



**Near miss at Ballymurray level crossing on the 14th of June 2008
between Athlone and Westport**

Report 08061401 (issued 11th of May 2009)

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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 14th of June 2008 at 8.50 hours an empty Diesel Multiple Unit, identification number J851, travelling from Manulla Junction to Dublin, passed through the raised barriers of Ballymurray level crossing, XM 075. Approximately two seconds prior to the Diesel Multiple Unit passing, a car crossed through the level crossing and as Diesel Multiple Unit crossed the crossing another car approached but came to a stop.

The incident was a result of poor communications between staff involved in the maintenance of the Automatic Half Barrier. Staff had worked together regularly in the past, leading to familiarity and an informal approach to communications. The lack of a formal maintenance process, that should include a safe system of work, would also have contributed to the incident.

Immediate cause, contributory factor, underlying causes

Immediate cause:

- The barriers were raised to road traffic while maintenance works was being carried out, as a train approached.

Contributory factors:

- Poor communication between the signalman and the Special Class Linesman led to a misunderstanding of when there was a safe margin between trains to allow the maintenance work to be carried out;
- Staff had worked together regularly in the past and this familiarity led to an informal approach to communications and therefore did not follow communication procedures.

Underlying cause:

- Lack of a formal maintenance process for the maintenance of Automatic Half Barriers which should include the communications process and when it was safe to commence work;
- Lack of competence auditing system for communications procedures.

Recommendations

- Iarnród Éireann should ensure all safety critical staff have undertaken safety critical communications training and that their ongoing competency management systems specifically monitors the quality of safety critical communications.
- Iarnród Éireann should put in place safe work methods for the maintenance of AHBs, these methods should include risk assessments for any hazards identified in the maintenance of AHBs.

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1 Factual information

1.1 The incident

On Saturday the 14th of June 2008 at 8.50 hours (hrs) an empty Diesel Multiple Unit (DMU), identification number J851, which was carrying out an empty transfer movement, travelling from Manulla Junction to Dublin, passed through the raised barriers of Ballymurray level crossing, which is an Automatic Half Barriers (AHB) type level crossing. Approximately two seconds prior to the DMU passing a car crossed through the level crossing. The incident was recorded on closed-circuit television (CCTV) of which the following photographs are taken at one second intervals:



A car approaches the crossing



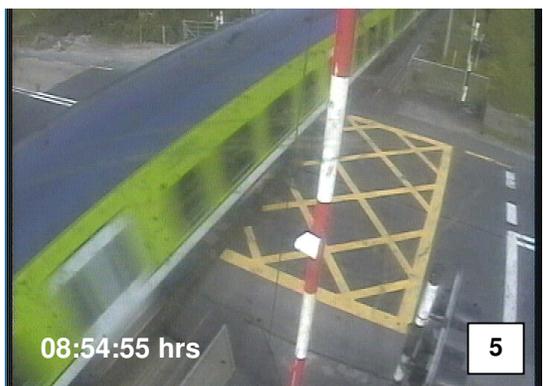
The car drives through the crossing



The car clears the crossing



A train approaches the crossing while the barriers are raised



The train drives through the crossings while the barriers are raised



A car approaches, but stops, at the crossing while the barriers are raised and the train is crossing

1.2 Personnel involved in incident

The personnel involved in the incident were all experienced rail staff who had carried out this type of maintenance in the past.

Personnel involved in the incident were as follows:

- Signalman The Mayo Line signalman based at Athlone;
- SCL A Special Class Linesman (SCL), part of the Signalling, Electrical and Signalling (SET) maintenance staff. SCL A was in contact with the Signalman in relation to the maintenance works and was responsible for switching the barrier to manual operation;
- SCL B SCL who was carrying out maintenance works on and was in contact with SCL A in relation to carrying out works on the line.

