



Rail Accident Investigation Branch

Rail Accident Report



**Fatal accident at Bronwydd Arms station,
Gwili Railway
19 July 2006**

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC;
- the Railways and Transport Safety Act 2003; and
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Fatal accident at Bronwydd Arms station, Gwili Railway, 19 July 2006

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Introduction

- 1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.
- 2 The RAIB does not establish blame, liability or carry out prosecutions.
- 3 Access was freely given by the Gwili Railway Company Ltd to their staff, data and records in connection with the investigation.
- 4 Appendices at the rear of this report contain glossaries and details explaining the following:
 - acronyms and abbreviations are explained in Appendix A; and
 - technical terms (shown in *italics* the first time they appear in the report) are explained in Appendix B.

Summary of the report

Key facts about the accident

- 5 A volunteer train guard on the Gwili Railway became trapped between two carriages as they were being coupled together during a shunting manoeuvre at Bronwydd Arms station at 10:27 hrs on Wednesday 19 July 2006. The injuries he sustained were so severe that he died in hospital later that day.

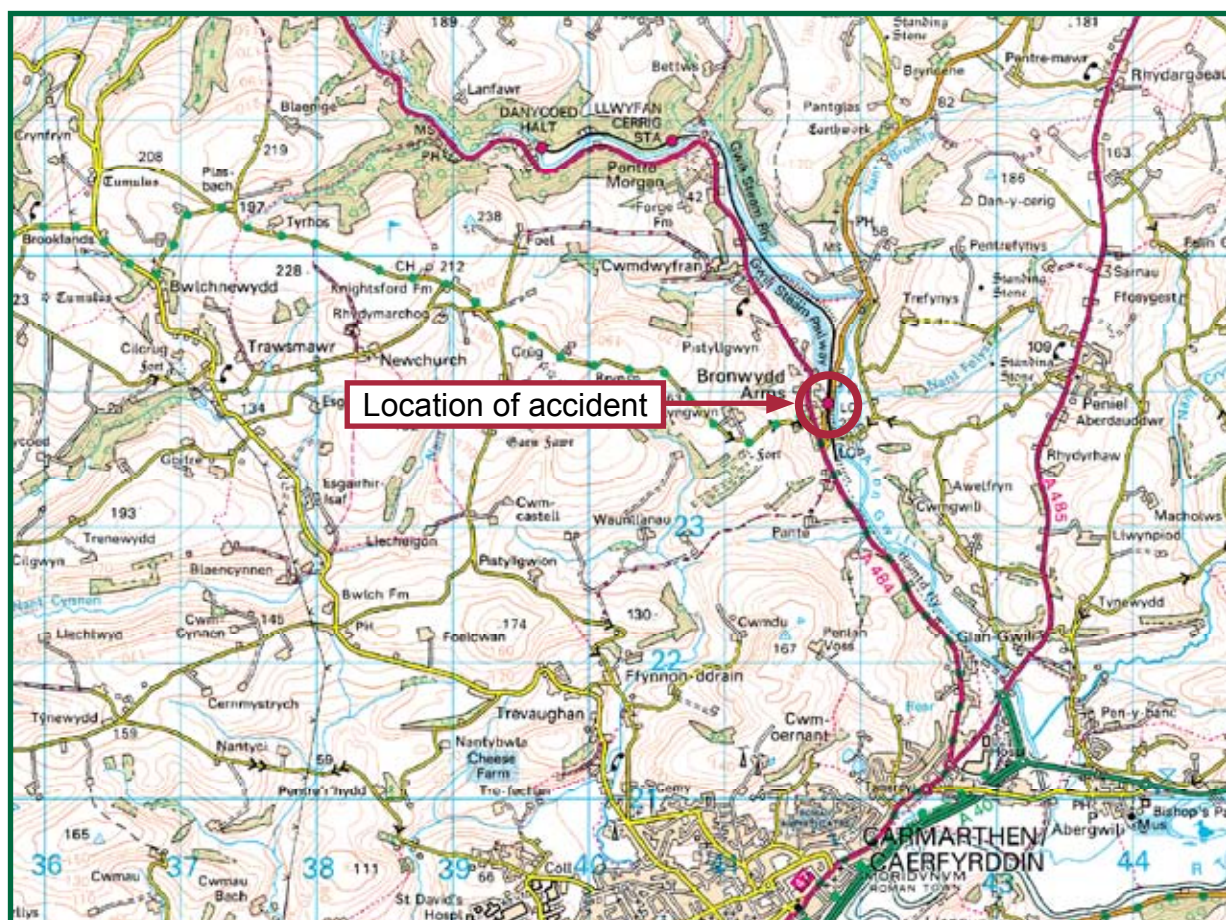


Figure 1: Extract from Ordnance Survey map showing location of accident

Immediate cause, causal and contributory factors, underlying causes

- 6 The immediate causes of the accident were:
 - a misunderstanding of shunting hand signals between the driver and fireman on duty, resulting in the driver moving a carriage for coupling to others that were stationary; and
 - at the same time the guard stepping into the gap between the carriages to perform a task in the belief that the vehicles would not move.

7 Contributory factors were:

- a lack of operational supervision on the day;
- the guard had acted as shunter during an earlier stage of the shunting manoeuvres and may have had the impression that he retained responsibility for the train preparation;
- the fireman taking over the duties of shunter but not positively advising the guard, and the guard not seeking to clarify any changes in the arrangements; and
- the rostered fireman for the day did not turn up as expected which resulted in a replacement staff member being called in.

8 Underlying causes were:

- a custom and practice of volunteers multi-tasking and helping each other in safety critical activities, and on this occasion without coming to clear understanding of their limits; and
