RAIU

Railway Accident Investigation Unit

# Investigation Report 2010-R001

## Collision of a Locomotive with Passenger Carriages at Plunkett Station in Waterford on the Limerick to Rosslare Line

## 29th of March 2009

## Document History

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### Function of the Railway Accident Investigation Unit

The Railway Accident Investigation Unit (RAIU) is a functionally independent investigation unit within the Railway Safety Commission (RSC). The purpose of an investigation by the RAIU is to improve railway safety by establishing, in so far as possible, the cause or causes of an accident or incident with a view to making recommendations for the avoidance of accidents in the future, or otherwise for the improvement of railway safety. It is not the purpose of an investigation to attribute blame or liability.

The RAIU's investigations are carried out in accordance with the Railway Safety Act 2005 and European railway safety directive 2004/49/EC.

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## Executive Summary

On the 29th of March 2009 at 20.12 hours the 17.35 hours service from Dublin to Waterford arrived on the Platform Line at Plunkett Station in Waterford. The carriages were uncoupled from the locomotive in order to move the locomotive from one end of the carriages to the other. The locomotive was moved over a set of points onto the Up Main Line. The train driver then tried to change cab to travel in the opposite direction but could not as the MU-2-B1 valve was defective and therefore drove from the rear cab of the locomotive without a shunter controlling the movement from the leading cab. The locomotive was incorrectly routed back onto the Platform Line towards the carriages by the signalman. When the train driver became aware the locomotive was mis-routed the train driver applied the brakes but the locomotive collided with the carriages. The coupling systems on all the carriages were damaged and the four wheels on one bogie of the first carriage struck derailed. A shunter who was at the rear of the carriages at the time was struck by the moving carriages. There were no fatalities. The shunter was hospitalised and released the same day. Two other members of staff who were in the carriages at the time of the collision suffered minor injuries. There were no passengers on the carriages at the time of the accident.

**Immediate cause, causal factor and contributory factors**

The immediate cause of the accident was:

- The route was not set correctly for the locomotive movement causing the locomotive to collide with the carriages.

The causal factor identified was:

- The locomotive movement was not controlled in accordance with the Iarnród Éireann Rule Book.

The contributory factors were:

- The lack of formal requirements for refresher training and assessment of signalmen in cabins where they work as a relief signalman;
- The locomotive was in service with a defective MU-2-B1 valve;
- The lack of train driver instruction in the correct operation of the MU-2-B1 valve.

**Recommendations**

- Iarnród Éireann should review their systems for training and competency management of signalmen ensuring working as a relief signalman is taken into account;
- Iarnród Éireann should ensure procedures are put in place for the operation and maintenance of the MU-2-B1 valves.

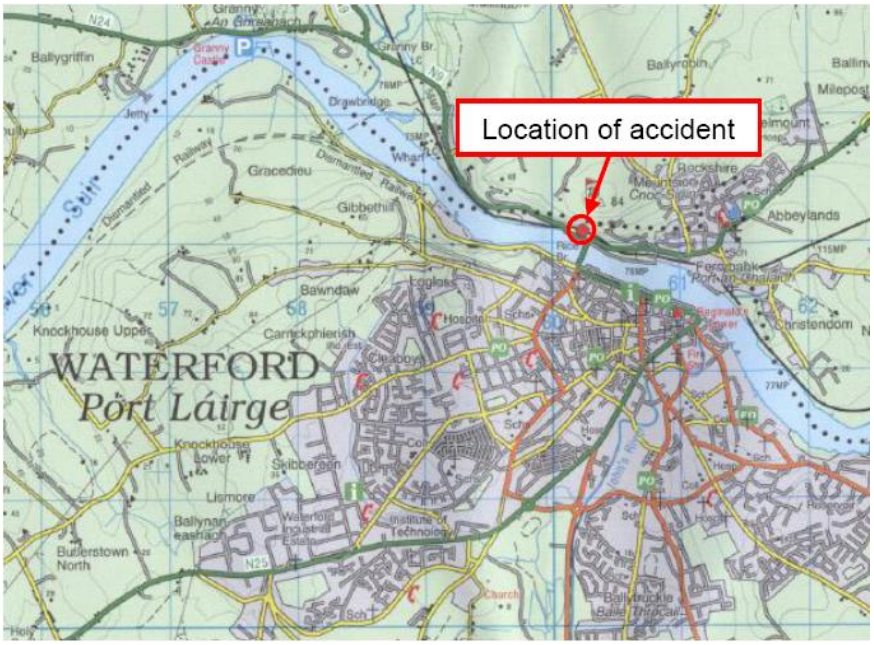
## Contents

# 1 Factual information

## 1.1 The accident

On the 29th of March 2009 at 20.12 hours (hrs)[1] the 17.35 hrs service from Dublin to Waterford (identification number A506) arrived at Plunkett Station in Waterford, see figure 1. The train was parked on the *Platform Line*[2] at platforms 3 and 4 in Plunkett Station where there was a change of train driver and the passengers left the train. The train arrived into Plunkett Station with cab number (no.) 2 leading. The *locomotive* was then to be moved from one end of the train to the other as shown in figure 2.

