of the European Parliament, Article 20, Obligation to Investigate). As under slightly different circumstances the accident may have led to serious accident with the potential for a fatality or serious injuries, due to the collision of rolling stock with a member of staff.

Scope & limits of investigation

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

- Examine the planning and execution of the work being carried out;
- Establish the sequence of events leading up to, during and after the accident;
- Identify any other precursors which led to the accident;
- Establish, where applicable, causal, contributing and systemic factors;
- Examine the training of staff involved in the accident.

22 As set out in "Commission Implementation Regulation (EU) 2020/572 of 24 April 2020 on the reporting structure to be followed for railway accident and incident investigation reports" the scope of this report includes all titles and subtitles with the exception of roles and duties and similar occurrences, which, although considered, were not relevant for this accident.

Technical capabilities & investigation methods

23 The RAIU's Chief Investigator allocated RAIU Senior Investigators, trained in accident investigation, to conduct this investigation, as appropriate. In this instance, no external parties were required to assist with the investigation.

24 During the investigation, the RAIU visited the accident site and later collated evidence through the submission of Requests for Information (RFIs) to the IÉ-IM Safety Department and formal interviewing of relevant staff. Related to this investigation, the RAIU collated and logged the following evidence:

- Photographs taken on the day from the site;
- Witness statements and interview notes from parties involved in the accident;
- The planning and execution of the work being carried out;
- The site briefings conducted on the day of the accident;
- The method of controlling movements of RRVs on site;
- Training and competence records for those directly involved;
- Training documentation for RRVOs and PTS Certification;
- IÉ Rule Book;
- Site visit and examination of the views available to the RRVO from the driving cab including the operation of the reversing camera monitor;
- The reporting and response to the accident.

Communications & evidence collection

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

26 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 (parties and roles) and the Commission for Railway Regulation (CRR)[1].

27 All relevant parties co-operated fully with the RAIU investigation; with no difficulties arising; although it is noted that in some instances the IÉ-IM CCE Department did not submit responses to RFIs in the requested time period, despite the best efforts of the IÉ-IM Safety Department to compile the information.

Other stakeholder inputs

28 Emergency services (ambulance) were requested and attended to treat Engineer 1, who on examination did not require hospital attendance.

[1] The CRR is the National Safety Authority (NSA) for the Republic of Ireland and is responsible for the regulatory oversight of the application and effectiveness of railway organisation's 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.

Description of the occurrence & background information

Description of the occurrence type

29 The accident involved a member of IÉ-IM CCE staff being struck by an RRV Dumper, at a worksite at Tivoli, Co. Cork, during a T3 Possession at 13:25 hrs on the 6th July 2022. In terms of categorisation, the EU Agency for Railways categorisation for this occurrence is an: Accident – *To Persons due to Rolling Stock in Motion*.

Background to the works being undertaken

30 There was a planned T3 Possession for the entire Cork-Cobh-Midleton line from Saturday 2nd to Sunday 17th July 2022 for four different worksites.

31 On the 6th July 2020, there were four separate worksites within a T3 Possession in which engineering works on the Cork-Cobh-Midleton lines was undertaken. The work being undertaken in the worksite relevant to the accident, Worksite 1 entailed track panel relaying and steel bridge repairs / maintenance between Woodhill and Tivoli (Figure 1).

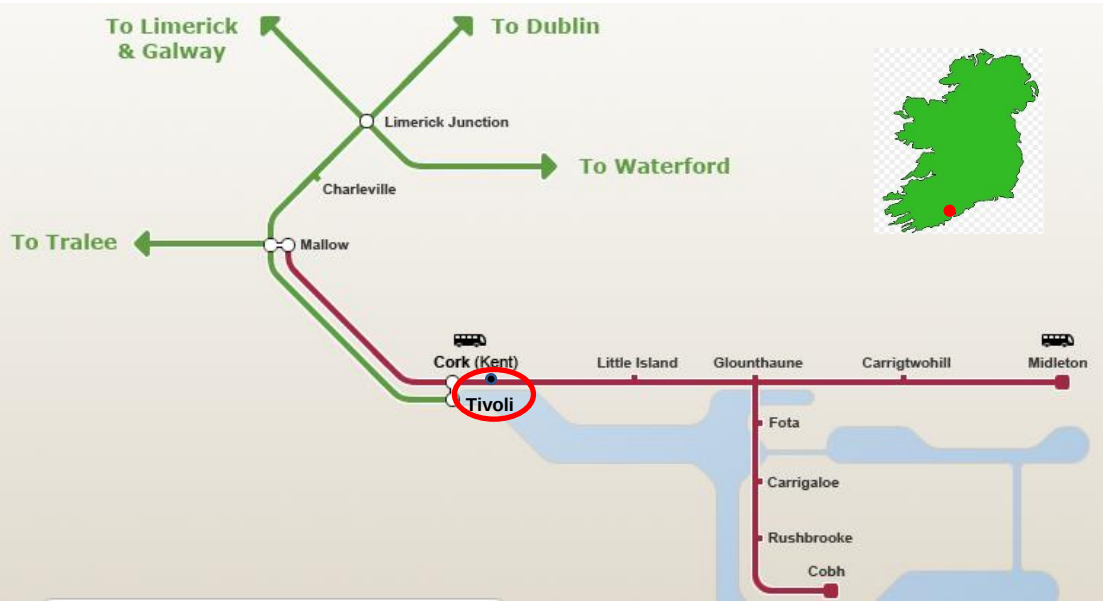


Figure 1 – Location of the accident

32 There were thirteen items of hired plant and machinery in the worksite, including six RRV Dumpers. Given the scale of the works and the size of the worksite, eight PIC-RRVs were appointed to control the movements of the RRV Dumpers within the worksite.

33 The six RRV Dumpers were used for drawing stone from a lineside stockpile at Tivoli access point on the Cobh side of the Up Line before awaiting directions from the PIC-RRV to tip the stone over the course of the track relaying works.

34 The accident occurred during daylight and the weather was fine with no rain.

Deaths, injuries & material damage

35 Engineer 1 sustained a cut to his nose and soft tissue injury to his arms and ribs. Emergency services (ambulance) were requested and attended to treat Engineer 1, who on examination did not require hospital attendance.

36 There was no material damage.

Other consequences as a result of the accident

37 As the accident took place in a T3 Possession there were no delay minutes to rail traffic.

Parties & roles associated with the accident

IÉ-IM

38 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 Commission Regulation S.I. 476 2020. The authorisation was renewed on the 24th March 2022 for a period of five years. The IÉ-IM department involved in the accident and relevant to this investigation is:

- IÉ-IM CCE Department – The CCE directs the Technical Support, Business Support and Safety sections within the Civil Engineering Department of IÉ-IM. This department carries out the inspections and maintenance of track and structures and is divided into three different geographical areas, with offices based at Dublin, Athlone and Limerick Junction.

39 The IÉ-IM CCE roles involved, directly and indirectly, and respective experiences at the accident, are as follows:

- PIC-RRV (directly involved in the accident) – Had over thirty-five years' experience working on the railway at the time of the accident. The PIC-RRV was experienced, trained, and certified as competent to carry out all safety critical tasks required;
- Engineer 1 – Had eight years' experience as a fully qualified engineer working with IÉ-IM CCE (and had previous experience as a student in IÉ-IM). Engineer 1 was experienced, trained and certified as competent to carry out all safety critical tasks required (including PTS Certification);
- Engineer 2 – Had two years' experience with IÉ-IM (eighteen years of previous railway experience). Engineer 2 was experienced, trained and certified as competent to carry out all safety critical tasks required.