1.3 Incident description

On Saturday the 14th of June 2008 SCL A & SCL B were carrying out routine maintenance work at the AHB at Ballymurray and other AHBs in the area when the following events occurred resulting in the incident:

- 07:25:00 hrs An empty DMU departed from Manulla Junction, travelling to Dublin;
- 07:49:00 hrs SCL A contacted the Signalman, using the telephone provided at the AHB, to advise him of the maintenance work to be carried out at Ballymurray AHB, which involved switching the barrier to manual and dropping track circuits. The signalman advised SCL A that he had approximately 30 minutes to carry out the maintenance works and that SCL B would have time to work on one side of the crossing;
- 08:15:34 hrs SCL A contacted the Signalman, again using the telephone at the AHB, and asked the signalman if there was a train near Ballymurray AHB as they were preparing to start work on the other side of the crossing. The Signalman informed SCL A that there was a train in Castlerea and that it was on time. SCL A then advised the Signalman that he would phone back when SCL B was in position;
- 08:53:11hrs SCL A phoned the Signalman, again using the telephone at the AHB, and asked the Signalman for permission to work at Ballymurray AHB as the work he was undertaking would cause detection in a track circuit being interrupted. The Signalman advised SCL A that a railcar had gone out into the section and that the 'Up direction' passenger train had not left Athlone. SCL A then asked the Signalman if the train had left Athlone as it would only take 5 to 10 minutes to carry out their work. The Signalman advised SCL A that the train would be there very shortly and that he could work away when the train went by. SCL A told the Signalman that he would contact him when the work

- was carried out;
- 08:54:00 hrs At approximately 08:54 hrs the empty railcars (J851) initiated the AHB at Ballymurray Level Crossing;
- 08:54:35 hrs Ballymurray barriers completed the automatic lowering sequence against on coming road traffic;
- At the same time SCL A switched Ballymurray AHB to manual. This resulted in the initiation of the barriers being raised and the consequent extinguishing of the road traffic lights.
- 08:54:40 hrs *This resulted in a critical alarm fault registering for this crossing on the signalman's Visual Display Unit (VDU);*
- 08:54:50 hrs SCL A switched the Ballymurray AHB to automatic and the barriers started to rise;
- The fault alarm was acknowledged by the Signalman;*
- 08:54:53 hrs A car passed from the south west of the crossing with the barriers in the raised position;
- 08:54:55 hrs The empty train passed over Ballymurray Level Crossing with the barriers in the raised position;
- 08:54:57 hrs A second car approaches and stops at the crossing while the train passes through the crossing with the barriers in the raised position.

SCL A, on seeing the train, puts Ballymurray AHB back to automatic operation. SCL B, who is carrying out maintenance works at Curry Level Crossing (XM072), south of Ballymurray AHB, hears the train and moves off the track.

1.4 Actions post incident

The train driver made an emergency brake application when he saw the car pass through the level crossing which brought the train to a halt past the crossing. The train driver then called the signalman to inform him that he had passed through the level crossing with the barriers raised, he also talked to SCL B, at Curry Level Crossing, to inform him of the incident. The train driver then continued on to Athlone when authorised by the signalman.

The signalman contacted SCL A, by mobile phone, to inform him that a critical alarm appeared on his VDU, the SCL A then informed him of the incident. He then contacted Central Traffic Control and the District Manager to report the incident. SCL A switched the AHBs to automatic. The signalman and SCL A were tested for drugs and alcohol after the incident, the results of which were negative.