Figure 1 – Location Map

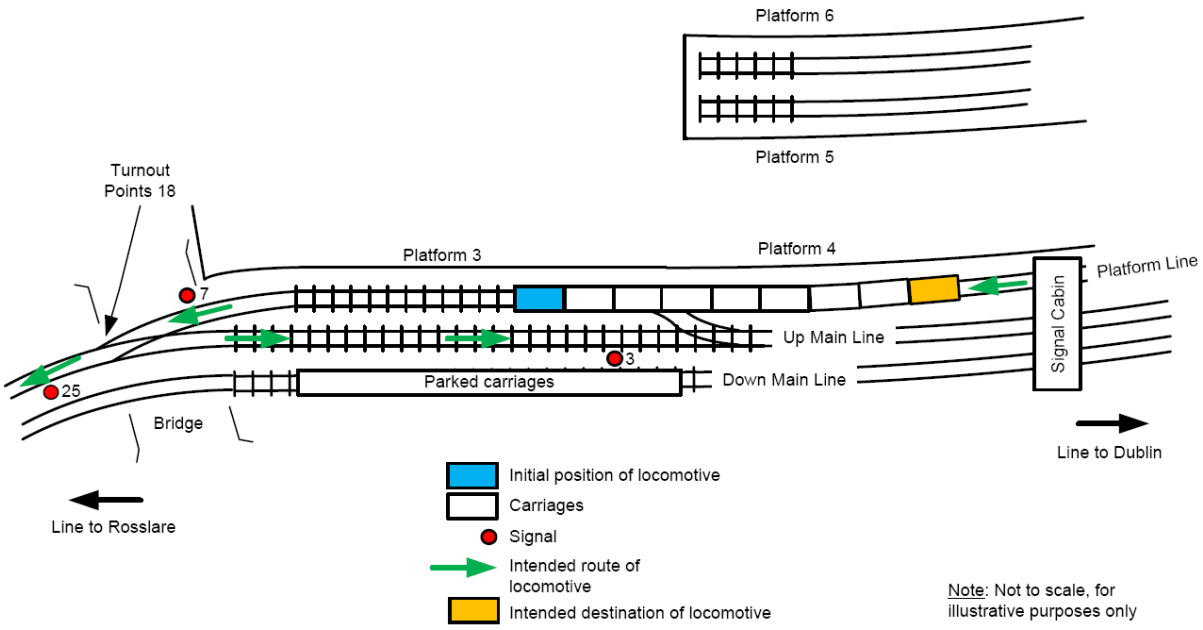





[1] All abbreviations are explained in the list of abbreviations.

[2] All terms in italics are explained in the glossary of terms.

Figure 2 – Station layout




The locomotive was uncoupled from the carriages by a *shunter*. The locomotive was driven to the end of the platform from cab no. 2 and stopped beside signal no. 7, see figure 3. The train driver contacted the *signalman* in the Waterford Central Cabin by radio to request the route to allow the movement of the locomotive to the opposite end of the carriages (as illustrated in figure 2).

Figure 3 – First movement of locomotive

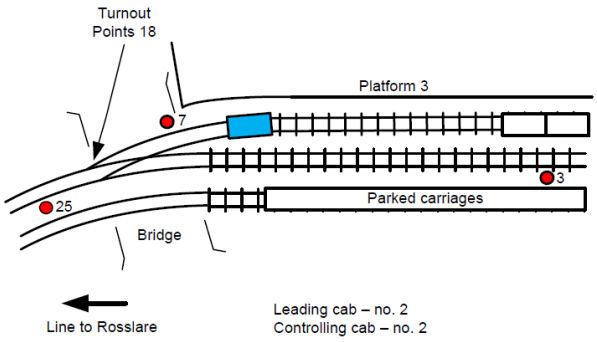
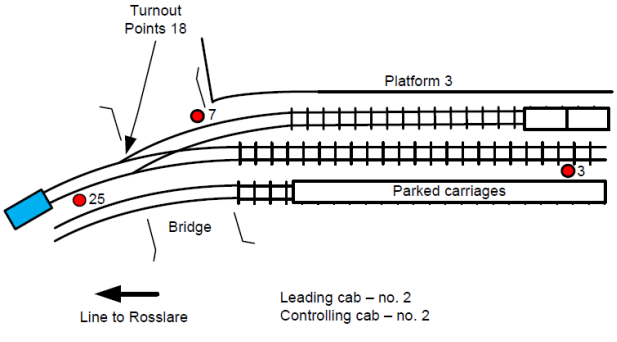



Figure 4 – Second movement of locomotive




The locomotive then travelled over a set of *points* moving from the Platform Line onto the *Up Main Line* where it stopped, see figure 4. The train driver tried to take cab no. 2 out of service in order to drive the locomotive from cab no. 1 at the opposite end, by operating a cut in/cut out valve. Several attempts were made to operate the valve but this was unsuccessful. The train driver remained in the cab no. 2 and waited for the proceed aspect on the no. 25 signal to continue the movement. Once this was given the locomotive proceeded in reverse with the train driver in cab no. 2.