RRV Contractor

40 The RRV Contractor is an independent contractor who owns, supplies, operates and maintains RRVs for IÉ-IM (through the IÉ-IM CCE's, SMS document, CCE-SMS-005, "Contractors and Permit to Access", Version 5.0 re-issued on the 12th March 2018). The name of the RRV Contractor has not been directly identified in this RAIU Report.

41 The role involved in the accident, from the RRV Contractor, is as follows:

- RRVO – The RRVO had fourteen months experience as a plant operator and nine months experience working on the IÉ network as an RRVO. RRVO was experienced, trained and certified as competent to drive an RRV Dumper and to carry out all safety critical tasks required on the IÉ network.

Rolling Stock

General description of RRVs

42 An RRV is a self-propelled machine, equipped with road wheels and rail wheels, that can run on rails and ground on the public road or on the railway line. When in rail mode, RRVs are considered to be train (Glossary 6, IÉ Rule Book).

43 IÉ rules and regulations do not permit RRVs to operate outside the limits of a possession.

44 RRV movements are controlled by a PIC-RRV.

RRV Dumper involved in the accident

Certification, checks & general fixtures

45 The RRV Dumper involved the accident was a Dieci Dumper RRD17, 12 Ton, Identification No. 99609-943107-3 and is classified as a Type 9B High Ride Machine (where the traction and braking is indirectly applied to the rail wheel through the road wheel; road wheels may drive the rail wheels or a spindle drum attached to the wheel). RRV Dumper, RRD17, was on hire from a plant hire contractor who also supply the operator, working under the instruction of IÉ-IM staff.

46 RRV Dumper, RRD17, Certificate of Engineering Acceptance was issued for the RRV Dumper on the 2nd March 2018 and valid until 2nd March 2023. The last “Thorough Examination” was carried out on 13th September 2021 with no issues raised and was valid until 12th September 2022.

47 An RRV Pre-Operational Check (POC 033984) was also carried out on the day of the accident with no faults identified.

48 RRV Dumper, RRD17 was fitted with a flashing beacon, an audible reversing movement warning (white noise / squawker), mirrors, rotational driving seat and associated equipment for forward and reversing movements (paragraphs 49), camera monitor (paragraph 50) and directional lights (paragraph 52).

Driving orientation

49 The driving seat, steering wheel, brake, and accelerator pedals can be rotated 180° to facilitate the driver facing the direction of travel for forward (Figure 2) and reverse movements (Figure 3).

Figure 2 – Forward driving configuration

Figure 3 – Reverse driving configuration

Camera monitor

50 Note how the view from the rear windscreen could become obstructed when the dumper is laden with materials in Figure 3. To compensate for this, there is a 120° angle camera (circled in Figure 4). The 120° angle (highlighted green in Figure 4) gives a 30° blind spot on both sides. The camera images are projected to a monitor situated at 90° to the RRVO's right-hand-side seated position while in reverse mode (circled and inset in Figure 5), the camera images only show live images and does not record i.e. the RRVO has to look to his right-hand-side to view the monitor.

Figure 4 – Reversing camera

Figure 5 - Camera monitor

51 In terms of the restricted views, PTS Certification training highlights that RRVOs do not always have a clear view ahead due to the design of the vehicle or the load it is carrying.

Headlights and tail lights

52 IÉ Rule Book, Section H, 2.0 General Instructions, set out the requirements for headlights (2.6) and tail lights (2.7) for train. In terms of headlights, the highlights must be illuminated (and also applies when a train is propelled). Two red lights must normally be exhibited at the rear of any train or movement when on a running line.

53 These requirements are outlined in the RRVO Training Presentation (Version 14, 28/06/2021 valid at the time of the accident), highlighting that when an RRV is travelling it must display white lights at the leading end indicating a forward movement of travel (see Figure 6); and red lights at the tail end (see Figure 7). In addition, the RRVO training also requires that when an RRV is stationary it must display red lights at both ends of the vehicle, so they always remain visible[2].

54 The RRVO configures the RRV's headlights and tail lights.

Figure 6 – White lights illuminated

Figure 7 – Red lights illuminated

Note: The above would have been the configuration of the lights on the day of accident.

[2] It is noted that this is not included in PTS Certification training. The RAIU consider this to be an additional observation, AO-01 (paragraph 116), which warrants a safety recommendation, 2023003-01 (paragraph 127).

Post-accident inspection of the RRV Dumper

55 A post-accident inspection found the headlights and tail lights to be working.

56 The inspection also found the monitor to be working. The monitor gives a clear view of the five foot ahead of the RRV Dumper, while working in reverse.

57 Figure 8 shows the monitor displaying the view of a member of staff during an IÉ-IM re-enactment of the accident, in the five foot, 3 m ahead of the RRV Dumper. Note, the RRVO has to look to his right-hand-side to see the monitor (paragraph 50).

Figure 8 – Monitor view of person 3 m ahead (image taken by IÉ-IM)

58 At the time of the accident the RRV Dumper was laden with stone ballast restricting the RRVO's view through the rear windscreen. The IÉ-IM re-enactment of the accident conditions identified that for the first 15 metres (m) the head of a person standing in the five foot could not be seen from the RRV Dumper cab in reverse mode over a bucket laden with stone ballast i.e. they become visible after 15 m (Figure 9).

Figure 9 – RRVO's view looking out of the rear windscreen (image taken by IÉ-IM)

Infrastructure

Track

59 The accident location, Tivoli is situated on the Cork to Cobh line just over a mile from Cork Kent Station (165 ¼ MP) and is double line throughout.

Signalling

60 Movements on the Cork to Cobh / Midleton lines are controlled by the Signalman located in the Cork Cabin / Cork East Emergency Control Panel.

61 The line is operated under the rules and regulations for train signalling by Track Circuit Block (TCB) system and is fitted with colour light signals throughout.

62 At the time of the accident the Cork to Cobh and Midleton Up and Down lines were entirely shutdown for major engineering works and was operating under a T3 Possession with no signals operational.

Safety Documentation

IÉ Rule Book

IÉ Rule Book, Section B, Part One, 2.0 Personal Safety

63 Subsection 2.1.4 “Where there are trains or vehicles” states:

- Do not cross the line in front of an approaching train;
- Do not pass between stationary vehicles (or between stationary vehicles and stop blocks) where the gap is less than 50 metres (50 yards) without first checking that no movement will take place;
- Do not go in between vehicles unless there is clearly no possibility of a movement taking place.

64 Subsection 2.3 “What you must do when walking on or near the line” requires staff to:

- Be alert constantly;
- Look up frequently;
- Do not be distracted by anyone nearby;
- Do not rely on anyone giving warning of approaching trains;
- As far as possible, keep to the cess beside all lines and face the direction from which trains normally approach.