1.5 Damage / injuries

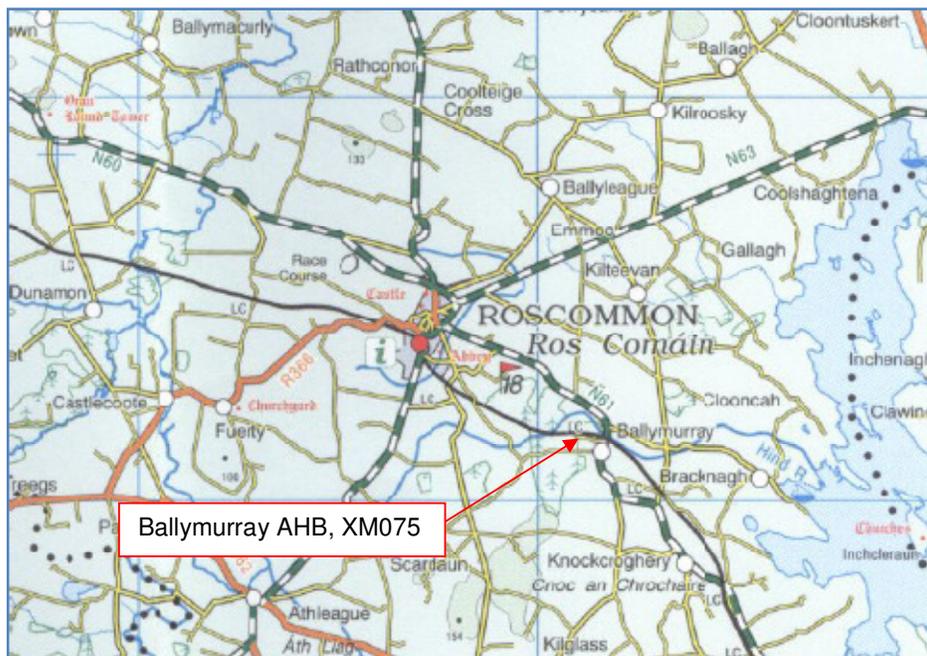
There was no damage to the train, the railway infrastructure, the level crossing or the surrounding environment as a result of this incident. There were no injuries.

1.6 The level crossing

1.6.1 Description of the level crossing

Ballymurray level crossing, identified as XM075, is situated at 92 miles 1613 yards on the Athlone to Westport line in the Knockcroghery to Roscommon section (see figure 1). The crossing is situated on the N61, the national secondary road between Athlone and Roscommon. The crossing is in County Roscommon, approximately three miles from Roscommon town and fifteen miles from Athlone.

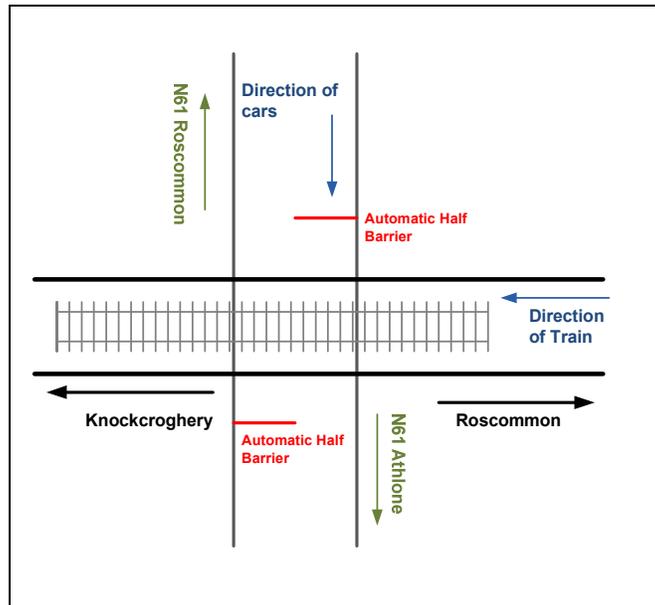
Figure 1 – Ballymurray AHB location map



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The level crossing, XM075, is an AHB type crossing. This type of crossing prevents access by means of two half-barriers that block the flow of road traffic, but not the exits (see figure 2). The level crossing is protected by traffic light signals, audible warning devices and the half-barriers. The operation of the lights and sirens followed by the lowering of the barriers is initiated automatically as the train approaches the crossing. The barriers raise automatically once the train has passed. The crossing equipment is supervised from a manned location (in this case Athlone).

Figure 2 – Site map of Ballymurray AHB



Telephones are provided for public use and connected to the supervising point in Athlone. The level crossing meets the Railway Safety Commission's 'Guidelines for the Design of Railway Infrastructure & Rolling Stock', Section 5, Level Crossing. The road traffic activity at the level crossing is recorded by CCTV and a signal post telephone is provided at the crossing for direct communication with the controlling signalman. Calls on this telephone are recorded.

1.6.2 Level crossing risk assessment

In 1999, consultants A D Little developed a level crossing risk assessment model for IÉ. This model was created to identify level crossings judged to need priority investment to reduce risk. From this model, XM075 was deemed to be a high risk level crossing. There have been a number of traffic incidents / accidents at the crossing.