The train driver could not see the next signal, no. 3, directly but observed the proceed aspect at signal no. 3 reflected in the windows of passenger carriages parked on the *Down Main Line*. The train driver continued the movement and then observed that the locomotive was travelling on the Platform Line instead of the Up Main Line. The train driver applied the locomotive brake, see figure 5, but the locomotive collided with the carriages, see figure 6.

Figure 5 – Train driver applies brakes

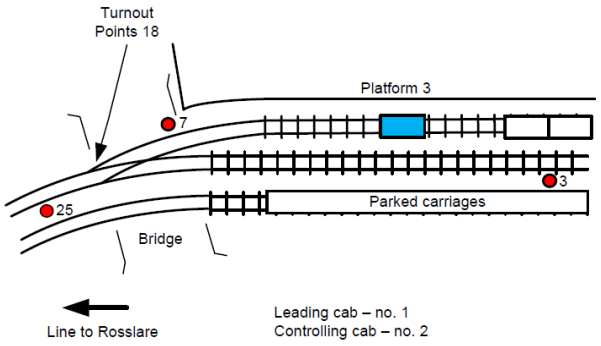
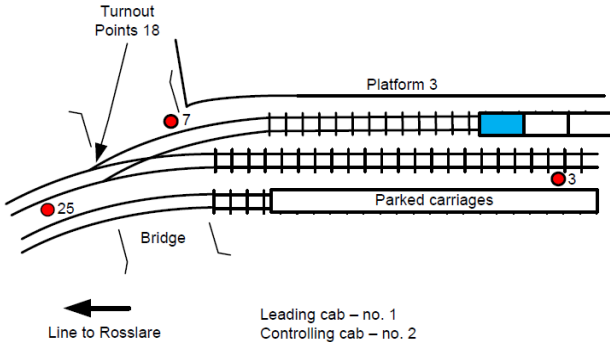



Figure 6 – Collision




The rear carriage of a train is normally fitted with *tail lights* indicating the rear of a train. While the train driver was moving the locomotive, the shunter had climbed onto the track at the rear end of the carriages and was removing the tail lights from the carriage. The shunter observed that the locomotive was travelling towards the carriages on the Platform Line and turned to move away from the carriages but was struck by the rearmost carriage and fell forward onto the track. Two members of staff who were on the carriages fell over. There were no passengers on the carriages at the time of the collision. The carriages moved approximately 3.4 m and all four wheels of the second bogie on the carriage struck by the locomotive derailed.

The accident occurred during hours of darkness. The weather at the time was cloudy and it had just stopped raining. The temperature was 8 degrees Celsius.

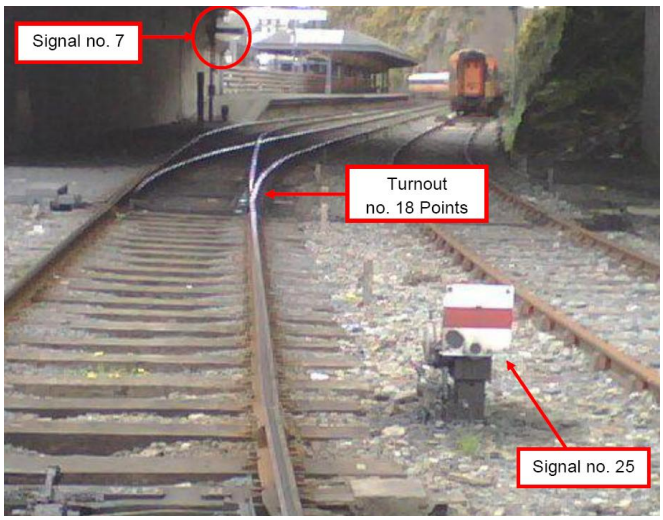
### 1.2 Infrastructure

Plunkett Station is located at the 75 ¾ milepost measured from Mallow via Fermoy on the Limerick to Rosslare Line. The station is positioned on a curve. There is a road bridge over the railway line at the Rosslare end of the station. As the track passes under the road bridge the track starts to curve in the opposite direction. There is a rock face on the opposite side of the tracks from the station beside the Down Main Line. The Down Main Line is not used in normal train running and is used to store carriages. See figure 2 and photo 1.

The track at Plunkett Station is ballasted with jointed rail on wooden sleepers. The rail is a combination of 87 lb (pound) Bullhead rail and 50 kg (kilogram) Flatbottom rail. Based on derailment marks on the track, the carriages moved approximately 3.4 m due to the impact. There is a *turnout* connecting the Platform Line to the Up Main Line, at the Rosslare end of the station at the end of platform 3 referred to as the no. 18 points.