IÉ Rule Book, Section Q, Part One, Road-Rail Vehicles

65 Section Q, Part One, RRVs, sets out the following in terms of RRVs: principles; general instructions; instructions to the RRVO (including checking the RRV, travelling in convoy, and what to do if the RRV derails); instructions to the PIC-RRV (including what to do before going on the line, controlling more than one RRV, works near points, passing over level crossings, etc). Some of the requirements related to this accident include:

- The maximum permitted speed of an RRV in a worksite is 5 mph (8 km/h) (Section 2.4);
- A PIC-RRV must be present when an RRV is travelling (Section 3.1).

Method Statement

66 The renewal of the Up and Down Road under OBC[3]411 / OBC412 and all associated Infrastructure Manager work in the Tivoli to Tivoli Docks area was planned to take place from Saturday 2nd to Sunday 17th of July 2022 during the hours of 08:00am to 20:00pm and was covered by *Method Statement* MS-D17-51-V1.1, Version 1.1 issued on the 7th June 2021, to be referred to as the Method Statement for the remainder of this report.

67 In terms of the RRVO duties, the Method Statement requires that the RRVO must make all RRV movements at a speed that will allow the RRVO to stop the RRV within the distance that the RRVO can see is clear (Section 6.2, RRVO (Section 6.0, Management of RRVs)).

68 Related to staff movements on the railway, the Method Statement requires the following:

- Look and listen carefully for approaching trains or On Track Machinery/ RRV movements (Appendix B, Personal Safety, Going Lineside);
- The hazard “struck by RRV” is highlighted (Appendix B, Personal Safety, Up and Down Line Hazards);
- In addition, it notes “Staff must choose to walk in the cess at all times prior to walking in the five foot” (Appendix B, Personal Safety).

[3] OBC – Overbridge Cork

Risk Assessments

69 Two site specific risk assessments were produced prior to the commencement of engineering works, the one relevant to this investigation is Risk Assessment RA14658 which included the task of "panel excavation works at Tivoli and Whitepoint", operative since the 7th June 2022 (to be referred to as RA14658 for the remainder of this report)[4].

70 RA14658 identifies twenty-six hazards; the following are relevant to the accident:

- For the hazard, "RRV movements", the risk has been identified as "death or serious injury" and the risk control includes that "all personnel on site are to be made aware of movements…. Where RRVs are remaining stationary on track under possession, RRVs must be switched off…." (Hazard 4);
- For the hazard of, "Excavation, Formation Works", the risk has been identified as "death or serious injury" and the risk controls include that "All uninvolved staff to stand well clear of operating plant…. Staff to maintain a safe distance from RRVs at all times… staff must be aware of RRV blind spots" (Hazard 21);
- For the hazard of "Hired Plant", the risk is identified as "death or serious injury" and the risk controls include that "All staff to stand clear of all machine movements… Stay away from all machines while they are working unless a safe distance is maintained and the driver has full visibility" (Hazard 22).

71 It is noted that RA14658 does not address the directional lights (paragraph 53) or the requirement for RRVs to display red lights at both ends when stationary (paragraph 53)[5].

[4] Engineer 1 was a panel member for the drafting of the risk assessment RA14658.

[5] The RAIU consider this to be an additional observation, AO-02 (paragraph 116), which warrants a safety recommendation, 2023003-02 (paragraph 128).

Events before, during and after the accident

Events before the accident

72 There was a planned T3 Possession for the entire Cork-Cobh-Midleton line from Saturday 2nd to Sunday 17th July 2022 for four different worksites.

73 Briefings on the Method Statement took place on 1st and 2nd of July 2022 for IÉ-IM and contractor staff, prior to the commencement of work for all relevant IÉ and contracted staff and the record of briefing form[6] was signed by all attendees.

74 Worked commenced on Saturday 2nd July 2022 and there were daily site safety briefings prior to the start of work each morning. Additional briefings were given to staff attending site throughout the day who did not attend the initial briefings.

75 On Wednesday 6th July 2022 IÉ and contracted staff arriving at Worksite 1 received a site safety briefing[7] which included, but not limited to, the movement of RRVs.

76 During the morning six RRV Dumpers, located on the Up Line, were involved in travelling back and forth from a stone stockpile located at Cobh side of Tivoli to the track panel relaying location at the Cork side of Woodhill overbridge OBC411 (see Figure 10).

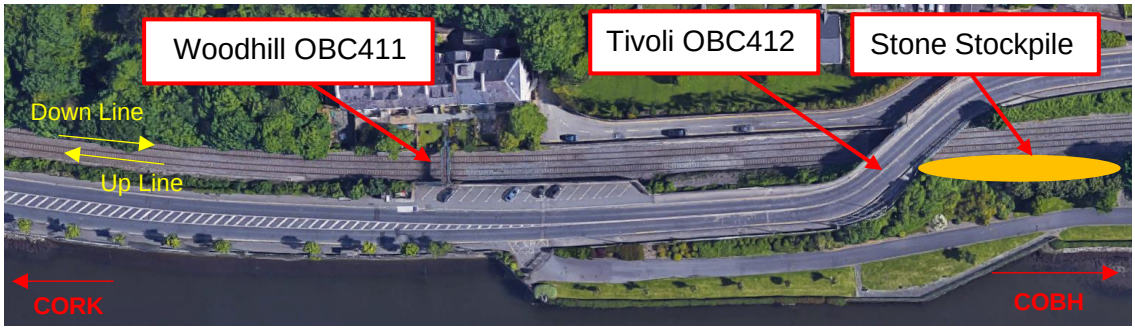


Figure 10 – Worksite 1 location

77 Engineer 1 was onsite, supervising the works and found issues related to false track bed levelling readings and unforeseen soft ground conditions which had the potential to delay the Up Line works significantly if not resolved.

78 At approximately 12:45 hrs Engineer 2 arrived on site to take over from Engineer 1 who was coming to the end of his shift. Engineer 1 advised Engineer 2 of the identified issues. Engineer 1 agreed to stay on site for the arrival of the Reginal Manager who was on route to discuss a proposal to deal with the soft ground issue.

[6] Ref No. CCE RB 88005 and 90508

[7] CCE SSB 387617 and CCE SSB 387618

79 Shortly after 13:00 hrs, two RRV Dumpers, after loading at Tivoli, travelled along the Up Line towards Cork under the control of the PIC-RRVs. The RRV Dumpers stopped under Woodhill OBC411 (see Figure 11).

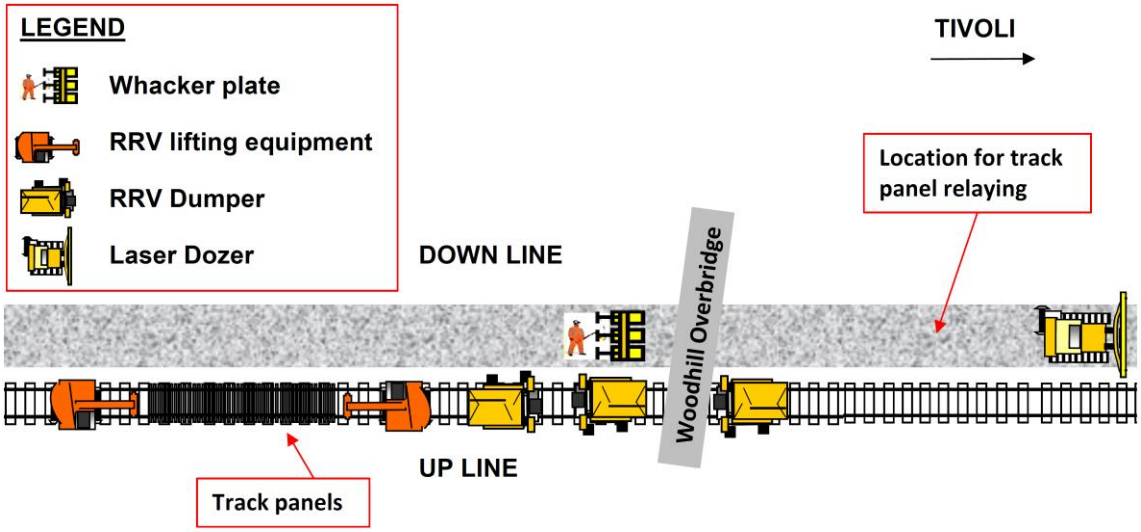


Figure 11 – RRV Dumpers stationary adjacent to Woodhill OB
Note 1: The drawings are not to scale and are for used to illustrate the sequence of events.
Note 2: Legend applicable to all similar sequencing of events drawings.