1.6.3 Maintenance of the level crossing

Maintenance at XM 075 was carried out every eight weeks.

1.7 The railway infrastructure

The line between Athlone and Westport is a single line, continuously welded rail track. The line speed on this section is 110 km/h (70 mph), there were no temporary speed restrictions in effect on the day of the incident.

1.8 Signalling and communications

The Athlone to Westport line is signalled under a system known as 'Track Circuit Block' system (TCB). Colour light signals are provided throughout the section and are controlled by the Mayo Line Signaller, who is located in Athlone. On the line there is a discrete train radio system for trains which gives direct contact on a closed channel between the train driver and the Mayo Line Signaller at Athlone and also between the train driver and the traffic regulator based in Central Traffic Control (CTC), Dublin. Lineside telephones are provided at stations and lineside signals. These give a direct connection to the Mayo Line Signaller at Athlone.

1.9 The train

The train was a Class 2600 Diesel Multiple Unit (DMU), identification number J851. The Class 2600s entered service in 1994. The train was driver only operated. The Class 2600 DMUs have a tare weight of 81,400 kg. The maximum service speed is 110 km/h. The maximum service braking rate is 0.88 m/s². The emergency braking rate is 0.96 m/s². The braking system is a two pipe air pressure brake system with wheel mounted disc brakes.

1.10 History of accidents/incidents at the crossing

There have been a number of road traffic related incidents at XM 075. However, there are no known incidents directly related to Iarnród Éireann maintenance works.

- On the 25th of January 2001 there was a reported near miss when a lorry broke through the barrier;
- On the 1st of May 2002 there was a reported near miss when a lorry broke through the barrier in front of a train, and the train hit the broken barrier;
- On the 15th of July 2002 there was a reported near miss when a barrier was struck by a lorry as a train approached;
- On the 1st of June 2004 there was a reported near miss when a van drove through the barriers forty-seven seconds prior to a timber train passing through the crossing when travelling from Westport to Athlone;
- On the 10th of November 2004 the barrier was struck by a road vehicle;
- On the 26th of May 2005 the barrier was struck by a road vehicle;
- On the 25th of August 2005 a car struck a post beside Ballymurray level crossings and dragged a warning sign over the crossing;
- On the 31st August 2005 the barrier was struck by a road vehicle;
- On the 21st of November 2005 there was a reported near miss when a car drove around the lowered barriers as a train passed;

- On the 21st of February 2007 there was a reported near miss as a car failed to stop at the level crossing;
- On the 1st of December 2007 a car damaged the crossing surface.

1.11 Iarnród Éireann Procedures

1.11.1 The Iarnród Éireann Rule Book, Section A, Part 3: Communications

Section A, Part 3 of the rule book details communication procedures.

Paragraph 3.1, the basic principles of communications state:

- messages concerning safety must be properly understood by both parties;
- you must ensure that the person understands correctly who and where you are;
- you must ensure that your message is correctly understood before ending the conversation.

Paragraph 3.3, details what you must do to ensure your message is properly understood:

- first say who you are and where you are;
- if you are the signalman, give the name of the signal box where you are located;
- check you are speaking to the correct person at the right place;
- give your message clearly, slowly and concisely;
- ask the person receiving the message to repeat it to you.

Paragraph 3.4, details what you must do to ensure you receive a message correctly:

- when answering the radio or telephone, identify yourself and your location to the caller;
- repeat the message to enable the caller to ensure you have correctly understood it.

1.11.2 The Iarnród Éireann Rule Book, Section B, Part 1: General instructions to all persons

Section B outlines instructions to persons having duties on or near the line, or on trains or vehicles, or at passenger stations. Paragraph 2.4 states the requirement for the appointment of a Track Safety Co-ordinator (TSC) when working on or near the lines. When the TSC is appointed, staff must comply with the arrangements made by the TSC to ensure staff safety. The TSC will instruct the following:

- prior to work commencing, without lookout protection, the TSC will tell staff which systems of work are to be adopted to ensure staff safety;
- the TSC will tell staff when it is safe to start work;
- during the work, staff must stay in the limits specified by the TSC.