The platform area in Plunkett Station is lit at night, there is no lighting beyond the ends of the platforms. The signals are backlight during hours of darkness for visibility. To visually check the direction the points are set for, the train driver relies on the train headlights.

Photo 1 – Plunkett Station from Rosslare side




## 1.3 Signalling and communications

### 1.3.1 General description

The signalling system in Plunkett Station is a combination of *mechanical signal control* and *electro-mechanical signal control*. Movements are controlled locally by a signalman in the Waterford Central Signal Cabin over the railway line at the Dublin end of Platform 4.

There are *track circuits* to show the presence of a train at platforms 3, 4, 5 and 6 as well as on the Up and Down Main Lines as far as the end of the Platform Line on the Rosslare side.

The no. 7 signal is a *semaphore signal* positioned on the track at the Rosslare end of the Platform Line, see photo 2. The no. 25 signal is a mechanically operated *disc* on the ground between the Up Main Line and the Down Main Line, see photo 3. The no. 3 signal is a *colour light signal* suspended over the railway line between platforms 3 and 4.

Photo 2 – Signal no. 7

Photo 3 – Signal no. 25

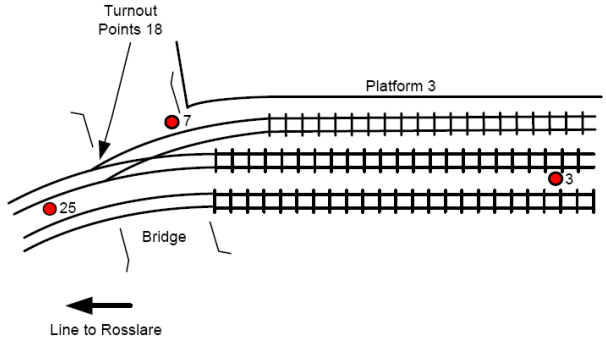
The turnout at the Rosslare end of the Platform Line, no. 18 points, is operated by the signalman in the Waterford Central Cabin by pressing a push button to release the lever and moving the lever. The position of the points is detected electrically and indicated by the lights on the direction release, see photo 4.

Photo 3 – Waterford Central Cabin

Photo 4 – Turnout direction release button


The distances between the signals and the points are indicated in figure 7.

Figure 7 – Distances between elements




From signal no. 7 to signal no. 25 - 66 m

From no. 18 points to signal no. 25 - 14 m

From signal no. 25 to signal no. 3 - 244 m

Communication between the signalman and train drivers is over an open channel radio system referred to as mode C. This provides communication between the signal cabins and train radios.

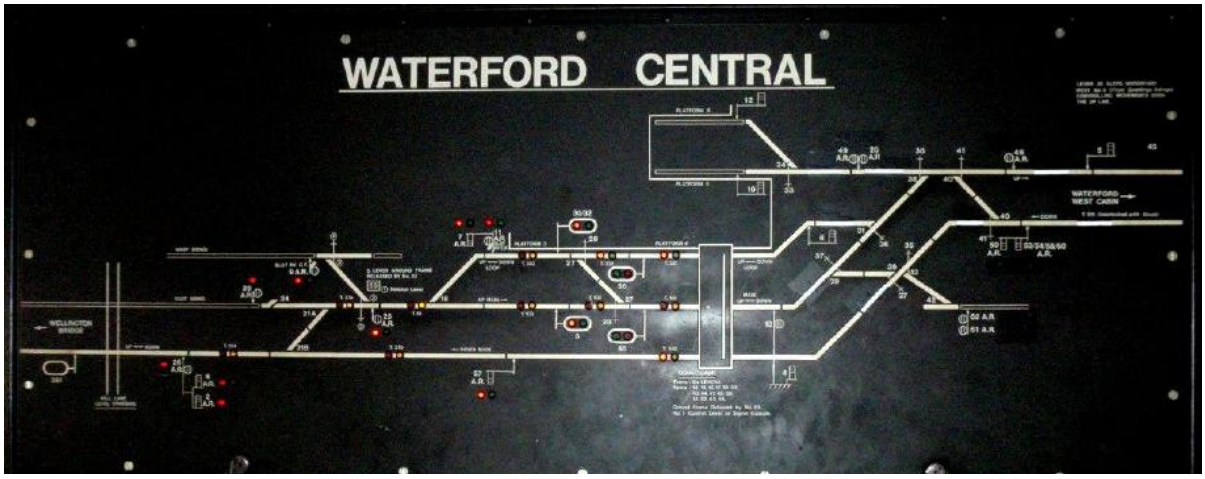
### 1.3.2 Route setting

Waterford Central Cabin has a signal panel above the levers to assist the signalman to set routes and control movements in the station area, see photo 2. The panel has track circuit indicators and signal indicators that show red or green lights as indicated in table 1.