80 While stationary, the cab seats and headlights and tail lights (directional lights) were reconfigured by the RRVOs in anticipation of a request from the PIC-RRV to move back towards Tivoli and distribute the stone as required for the track panel relaying on the Down Line (see Figure 11)[8].

[8] The directional lights should not have been configured for movement at this stage as when an RRV is stationary it must display red lights at both ends of the vehicle, so they always remain visible (paragraph 53). The RAIU consider this to be an additional observation, AO-02 (paragraph 116), which requires a safety recommendation, 2023002-02 (paragraph 128).

81 Engineer 1 had two work related missed calls on his company issued mobile phone and while waiting for the Regional Manager moved to a position of safety from the Down Side to the Up Side cess and beside one of the laden RRV Dumpers (see Figure 12) to return the calls[9].

82 Engineer 2 identified that the panel lifting equipment machinery (orange machinery in Figure 11) was required to be moved in the direction of Cobh ("Location for track panel relaying", Figure 11) in order to place a track panel on the Down Line. However this was blocked by RRV Dumpers, which were required to move in the direction of Cobh to clear the location.

83 Engineer 2 approached the PIC-RRV who was near the leading RRV Dumper (Figure 12) and made a request for the RRV Dumpers to move forward towards Cobh to facilitate the placement of track panels.

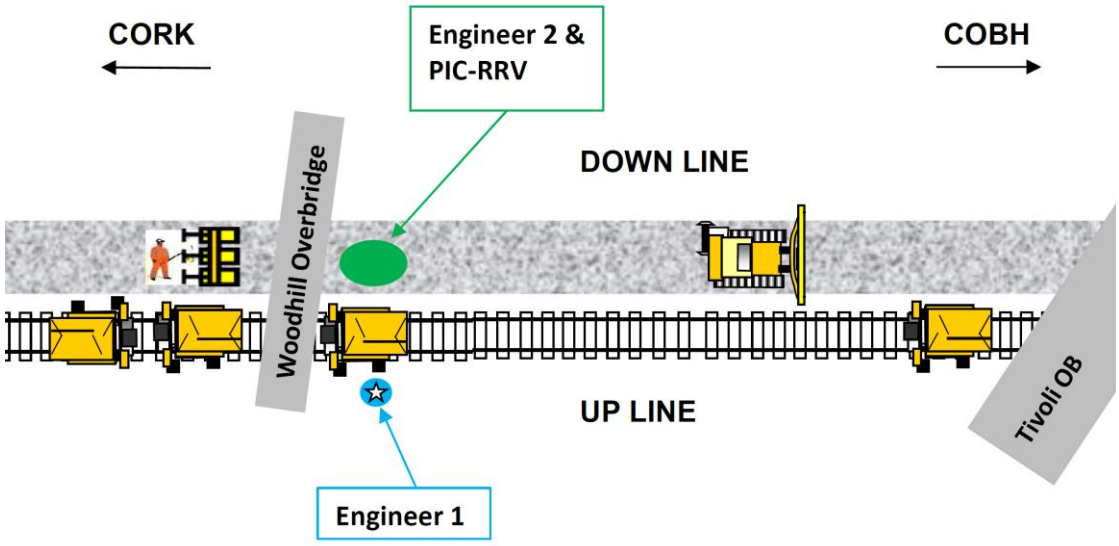


Figure 12 – Approximate locations of members of staff

[9] In relation to mobile phones, the IÉ Rule Book (Section A, 3.0, Communications) and the Method Statement (MS-D17-51-V1.1, Version 1.1, 07/06/21) have provisions and restrictions for the use of mobile phones (e.g. be in a position of safety; clear of the working radius of RRVs, etc.). It is noted that IÉ-RU have had a standalone mobile phone policy for a number of years and that IÉ-IM's policy is currently in draft. The RAIU consider this to be an additional observation, AO-03 (paragraph 116), which requires a safety recommendation, 2023002-03 (paragraph 129).

84 At approximately 13:10 hrs, the RRV Dumpers had, by this stage, remained stationary on the track with the engines running for approximately ten minutes before the request to move (the RRVOs were under instruction not to switch off the RRVs, as set out in RA14658 (paragraph 70), due to concerns that the RRV Dumpers would not restart[10].

85 Engineer 1, (Figure 12), in Up Side cess, in a position of safety, made two return phone calls, commencing at 13:18 hrs and finishing at 13:23 hrs.

86 The PIC-RRV walked towards the front of leading RRV Dumper, into the *six foot*, observing the line ahead of the RRV Dumper was clear. While in the six foot in a noisy environment (RRV Dumpers engines were running and the whacker plate operating (Figure 12)) the PIC-RRV shouted instructions and also hand signalled to the leading RRVO to move forward towards a stationary RRV Dumper approximately 40 - 50 m ahead close by to Tivoli OBC412.

87 While the PIC-RRV was instructing the RRVO to move forward; Engineer 1 was out of sight of the PIC-RRV as he was the opposite side of the RRV Dumper.

Events during the accident

88 Engineer 1, having completed two work related work calls, decided to return to speak with Engineer 2 on the Down Line (Figure 12).

89 Engineer 1 walked in the cess for approximately three metres, in the direction of Cobh, taking him past the stationary RRV Dumper before looking at the RRV Dumper and observing the head of the RRVO but did not make eye contact or gesture to the RRVO. Engineer 1 did not observe the illuminated head lights on the RRV Dumper.

90 At the same time, the RRVO of the leading RRV Dumper, viewed his in-cab monitor (located to his right-hand side) and as it was clear; the RRVO then looked forward, through the windscreen (illustrated in Figure 9), over the ballast and again, his view was clear.

[10] The RAIU requested information on the concerns related to the switching off of the RRVs. It was identified that there has been issues in the past related to RRVs not re-starting; due to the operational of these RRVs, they are difficult to remove from the railway line when “dead”. It is noted that RA14658 (Hazard 4, RRV Movements) requires that stationary RRVs be switched off; this indicated that the mitigation measure is unrealistic as it cannot always be achieved. The RAIU consider this to be an additional observation, AO-02 (paragraph 116), which warrants safety recommendation, 2023003-02 (paragraph 128).

91 As the terrain in the cess became difficult, Engineer 1 looked around and behind to see if the was any movements of machinery and stepped into the five foot of the Up Line and continued walking with his back to the RRV Dumper (see Figure 13 for route taken by Engineer 1).