1.11.3 The Iarnród Éireann Rule Book, Section B, Part 2: Additional instructions to persons with specific responsibilities

Paragraph 6.5 gives instructions for TSCs on systems of work. What a TSC must ensure about their systems of work include:

- the TSC must select a system of work which will ensure that no-one in the group is endangered by trains;
- the TSC must ensure that all staff in the group is briefed and understands the system before work starts;
- the TSC must stop work and move everyone to a position of safety immediately if there is any doubt whether work may safely continue;
- the TSC must alter the system of work whenever changed conditions or circumstances make it necessary and everyone must understand the new arrangements before restarting work.

1.11.4 The Iarnród Éireann Rule Book, Section E, Operation of signalling equipment during failure or while work takes place

Paragraph 3.11 details instructions to the signalman of what he/she must do when routine maintenance work is to be carried out. Work which will make signalling equipment inoperative for a short period of time requires:

- the Technician to tell the signalman what is required;
- to find a suitable margin between trains before giving the Technician permission to start.

Paragraph 4.4.2 details instruction for the Technician on what he/she must do when routine maintenance work is to be done if the work makes the signalling equipment inoperative for a short period of time. The Technician must:

- inform the signalman of what is required
- obtain permission of the Signalman who will find a suitable margin between trains.

1.11.5 The Iarnród Éireann train signalling regulations and general instructions to signalmen

Paragraph 41.7, Routine Maintenance of Crossing Equipment, of the general instructions to signalmen, states:

- that the signal technician will obtain permission from the signalman before starting routine maintenance work which will interfere with the normal operation of the crossing;
- before giving permission the signalman must agree suitable margins between trains.

1.12 Safety Critical Communications Training

The training for safety critical communications consisted of a briefing in Section E of the Iarnród Éireann Rule Book which took place in 2002, which was carried out by a specialist signalling consultant. This briefing specifically emphasised the need to communicate and reach a clear understanding with the signalman about the work to be carried out. All attendees were assessed and received one-to-one feedback as part of the briefing. SCL B did attend this training and SCL A did not attend.

Monitoring of safety communications was not carried out as an independent item within the competency management systems for staff.

2 Analysis

2.1 Iarnród Éireann Procedures

The recordings of the calls between SCL A and the signalman, using the phone provided at the AHB, were downloaded for analysis. The sound from the recording is poor, and at times SCL A is the only voice that can be heard clearly. However, there is enough information from the recordings to ascertain to events on the day. SCL A and the signalman confirmed that they could hear each other clearly on the day.

The Rule Book, Section A, 3.1 states that the caller and receiver should identify themselves; 3.3 states that the caller should request that the receiver repeat back the message; 3.4 states that the message should be repeated back by the receiver to ensure that it has been clearly understood. The above procedures were not carried out.

Section E, Part 4.4.2 of the Rule Book “Before starting routine maintenance work” requires that before starting routine maintenance the technician must inform the Signalman what is required, obtain the permission of the Signalman who will find a suitable margin between trains. This clarification of a suitable margin between trains, to carry out the works, was not agreed.

All parties involved in the maintenance of the AHB would have worked with each other on a regular basis, this familiarity may have led to the staff not using the formal protocols outlined in the Rule Book. The competency management system does not sufficiently monitor safety communications, allowing informal communication practices to exist.

2.2 Maintenance procedures for AHBs

It was found that there were:

- No specific assessment of the risks for the maintenance of AHBs such as a risk assessment specific to this area of work;
- No formal procedures for the carrying out of maintenance of AHBs, such as a Safe Work Method Statement
- No formal training for the testing of AHBs

As a result of the lack of these documents, signal maintenance technicians have adopted their own procedures for the testing of AHBs.

3 Conclusions

The incident was a result of poor communications between staff involved in the maintenance of the Automatic Half Barrier. Staff had worked together regularly in the past, leading to familiarity and an informal approach to communications. The lack of a formal maintenance process, that should include a safe system of work, would also have contributed to the incident.