Table 1 – Signal panel indications

| Indicator Colour | Track Circuit Indicator | Signal Indicator |
|---|---|---|
| Green | Track unoccupied | Proceed aspect for train driver |
| Red | Track occupied | Stop aspect for train driver |

Photo 2 – Signal panel for Waterford Central Cabin




In order to set the movement from the Rosslare side of Plunkett Station on the Up Main Line to the other end of the carriages on the Platform Line, the signalman needed to set the route for the locomotive to travel past the no. 40 points beyond the carriages. To do this the levers for signals no. 25, 3 and 7 as well as points no. 18, 39 and 40 all need to be set correctly. In order to release the levers for the points, the signalman must press the push button for each of the points in order to release the lever.

The signalman pulled the levers to set signals no. 25, 3 and 7 as well as pressing the buttons and moving the levers for points no. 39 and 40, see photo 3. This gave the train driver a proceed indication at signals no. 25 and 3.

While setting the route for the locomotive on the night of the 29th March 2009 the signalman omitted to press the control button and move the lever to change the turnout direction at the no. 18 points for the movement, see photo 4.

The direction the turnout at the no. 18 points is set for is indicated by the lighting of the turnout release button light, see photo 4. Signal no. 25 does not indicate if the route is set to travel on the Up Main Line or the Platform Line, it simply indicates if the train driver has permission to proceed past the signal or not. When setting a route past signals no. 25 and 3 over points no. 18, the signal panel will display the track circuit indicators and the signal indicators as green if the route is clear regardless of whether or not the no. 18 points are set for the intended direction. The panel was showing green indications for the track circuits and signals along the route on the Up Main Line, meaning that the track was clear of other trains and the signals were showing a proceed aspect for the locomotive.

## 1.4 Traction and rolling stock

### 1.4.1 General description

The *rolling stock* involved consisted of a class 201 locomotive, identification number 232, and Mark III carriages: 7148, 7119, 7105, 7112; dining carriage 7410; 7167; and generator van carriage 7607.

Locomotive 232 is a class 201 locomotive manufactured by General Motors in 1994. These locomotives have a cab at both ends and can be driven from the left or right side of both cabs. They are equipped with Hasler Teloc *event recorders*. They have a braking rate of 0.4 metres per second squared ($m/s^2$). Movement of the locomotive is controlled by a notched traction controller that is operated by the train driver, there is an idle notch and 8 traction notches (from 1 to 8). The traction effort increases as the notch number increases meaning that the locomotive will accelerate faster. The mass of the locomotive was 107,000 kilograms (kg). A locomotive is referred to as a *light engine* when it is not coupled to any other vehicles.

The carriages and generator van are Mark III rolling stock manufactured by British Rail Engineering Limited starting in 1984. The total mass of the carriages and generator van was 248,000 kg.

### 1.4.2 Locomotive cab selection

Each cab of the 201 locomotives has an MU-2-B1 valve. In order to drive a locomotive from one of the cabs the MU-2-B1 valve for other cab must first be cut out and then the MU-2-B1 valve for the cab being used to drive must be cut in. This allows the brakes to be released in order to move the locomotive. The valve is operated by pulling on the spring loaded lever which lifts a pin inside the valve allowing the train driver to turn the handle between the cut in and cut out positions, see photo 5. No operating instructions are available to the train drivers for the valve.

Each locomotive has a log book for train drivers to record faults for the attention of maintenance personnel. The MU-2-B1 valve in cab no. 2 was recorded in the log book for locomotive 232 as not cutting out on the 24th of February 2009. The detent pin inside the valve, which allows the valve to be cut in and out, was found to be broken. The handle, lever and shaft as well as the associated components including the detent pin were replaced on the 24th of February 2009.

The previous train driver advised the train driver who was to move the locomotive that there were difficulties cutting out the MU-2-B1 valve in cab no. 2 when the train stopped at Kilkenny. The fault was not recorded in the log book by the previous train driver.

There is no written requirement to maintain the MU-2-B1 valve or carry out pre-service inspections on it. IÉ advised that the valves are overhauled every four years during the heavy locomotive maintenance. Following the accident, examination of the MU-2-B1 valve revealed that the detent pin inside the valve was bent, see photo 6. This would have required the train driver to manipulate the lever in order to turn the handle.