92 The RRVO moved forward slowly with the audible warning squawker sounding (paragraph 48, squawker sounds for reversing movement).

93 Engineer 1 could not hear audible warning squawker device over the noise of the other machinery (RRV Dumpers operating, and whacker plate operating nearby on the adjacent Down Line) and continued walking in the five foot unaware of the RRV Dumper approaching him from behind.

Figure 13 – Positions of Engineer 1 and RRV Dumper before and after collision (blue line indicates the route taken by Engineer 1, red dot indicates point of collision)

94 Engineer 1 walked for a few metres before feeling something striking his back, he turned around realised it was the RRV Dumper and instinctively decided to “go to ground” and lay as flat as possible in the five foot, knowing the RRV Dumper was going to travel over him. The RRV Dumper had travelled approximately twelve metres from its stationary position.

95 The RRV Dumper slowly (under 5 mph/ 8 km/h, as per IÉ Rule Book (paragraph 65) travelled over Engineer 1, with Engineer 1 sustaining a cut to his nose and minor abrasions to his arm.

Events after the accident

96 When the RRV Dumper had passed over Engineer 1 completely, he looked back to see if anything else was approaching and he sat up.

97 Another member of staff, who had seen the latter part of the accident, ran towards the RRV Dumper to get the attention of the RRVO, who had not realised that the RRV Dumper had struck Engineer 1. The RRVO brought the RRV Dumper to a stop approximately twenty-two metres past the point of collision.

98 On site staff attended to Engineer 1 to check on his welfare and first aid was administered while awaiting the arrival of an ambulance.

99 All work on the site was stopped.

100 Additional medical attention was administered by the ambulance who advised a hospital visit was not required. Engineer 1 was brought home by a member of staff.

101 All relevant staff and bodies were notified timely of the accident.

102 A number of drug and alcohol screenings were later conducted in the CCE base in Cork Station. Subsequently, all tests obtained on the day were returned as “negative”.

Analysis

Rolling stock

RRV Dumper

103 RRV Dumper, RRD17, had the required Certificate of Engineering Acceptance and had been subject to the required maintenance (paragraph 46) and had been checked on the day of the accident (paragraph 47). RRD17 was operating with a flashing beacon, audible reversing movement warning, mirrors, monitor and directional lights (paragraph 48).

104 When driving a RRV Dumper in the forward direction a clear view through the windscreen is available as there is no obstructions (Figure 2 and Figure 7). However, the view when driving in reverse, through the rear windscreen is obstructed low down, by the bucket (Figure 3) and can become further obstructed when laden (Figure 9, in the case of the re-enactment, this was 15 m). To address this, RRV Dumpers are fitted with reversing cameras (Figure 4 and limited to 120° rather than 180°) and in-cab monitor on the RRVO's right-hand-side (Figure 5). However, the position of the reversing monitor, is such, that the RRVO must turn his head away from the direction of travel to view it.

Human factors

Actions of Engineer 1

105 At the time of the accident, Engineer 1 was experienced, trained and certified as competent to carry out all safety critical tasks required (paragraph 39) and was a panel member for the drafting of RA14658 which included site specific control measures for the works.

106 When Engineer 1 decided to return to Engineer 2 (paragraph 88), Engineer 1 began walking in the cess as required; however when the terrain became difficult in the cess (paragraph 91), Engineer 1 decided to leave the cess and enter the five foot, however, Engineer 1 made a number of RA14658 and IÉ Rule Book violations:

- Did not maintain a safe distance from the RRV Dumper (paragraph 70);
- Crossed in between vehicles and in front of an approaching train (IÉ Rule Book violation);
- Did not check to see if train movements were about to occur (paragraph 63);
- Did not consider the RRVO's blind spot despite seeing the RRVO on the RRV Dumper, which in turn meant that there may be the possibility of the vehicle moving (paragraph 70); the issue with the RRVO's view is also highlighted in PTS Certification training (paragraph 51);
- Did not maintain sufficient alertness and look up frequently (paragraph 64), despite, being in a noisy environment with numerous train /vehicle movements and the operation of machinery;
- Did not look at the white lights which indicated a forward movement was about to occur (paragraph 53); this also would dictate that Engineer 1 should not walk in the same direction of train movements (paragraph 64),

107 Engineer 1 may have an incorrect expectation that the RRV Dumpers were remaining stationary, which may have been as a result of the RRV Dumpers being stationary for approximately ten minutes. Engineer 1 may have also lost situational awareness as he was walking in the five foot, along which the RRV Dumpers were moving, a practice which is not advised in the IÉ Rule Book.

Actions of PIC-RRV

108 Engineer 2 requested that the PIC-RRV move the RRV Dumpers at Woodhill OBC411 in the direction of Cobh to allow the panel lifting equipment machinery to place a track panel on the Down Line (paragraph 83).

109 The PIC-RRV walked in the six foot toward the cab of the leading RRV Dumper from the Cobh side observing that the line ahead of the RRV Dumper was clear, (the PIC-RRV did not see Engineer 1 as he was on the opposite side of the RRV Dumper (paragraph 87).The PIC-RRV made eye contact with the RRVO and due to the noisy environment shouted and indicated by hand to the RRVO to move along the line in the direction of Cobh towards a stationary RRV Dumper what was approximately 40 - 50 m ahead (paragraph 86). The PIC-RRV requested the movement as, at the exact time of instruction to the RRVO, the line was clear for the RRV and as such operated in line with the related safety instructions.

Actions of the RRVO

110 The RRVO only began his movement on the instruction from and in the presence of the PIC-RRV (paragraphs 65 and 86), the RRVO checked the in-cab camera monitor to his right and observed that the line ahead of the RRV Dumper was clear. The RRVO then looked out through the rear windscreen over the stone loaded skip and observed the line ahead was clear. The RRVO moved forward slowly (paragraphs 65 and 95) with the audible warning squawker sounding (paragraph 91), operating in line with the related safety instructions. If Engineer 1 found the environment noisy he would have used ear defenders and still would not have heard the squawker.

Feedback and control mechanisms

111 The control mechanisms (IÉ Rule Book, Method Statement, RA14658) were found to be comprehensive and were adequately briefed to all staff prior to commencement of work; and had they been adhered to, in full, the accident is unlikely to have occurred. The actions of Engineer 1 on the day of the accident (paragraph 106) illustrate the non-compliance with these control mechanisms, despite being familiar with them.

Conclusions

Causal, contributing, and systemic factors

112 Engineer 1 was struck by an RRV Dumper, while walking in the five foot, within a worksite at Tivoli. It should be noted that the actions of the PIC-RRV (paragraph 109) and the RRVO (paragraph 110) were in line with requirements at the exact moment the instruction to move was given.