Immediate cause, contributory factor, underlying causes

Immediate cause:

- The barriers were raised to road traffic while maintenance works was being carried out, as a train approached.

Contributory factors:

- Poor communication between the signaller and the Special Class Linesman led to a misunderstanding of when there was a safe margin between trains to allow the maintenance work to be carried out;
- Staff had worked together regularly in the past and this familiarity led to an informal approach to communications and therefore did not follow communication procedures.

Underlying cause:

- Lack of a formal maintenance process for the maintenance of Automatic Half Barriers which should include the communications process and when it was safe to commence work;
- Lack of competence auditing system for communications procedures.

4 Recommendations

The following safety recommendations¹ are made:

- Iarnród Éireann should ensure all safety critical staff have undertaken safety critical communications training and that their ongoing competency management systems specifically monitors the quality of safety critical communications.
- Iarnród Éireann should put in place safe work methods for the maintenance of AHBs, these methods should include risk assessments for any hazards identified in the maintenance of AHBs.

¹ 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)

5 Relevant actions already taken or in progress

The following actions have been reported by IE as already taken or in progress relevant to this report (May 2009):

- a safety communications reminder was issued to all SET maintenance staff;
- a special instruction (SIN No. 2008/1), in relation to the maintenance of AHBs was issued by the Chief Engineer SET to, and must be adhered to, all SET maintenance technicians working on SET equipment at AHB Crossings. This notice is in addition to the mandatory requirements contained in Section E of the Rule Book, and sets out procedures for the maintenance of AHBs;
- a checklist was created to be used when carrying out the eight week maintenance tests at the level crossings;
- the briefing of Section E of the Iarnród Éireann Rule Book has been repeated and the majority of front-line signalling staff have attended. Safety executives are currently collating a list of those who did not attend so that further briefings can be arranged to complete attendance;
- a communications consultancy has been engaged to deliver a programme of training in safety critical communication for all staff engaged in safety critical work. This programme is scheduled to continue to the end of 2010 and SET safety executives are monitoring attendance by all SET staff so that by the end of the programme, everyone will have been trained;
- the SET are adopting the Institute of Railway Signal Engineers (IRSE) licence category of “Signalling Maintainer and Fault Finder” as the method of competence assessment in the workplace. The communication associated with creating a safe method of working will form part of the assessment. Currently, SET maintenance supervisors are being trained as assessors;
- a communications review group, consisting of representatives from a number of different departments has been established to meet periodically and review the effectiveness of the communications training across the organisation to date. Part of this group’s remit will be to review a set number of communications which will be selected from a range locations and departments, thus giving the group an indication of communication performance across the company.

6 Additional information

6.1 Glossary of terms

Central Traffic Control	Main signalling centre based in Dublin.
Diesel multiple unit	Self propelling train carriage powered by diesel, which can operate as single units or coupled together.
Railway Safety Act 2005	The Railway Safety Act 2005 puts in place a modern regulatory framework for railway safety. The Act established an independent statutory public body, the Railway Safety Commission (RSC), to regulate railway safety in Ireland. The RSC has wide-ranging powers to monitor and inspect railway infrastructure and to take enforcement action where necessary. The Commission's Railway Accident Investigation Unit investigates serious railway accidents.
Railway Safety Commission (RSC)	The RSC was established under the Railway Safety Act 2005. It has responsibility for matters of railway and cableway safety on passenger carrying systems and freight carrying systems where they interface with public roads. The principal functions of the RSC are to: foster and encourage railway safety; enforce this Act and any other legislation relating to railway safety; and investigate and report on railway incidents.
Track Circuit Block (TCB)	A development of the Absolute Block System, in which track circuiting is applied throughout. A train may proceed to the next stop signal as soon as the line is clear, determined by the operation of the track circuits, provided the overlap beyond that signal is also clear.
Up Direction	Direction of travel normally leading towards Dublin.

6.2 References

Iarnród Éireann General Appendix, Iarnród Éireann
Iarnród Éireann Rule Book, Iarnród Éireann
Iarnród Éireann Train Signalling Regulations and General Instructions to Signalmen
Modern Railways Dictionary of Railway Industry Terms, John Glover, 2005