Photo 5 – MU-2-B1 Valve

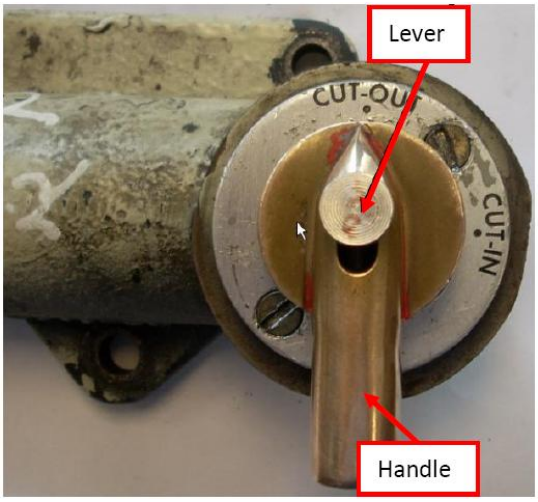
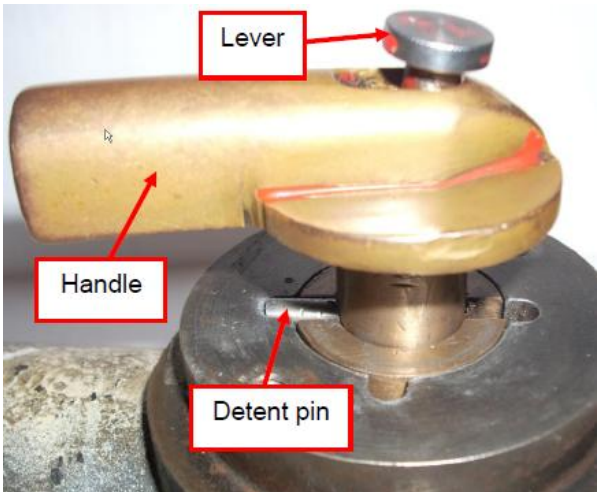



Photo 6 – Damaged detent pin




### 1.4.3 Vehicle movements

From the event recorder data on 232 as well as the final position of the locomotive and carriages it was possible to establish the original locations and movements of the locomotive and carriages. The steps involved in the final movement of the locomotive are broken down in table 2.

Table 2 – Locomotive movements

| **Event** | **Speed (km/h)** | **Distance travelled (m)** | **Time (s)** |
|---|---|---|---|
| Locomotive starts to move | 0 | 0 | 0 |
| Locomotive starts to move over 18 points back onto the Platform Line | 18 | 28 | 12.5 |
| Locomotive reaches 28.5 km/h | 28.5 | 95 | 22 |
| Train driver applies brakes | 28.5 | 172 | 31.5 |
| Locomotive collides with carriages | 28.6 | 215 | 37 |
| Locomotive brakes start to apply | | 217 | 37.5 |
| Locomotive stops | 0 | 218 | 38 |

(Note: Values are approximate)

The locomotive had travelled 100 m when it stopped on the Platform Line before the no. 7 signal, see figure 4. The locomotive then moved another 115 m and stopped 14 m beyond the no. 25 signal, see figure 5, before starting to move back towards the station. The locomotive travelled 218 m during the final move, this move took 38 s from when the locomotive started moving until it came to a stop, see figure 6.

The locomotive took the wrong route and started to travel back onto the Platform Line at 18 km/h. The train driver applied the locomotive brakes 43 m before the collision, see figure 5. The *brake reaction time*, which is the time for the brake pressure to build up and react to a train driver brake application, was 6 seconds. The locomotive was travelling at 28.6 km/h at the time of the collision, see figure 6.

Following the impact, the carriages were positioned 204 m from signal no. 25. Based on the derailment marks the carriages had been positioned approximately 200.6 m from signal no. 25 before the impact.

## 1.5 Operations

### 1.5.1 General description

The train was to be moved from the Platform Line to allow another train arrive approximately 40 minutes later. In order to do this the locomotive had to be moved from one end of the carriages to the other as a light engine. The maximum speed for light engine movements in Plunkett Station at 30 km/h. These movements are covered in the IÉ Rule Book[3] as well as the IÉ General Appendix[4].

The train driver moved the locomotive to the end of the Platform Line and stopped at signal no. 7. The train driver then contacted the signalman to ensure the signal was set for the locomotive to proceed as the signal was not displaying a proceed aspect. The signalman confirmed that the locomotive could proceed.

The train driver then moved the locomotive onto the Up Line and stopped beyond signal no. 25. The MU-2-B1 valve could not be cut out when the locomotive stopped on the Rosslare side of signal no. 25. This meant that the locomotive should have been driven under rules relating to movements driven from other than the leading cab.

The movement was to be carried out under the control of a person at the leading end of the movement, either in the leading cab or on the ground. The maximum permitted speed for the move was 30 km/h but was not to exceed the speed from which the person controlling the move can stop the vehicle based on their being able to see the line is clear.

The locomotive proceeded from signal no. 25 in the Dublin direction with the movement being controlled from the rear cab of the locomotive.

Signal no. 25 is a disc signal, this means that when a proceed aspect is given the movement is to be carried out cautiously as the line may be occupied and it should be possible to stop the movement short of any obstruction.

[3] Iarnród Éireann (November 2007), Rule Book.

[4] Iarnród Éireann (September 2007), General Appendix.