113 The RAIU have identified the following causal factors to the accident:

- CaF-01 – Engineer 1 did not follow the personal safety requirements outlined in the IÉ Rule Book such as maintaining vigilance (staying alert, looking up frequently); crossing in front of approaching trains and not going between vehicles (paragraphs 63, 64, 105 and 106);
- CaF-02 – Engineer 1 did not consider the RRVO's blind-spot or gain the attention of the RRVO despite seeing him in the cab, even though PTS Certification training highlights that RRVOs of RRV Dumpers do not have a clear view ahead due to the design of the vehicle and the load it is carrying (paragraphs 51, 89 and 106);
- CaF-03 – Engineer 1 did not follow the risk controls for the identified hazards in RA14658 such as maintaining a safe distance from RRVs; and, ensuring the RRVO had full visibility (paragraph 70);
- CaF-04 – Engineer 1 did not look at the RRV Dumper's directional lights which were white, indicating that the RRV Dumper was about to make a forward movement (paragraph 52, 53, 80 and 106);
- CaF-05 – The RRVO's view through the rear windscreen was obstructed by the RRV Dumper's bucket and load it was carrying. The reversing camera and monitor installed to improve visibility for the RRVO in reversing movement was positioned to the RRVO's right, whereby the RRVO could not see the full forward view without moving his head. (paragraphs 56, 58, Figure 9).

114 The following may have been a contributory factor:

- CoF-01 – RRVO did not switch off the RRV Dumper while stationary on the track as per instruction and had the directional lights set for forward movement for approximately ten minutes. This may have given Engineer 1 the incorrect impression that the RRV Dumpers were not going to move imminently and the noise of the re-starting of the RRV Dumpers may have alerted Engineer 1 to their imminent movement.

115 Although, there were additional observations made in relation to RA14658, these were not identified as systemic factors that were directly related to the cause of the accident.

Additional observations

116 Although not causal, contributing, or systemic to the accident on the 6th July 2022, the RAIU make the following additional observations:

- AO-01 – PTS Certification training does not include guidance on the head lights and tail lights for trains (“white lights” are coming towards you, or “red lights” are travelling away from you); and, specifically, for RRVs, does not mention the configurable directional lights and the requirement to have red lights displayed at both ends when stationary (Footnote 2, paragraph 53);
- AO-02 – RA14658 (Hazard 4, RRV Movements) does not adequately address the risks associated with RRVs Movements in terms of requirements to switch engines off when stationary on the track; and, for RRVs to display red lights at both ends of the vehicle so they always remain visible (Footnote 5, paragraph 71; Footnote 8, paragraph 80 & Footnote 10, paragraph 84);
- AO-03 – Although the use of mobile devices is covered in the IÉ Rule Book, IÉ-IM does not have a comprehensive stand-alone mobile device policy document (Footnote 9, paragraph 81).

Measures taken by IÉ-IM since the accident

117 IÉ-IM took a number of measures in the weeks following the accident, namely:

- The issue of Safety Alert IM/SA/05/2022 on the 7th July 2022, outlining details of the accident and reminding staff of the risk associated with being close to rail mounted machinery (Figure 14);
- The issue of Safety Notice including Briefing Note IM.BN/02/2022 on the 19th July 2022 to all PTS Certificate holders, detailing the precautions to be taken when walking by or working in the area of RRVs and the IÉ PTS Certification course was amended to include the instructions (Figure 15 and Figure 16);
- The CCE Safety Manager chaired a meeting in the days following the accident with RRV Contractors with a view to implement any immediate safety improvements to current systems of work. Following this, an interim sounding of horn instruction was introduced for all RRVs before either moving forward or reversing from a stationary position. This action was introduced while the cameras were re-positioned; the instruction is in the process of being withdrawn, subject to a safety assessment which is currently ongoing[11];
- The Regional Manager (Limerick Junction South) carried out a series of re-briefings to all staff from the panel relaying site in Cork along with additional safety tours to all worksites on the Cork to Cobh line;
- Engineer 1 and his manager held a discussion regarding the accident and Engineer 1 received briefing on the Safety Alert and Safety Notice.

118 In addition, IÉ-IM published their internal investigation report, "Report of Investigation: Member of staff struck by RRV during T3 Possession works (Cork) on the 6th of July 2022" on the 11th October 2022. The report contained two safety recommendations, related to the re-positioning of cameras (which is now closed, paragraph 119) and the continued examination of suitable technology to provide warning to members of staff and RRVOs when they come in to close proximity or conflict with RRVs in worksites.

[11] It should be noted that most RRV works are undertaken at night, and this was causing an environmental issue (noise pollution in residential areas) given the high number of movements and frequent stops e.g. there is a requirement to stop RRV prior to crossing points.

119 In the weeks after the accident a number of meetings, site visits and discussions with stakeholders took place around the positioning of in-cab camera monitors on site RRV Dumpers. It became apparent that a second monitor would be needed in order to cater for viewing by the dumper operator either facing forward or reverse. It was then necessary to establish if it was technically possible to install a second monitor to the original forward facing camera, so that the one camera provided pictures to two monitors. After a trial it was found to be technically possible. A suitable position which could be viewed by operators in 'skip first' travelling mode was then established and communicated out to all IÉ-IM RRV plant hire contractors., who then embarked on a fleet change programme, installing a second monitor in an appropriate position on each RRV Dumper. Confirmation was received on 12th April 2023 that all plant hire contractors had completed the vehicle modification, so that every site RRV Dumper operating on the IÉ network has a forward facing camera monitor which can be easily viewed by the RRVO as the vehicle travels skip first. This recommendation is thus considered complete by IÉ.

120 Research into the availability of collision avoidance technology was conducted by IÉ-IM CCE and IÉ-IM Safety, and one system was demonstrated to IÉ personnel in a third party works facility on 4th August 2022. This product was installed on machinery and established a safety zone around each machine. Each site worker was provided with a wearable item, which provided an audible warning and vibration warning to the worker when the safety zone was breached, and also triggered an alarm for the machine operator which had to be acknowledged by the operator. Following this demonstration, the product was thought to be suitable for IÉ requirements and an initial trial was arranged over a week of a line closure in Tralee commencing on 4th November 2022 involving a small range of RRVs. Feedback was received from personnel and further discussions were had with the equipment supplier. Following this review a more extensive trial was deemed to be required on a larger scale and in a more confined environment. The Tralee trial was in a relatively open yard area, whereas the majority of railway engineering works will be in a more linear confined area. The next trial is due to take place over a 4-week period in June 2023 during relaying works on the Dublin to Cork line. IÉ-IM is currently in consultation with the product supplier and plant hire contractors to establish standardised safety zones which will be suitable for the specific range of machinery and activity within the planned trial sites. The trial will be monitored, and a review will take place upon completion in order to evaluate and determine the next steps in this project. In parallel with this trial, IÉ-IM is also continuing to review the broader market and meeting with other suppliers of these types of technologies, as it is apparent that the market in this area is quite extensive.

121 A PTS Handbook, Version 1.0, was issued on the 23rd March 2023, available to all that complete PTS Certification training. The PTS Handbook states that “when trains are travelling, they will always display white lights in the front and red lights in the rear. This will give you a visual indication as to the direction they are travelling, “white lights” are coming towards you, or “red lights” are travelling away from you”. In terms of RRVs, the PTS Handbook includes the details outlined in Safety Alert IM/SA/05/2022 (paragraph 117 and Figure 14) and Briefing Note IM.BN/02/2022 (paragraph 117, Figure 15 and Figure 16).

Iarnród Éireann Infrastructure

SAFETY ALERT

Employee struck by RRV

During major engineering works within a T3 Absolute Possession, an employee was struck by a Road Rail Vehicle (RRV). The employee had stepped into the five foot after checking surveying equipment in the Up cess. There were RRV's in the immediate area but at that time of accessing the line they were stationary. The nearby use of 'wacker plates' also added to the noisy environment.