### 1.5.2 Staff

The shunter had 7 years experience. All competency records were found to be in date. The shunter was rostered to work as a train guard that day and finish work when the train arrived in Plunkett Station. There was no one on duty to assist with the locomotive movement at Plunkett Station when the train arrived, this meant that the train guard was asked to assist with the movement of the train from the Platform Line.

The train driver had been working for IÉ for 44 years and was driving trains for 27 years. The train driver's competency records were found to be in date. Train drivers are not instructed on how to operate the MU-2-B1 valve. Train drivers are trained to be aware that disc signals, such as the signal no. 25, allow travel on either line. The train driver was not aware that it was possible for a proceed aspect to be displayed at signal no. 3 when the no. 18 points had not been set for the intended route.

The signalman had been working as a signalman for 18 years. The signalman normally worked the Waterford West Cabin. The signalman's competency records were found to be in date. These did not address any issues specific to Waterford Central Cabin. The signalman worked as a relief signalman in Waterford Central Cabin and had previously worked the Waterford Central Cabin on the 8th March 2009. The signalman had worked Waterford Central Cabin four times in 2008. Signalmen undergo informal refresher training on Cabin working if the cabin is not worked in the previous six months, however, this is not a formal written requirement. Signalmen are assessed annually on working their normal cabin. There is no requirement to carry out annual assessments of signalmen in the Cabins where they work as relief signalmen.

## 1.6 Fatalities, injuries and material damage

### 1.6.1 Fatalities and injuries

The shunter was hospitalised and released the same day. Two other members of staff suffered minor injuries.

### 1.6.2 Infrastructure damage

There was no damage to infrastructure due to the accident.

### 1.6.3 Traction and rolling stock damage

The locomotive suffered damage to the buffer housing and a buffer location pin was sheared.

The gangways on all carriages and the generator van were damaged. The coupling system draw gear and buckeyes on carriages 7112 and 7148 were damaged. Numerous ceiling light covers fell due to the impact.

## 1.7 History of accidents

There were three collisions between locomotives and rolling stock in the last ten years prior to the accident:

- A locomotive collided with empty wagons at Kilmastulla sidings on the 6th October 2006 – the collision occurred at 30 km/h and the locomotive was damaged beyond repair;
- A locomotive collided with passenger carriages at Mallow Station on the 5th October 2005 – the collision is believed to have occurred at less than 5 km/h and three passengers attended hospital when the train arrived in Cork;
- A locomotive collided with passenger carriages at Kilkenny Station on the 31st August 2001 – the collision occurred at 16 km/h and ten passengers attended hospital for minor injuries.

# 2 Analysis

## 2.1 Signalman training and competency management

Carrying out the intended movement relied on the signalman remembering to change the direction of the no. 18 points for the route. The signalman omitted to set the no. 18 points for the movement. The signal panel did not identify this as the no. 18 points are not linked to the route indication on the panel, therefore the signalman was not aware of this omission.

Signalmen undergo annual competency assessment. The signalman normally worked at Waterford West Cabin and only worked as a relief signalman in Waterford Central Cabin approximately four times a year. There was an informal requirement for the signalman to undergo refresher training on the Waterford Central Cabin if it had not been worked in the previous six months. There was no formal requirement for the signalmen to undergo refresher training in cabins where they worked as a relief signalman.

## 2.2 Control of movement

In this instance the train driver was not able to cut out the MU-2-B1 valve to change cab and remained in the rear cab (cab no. 2). The combination of the fact that the train driver could see signal no. 25 and the reflection of signal no. 3 in the parked carriages may have led the train driver to incorrectly believe it was safe to carry out the move.

The MU-2-B1 valve was found to be defective following the accident. The component had been replaced 1 month prior to the accident. There was no formal maintenance requirement for the MU-2-B1 valve and its operation was not part of the daily or weekly pre-service checks. The lack of pre-service checks of the valve meant that it was possible for a locomotive to enter service with a faulty valve.

There were no instructions for train drivers on the correct operation of this valve and the requirement to move the lever in order to turn the handle. This meant that there was possibility of train drivers not operating the valves correctly and causing damage to them.

The movement being controlled from the rear cab would have resulted in delayed awareness of the incorrect routing of the locomotive.

## 3 Relevant actions already taken or in progress

As of the 26th of February 2010, IÉ had advised that the following actions had been taken in relation to the accident:

- The signalman was given corrective coaching;
- All Waterford based train drivers received a briefing on the relevant key learning points from this accident identified in the IÉ investigation;
- Locomotive hauled carriages were replaced by *diesel multiple units* with driving cabs at both ends for this service;
- A briefing plan for the correct use of MU-2-B1 valves has been developed which will cater for existing train drivers and new recruits;
- The 6 monthly maintenance examination of locomotives ('D' exam) will include a check of the condition of the MU-2-B1 valve.

The train driver has since retired.