Further movement of the nearby stationary RRV's was then required to allow ongoing works.

While walking in the five foot, the employee felt something striking them on the back and pushing them over. Instinctively they knew they had been struck by an RRV so they laid down flat between the rails. The RRV travelled over the employee and was stopped a short distance later.

The employee sustained cuts to their nose and arm and received first aid on site and further assessment and treatment from the emergency services, but did not require hospitalisation.

Always remember

- Never access any line, even within a T3 Absolute Possession, unless you have confirmed that it is safe to do so.
- Never assume nearby stationary vehicle(s) will remain stationary without first checking with the person controlling them.

Key Message:

Railway Engineering worksites are high risk environments. Always be vigilant for rail mounted movements.

Ref: IM/SA/05/2022 Issued by the IÉ IM Safety Department 07/07/2022

Figure 14 – Safety Alert IM/SA/05/2022

RRV Briefing Note

Iarnród Éireann Trackworker Safety

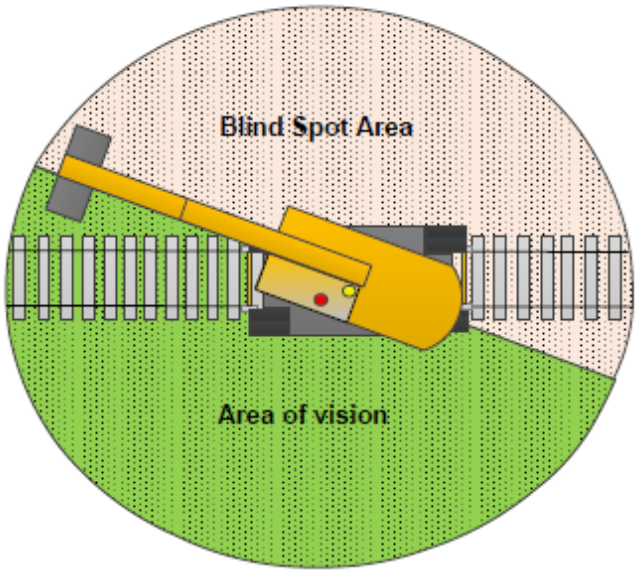
Please Note: This is a mandatory Briefing Note for all Personal Track Safety (PTS) competency holders.

RRV PLANT SAFETY

Like all plant machinery, Road Rail Vehicles (RRV's) can be hazardous and unpredictable. Therefore people must take special care before entering the operating area of the machine. Before you pass or work near an RRV always make sure you have **permission** from the Person in Charge of RRV (PIC-RRV).

1. RRV Blind spots

Due to the size, weight and power of RRV's one major hazard is the operators restricted view of their surroundings and range of blind spots in which people and objects can be hidden from sight. Many RRV's have substantial blind spots, not only immediately behind the vehicle, but also alongside and immediately in front.



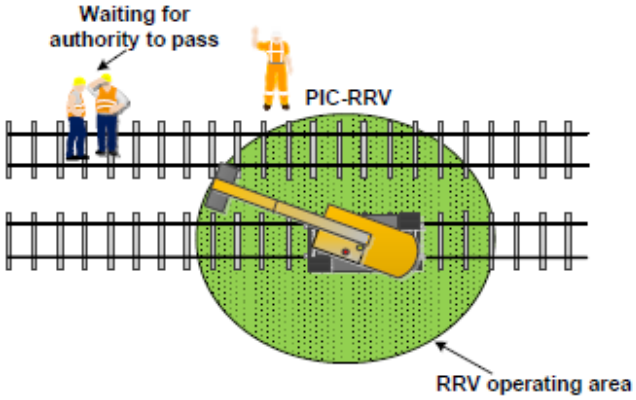
Remember: If you can not see the driver they can not see you!

Figure 15 – Briefing Note IM.BN/02/2022 (Page 1)

2. Walking past

Remember your PTS training – you are responsible for your own safety, be proactive and communicate with the PIC-RRV who will in turn communicate with the Road Rail Vehicle Operator (RRVO) and make it safe for you to pass.

- **When you need to move past a machine stop at a safe distance clear of the machines operating area.**
- **Make contact with the PIC-RRV.**
- **Only proceed when authorised by the PIC-RRV.**
- **If you cannot contact the PIC-RRV, before passing the machine, you must walk to a position where you can see the RRVO directly and the RRVO can see you.**
- **Never walk around a stationary RRV and assume that it will not move.**



3. Working in the vicinity of an RRV

If you are required to work in the vicinity of an RRV but **not** directly with it, you must contact the PIC-RRV before starting work. This will allow you to establish what each others work is and how you can maintain a safe distance from the machine's operating area.
Remember: never start work until you have agreed a safe method of work with the PIC-RRV.

- **Before you work in the vicinity of a machine you must first make contact with the PIC-RRV.**
- **The PIC-RRV will inform you if you can work in that particular area.**
- **Only when you receive this authority from the PIC-RRV can work commence.**

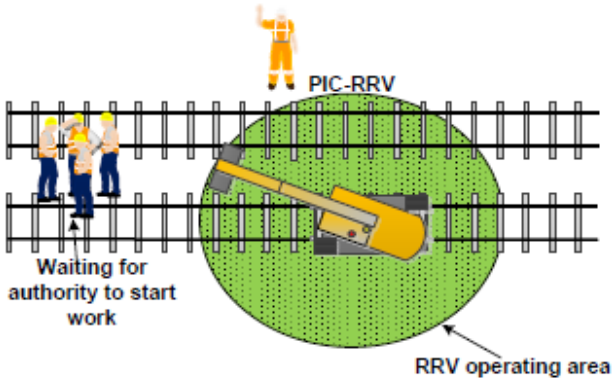


Figure 16 - Briefing Note IM.BN/02/2022 (Page 2)

Safety Recommendations

Introduction to safety recommendations

122 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 already taken

123 The RAIU previously carried out a trend investigation into RRV occurrences entitled, "Road Rail Vehicle occurrences on Iarnród Éireann Network from 2015 to 2018" (RAIU Report No: 2019 – R004), published on the 8th October 2019. Safety recommendation 2019004-03 included a list of improvements that should be considered. One of the improvements for consideration was for the "Installing of ACDs on RRVs for the prevention of collisions with other RRVs, rolling stock, infrastructure and staff (through the provision of portable ACDs fitted to staff) on the IÉ network. In cases, where this is not possible, as a result of a technical impossibility, control measures to address this deficiency should be clearly identified, risk assessed, and suitable controls implemented". At the time of publication of this report, this recommendation remains open. In addition, this recommendation is similar to the IÉ-IM recommendation "The CCE should continue to examine the use of suitable technology to provide warning to members of staff and RRVOs when they come in to close proximity or conflict with RRVs in worksites where engineering works are taking place". Therefore, the RAIU do not consider a further safety recommendation is warranted in relation to ACDs (CaF-01 – CaF-04, paragraph 112).

124 In terms of the issuing of Safety Notice including Briefing Note IM.BN/02/2022 on the 19th July 2022 (paragraph 117, Figure 15 and Figure 16). This document again highlights RRV blind spots and provides step-by-step instructions related to walking past and working in the vicinity of an RRV (in summary, permission must be sought from the PIC-RRV prior to making any movements). As a result, the RAIU does not consider a further safety recommendation is warranted in terms of staff movements where RRVs are on site (CaF-01 – CaF-04, paragraph 112).

125 The RRVO's forward view through the rear windscreen of the RRV Dumper was obstructed due to the orientation of the RRV Dumper (reverse movement) and the load it was carrying (paragraph 104); in addition, the reversing camera monitor, which gives a clear view of the five foot is to the RRVO's right hand side, whereby the RRVO cannot see the full forward view without moving his head. The RRV contractors have now installed additional cameras on all RRV Dumpers (paragraph 117) ensuring that RRVOs can now maintain an active view of the camera monitor and the line ahead (i.e. the RRVO does not have to move their head sideways) while the RRV is in motion. As a result, the RAIU does not consider a further safety recommendation is warranted in relation to the cameras/ views in RRV Dumpers (CaF-05, paragraph 113).

Safety recommendations as a result of this accident

126 As a result of measures already taken, there are no safety recommendations made as a direct result of the accident.

Safety recommendations as a result of additional observations

127 Although, the new PTS Handbook states that “when trains are travelling, they will always display white lights in the front and red lights in the rear. This will give you a visual indication as to the direction they are travelling, “white lights” are coming towards you, or “red lights” are travelling away from you”, this is not included in the PTS Certification training material. As a result the RAIU make the following safety recommendation to address AO-01 (paragraph 116):

Safety Recommendation 2023003-01

IÉ-IM PTS Certification training should include training on the head lights and tail lights for trains (“white lights” are coming towards you, or “red lights” are travelling away from you); and, specifically, for RRV Dumper, explain the configurable directional lights and the requirement to have red lights displayed at both ends when stationary.

128 The PIC-RRV requested that the RRV Dumpers remain switched on due to concerns they might not re-start, despite RA14658 (Hazard 4, RRV Movements) requiring RRVs to be switched off if they remain stationary on the track (Footnote 9). RA14658 did not address the requirement for stationary RRVs to display red lights at both ends of the vehicle (so they always remain visible) (Footnote 8). The RAIU consider that RA14658 be reviewed to re-consider the risk controls related to the hazard; as such, the RAIU make the following safety recommendation to address AO-02 (paragraph 116):

Safety Recommendation 2023003-02

IÉ-IM CCE should re-examine the risk assessment related to RRV movements, where previous control measures cannot be implemented (i.e. RRV engines cannot be switched off), alternatives should be considered.

129 The majority of IÉ staff have been issued “smart” phones or other handheld electronic devices in order for them to carry out their work; and although the use of mobile phones is covered in the IÉ Rule Book, the increased use of this technology for use on the railway needs to be addressed companywide (it is noted that IÉ-RU already have a policy in place). As a result, the RAIU make the following safety recommendation to address AO-03 (paragraph 116):

Safety Recommendation 2023003-03

IÉ-IM should produce and circulate a policy document for the use of phones and all handheld electronic devices for the acceptable, safe and secure use and management of these devices when working on the railway.

Additional Information

List of abbreviations

ACD	Anti-Collision Device
AO	Additional Observations
CaF	Causal Factors
CCE	Chief Civil Engineer
CME	Chief Mechanical Engineer
CoF	Contributory Factors
CRR	Commission for Railway Regulation
CTC	Centralised Traffic Control
DART	Dublin Area Rapid Transport
EU	European Union
hr	hour
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
OB	Overbridge
OBC	Overbridge Cork
PIC-RRV	Person In Charge Road Rail Vehicle
PTS	Personal Track Safety
RAIU	Railway Accident Investigation Unit
RA	Risk Assessment
RFI	Request For Information
RRV	Road Rail Vehicle
RRVO	Road Rail Vehicle Operator
SMS	Safety Management System
TCB	Track Circuit Block

Glossary of terms

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.
Anti-Collision Device	A collision prevention system, in this case, by the fitting of devices to rolling stock and portable ACDs to staff.
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.
Cess	The space along the running line
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.
Down Line	In this accident, trains travelling to Cobh 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.
Directional lights	As the driving position of the RRV Dumper can be rotated 180º so that the RRV Operator is facing the direction of travel, headlight and tail lights are present on each end of the RRV Dumper and need to be configured by the RRVO for the particular movements.
Five foot	The space between the rails.
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.
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
Method Statement	A document that detail exactly how to carry out work safely; they describe the safety precautions to control risks identified in the risk assessment and detail the personal protective equipment, health and safety contacts and the control equipment required to keep workers and site visitors safe whilst tasks are ongoing.
Milepost	Marks distances.
Personal track safety	IÉ provide PTS certification, which is a requirement for all staff, including contractors, whose duty requires them to go on or near the line. Training is provided by IÉ-RU. The content of the training material is taken from the relevant sections of the IÉ Rule Book.
Position of Safety	A place allowing a clearance of at least 1.5 metres between you and the nearest rail of any line on which a train is approaching.
Road Rail Vehicle	A dual mode vehicle than can operate both on rail tracks and road mostly used for rail infrastructure maintenance.

Road Rail Vehicle Operator	Driver operator of a Road Rail Vehicle.
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.
Six foot	The space between one line and another.
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.
Accident to persons due rolling stock in motion	Accidents to one or more persons that are either hit by a railway vehicle or part of it or hit by an object attached to or that has become detached from the vehicle. Persons that fall from railway vehicles are included, as well as persons that fall or are hit by loose objects when travelling on-board vehicles.
T3 Possession	Absolute possession no operational train movements. Engineering trains On Track Machinery/ RRV movements are permitted. Planned Engineering Work.
Track panel	A length of track assembled and transportable as a unit i.e. two rails together with the designated number of sleepers and rail fastenings.
Up Line	In this accident, trains travelling from Cobh are travelling in the Up direction on the Up Line.
Up Side	Being located on the same side of the railway as the Up Line.
Whacker Plate	Used to create a level and compact subbase before laying further materials.

References

Contractor (2022), A Road Rail Vehicle Pre-Operational Check (POC 033984).

IÉ (2007), IÉ Rule Book.

IÉ (2022), Weekly Circular No 4035, week ending 10.07.2022.

IÉ-IM (2022), CCE Department Risk Assessment, RA14658.

IÉ-IM (2018), Contractors and Permit to Access, Version 5.0, issued on the 12th March 2018.

IÉ-IM (2021), Introduction to Road-Rail Vehicles (RRV) for the Road Rail Vehicle Operator (RRVO), Version 14, 28/06/2021.

IÉ-IM (2021), Method Statement MS-D17-51-V1.1 07.06.2021.

IÉ-IM (2020), Personal Track Safety Handbook, Version 1.0, GB400/8/02.

IÉ-IM (2022), Report of Investigation: Member of staff struck by RRV during T3 Possession works (Cork) on the 6th of July 2022, R1102-2022_36.

IÉ-IM (2022), Safety briefing Ref: CCE SSB 387617 and CCE SSB 387618.

IÉ-RU (2019), Railway Undertaking's Mobile Device Policy, RU MED 1, Issue 2, operative since 29/06/2019).

RAIU (2019), Road Rail Vehicle occurrences on Iarnród Éireann Network from 2015 to 2018, (RAIU Report No: 2019 – R004), published on the 8th October 2019.