## 4 Conclusions

The locomotive struck the carriages as it was incorrectly routed back onto the Platform Line. As the movement was being controlled from the rear cab it was not immediately obvious that the locomotive was travelling back towards the carriages. When the mis-routing became apparent to the train driver, the brakes were applied but the locomotive collided with the carriages.

The risk of recurrence of similar accidents in Plunkett Station is mitigated by the replacement of locomotive hauled carriages by Diesel Multiple Units with driving cabs at both ends.

### Immediate cause, causal factor and contributory factors

The immediate cause of the accident was:

- The route was not set correctly for the locomotive movement causing the locomotive to collide with the carriages.

The causal factor identified was:

- The locomotive move was not controlled in accordance with the IÉ Rule Book.

The contributory factors were:

- The lack of formal requirements for refresher training and assessment of signalmen in cabins where they work as a relief signalman;
- The locomotive was in service with a defective MU-2-B1 valve;
- The lack of train driver instruction in the correct operation of the MU-2-B1 valve.

## 5 Recommendations

Based on the conclusions it has been determined that recommendations[5] were warranted in the areas identified below.

The signalman worked in Waterford Central Cabin infrequently. The risks relating to the signalman omitting to remember all of the steps required to correctly route the locomotive were not managed as the training and competency management system for signalmen was found not to cover signalmen working as a relief signalman in a cabin other than their normal workplace. This has led to the recommendation:

> **IÉ should review their systems for training and competency management of signalmen ensuring working as a relief signalman is taken into account.**

The MU-2-B1 valve was found to be defective resulting in the train drivers having to manipulate the lever in order to operate the valve. The testing of MU-2-B1 valves is not part of the pre-service checks, which are intended to ensure locomotives are functioning correctly when they enter service. In addition, train drivers were not instructed in the correct operation of the MU-2-B1 valve, which led to unintentional damage to the detent pin of the valves, leading to the recommendation:

> **IÉ should ensure procedures are put in place for the operation and maintenance of the MU-2-B1 valves.**

[5] Recommendations shall be addressed to the safety authority and, where needed by reason of the character of the recommendation, to other bodies or authorities in the Member State or to other Member States. Member States and their safety authorities shall take the necessary measures to ensure that the safety recommendations issued by the investigating bodies are duly taken into consideration, and, where appropriate, acted upon. (Railway Safety Directive, 2004/49/EC)

## 6 Previous RAIU Recommendations

The following is a list of previous RAIU reports and their recommendations that are relevant to this investigation.

'Collision of a train with the gates of level crossing XH066, Bridgetown, on the Limerick Junction to Rosslare Strand line' (Reference number 08120201):

- The Railway Safety Commission should audit Iarnród Éireann's training and competency management systems to verify its effectiveness.

This recommendation was issued on the 1 December 2009 and is in the process of being implemented.

# 7 Additional information

## 7.1 List of abbreviations

| | |
|---|---|
| Hrs | Hours |
| IÉ | Iarnród Éireann |
| Kg | Kilogram |
| Lb | Pound |
| M | Metre |

## 7.2 Glossary of terms

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| Brake reaction time | Time taken for the braking system to react to a brake application. |
| Colour light signal | An electric signal that displays a coloured lamp to indicate if a train has permission to pass the signal or not. |
| Disc | Small signal that rotates, displaying an red line horizontal or at 45 degrees to horizontal to indicate if a train has permission to pass the signal or not. |
| Diesel multiple unit | A railway vehicle capable for propelling itself. |
| Down Main Line | The line on which trains normally travel in a direction away from Dublin. |
| Electro-mechanical signal control | Signal control by means of electrical circuits which operates mechanically. |
| Event recorder | Device that records information from pre-defined pieces of equipment on a train. |
| Light engine | A locomotive travelling without any other rail vehicles connected to it. |
| Locomotive | A rail vehicle that is designed to move other rail vehicles. |
| Mechanical signal control | Signal control by mechanical means through the movement of levers to pull wires and change a signal aspect. |
| Platform Line | Railway line nearest to platforms 3 and 4. |
| Points | Section of track that moves to allow movement of a train from one line to another. |
| Rolling stock | Rail vehicles. |
| Semaphore signal | A mechanical signal controlled by levers at a groundframe through wires that run from the signal to the groundframe that displays an arm horizontal or at 45 degrees to horizontal to indicate if a train has permission to pass the signal or not. |
| Shunter | A person who directs and controls certain movements of rail vehicles as defined in their duties, including coupling and uncoupling of rail vehicles. |
| Signalman | A person who controls the movement of rail vehicles from a signal cabin. |

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| Tail lights | Red light fitted to the rear of a train to indicate to staff that the entire train has passed and no part has become detached. |
| Track circuit | An electrical train detection system that checks for the absence of a train. |
| Turnout | A junction with a set of points to allow travel on one of two routes, the direction of which depends on the position the points are set to. |
| Traction | Means of providing power to move rail vehicles. |
| Up Main Line | The line on which trains normally travel in a direction towards Dublin. |