- the safety management organisation and its application at the railway.

Severity of consequences

9 As a result of the incident, the volunteer guard lost his life.

10 The Gwili Railway was closed for one operating day.

Recommendations

11 Recommendations can be found at paragraph 117. They relate to the following areas:

- positive identification of the shunter;
- transfer of shunting responsibility during shunting manoeuvres;
- real time supervision of operations;
- rules in force on the Gwili Railway;
- medical standards on *Heritage Railways*; and
- management and administrative processes relating to operational standards at the Gwili Railway.

The Accident

Summary of the accident

- 12 A volunteer train guard became trapped between two carriages during a shunting manoeuvre at Bronwydd Arms station at 10:27 hrs on Wednesday 19 July 2006. He was released by fellow train crew, given first aid and received prompt medical attention. His injuries were such that he died in hospital later that day.



Figure 2: Class 03 locomotive and carriage

Location

- 13 The Gwili Railway is a standard gauge single track heritage railway with its base at Bronwydd Arms station which is located about 2 miles (3.2 km) north of Carmarthen. It is not connected to the national railway network.
- 14 The line has been reconstructed in stages over the route of the former British Railways (BR)/Great Western Railway line from Carmarthen to Aberystwyth via Lampeter. This line was closed to passenger traffic in 1965, to freight in 1973 and most of the track was lifted thereafter.
- 15 The Gwili Railway Company Ltd was incorporated in 1975, with the aim of recreating a passenger operation over part of the route of the closed railway, along the picturesque valley of the Afon Gwili. In July 2006, the operational line consisted of the 2 miles 20 chains (3.6 km) from Bronwydd Arms northwards to Danycoed Halt, and 18 ch (0.36 km) of sidings to the south of Bronwydd Arms station.

- 16 In 1997 the Gwili Railway had an application for exemption from regulations 3, 4 and 5 of the Railways (Safety Case) Regulations 1994 accepted by *HMRI* and a Certificate of Exemption was granted.
- 17 The station track layout at Bronwydd Arms consists of a single platform line with a run-round loop, and locomotive sidings to the north-west area of the site. In addition there are two carriage sidings to the south of the station, accessible by crossing the B4301 road by means of a gated level crossing which is normally open to road traffic. Refer to Figure 3.

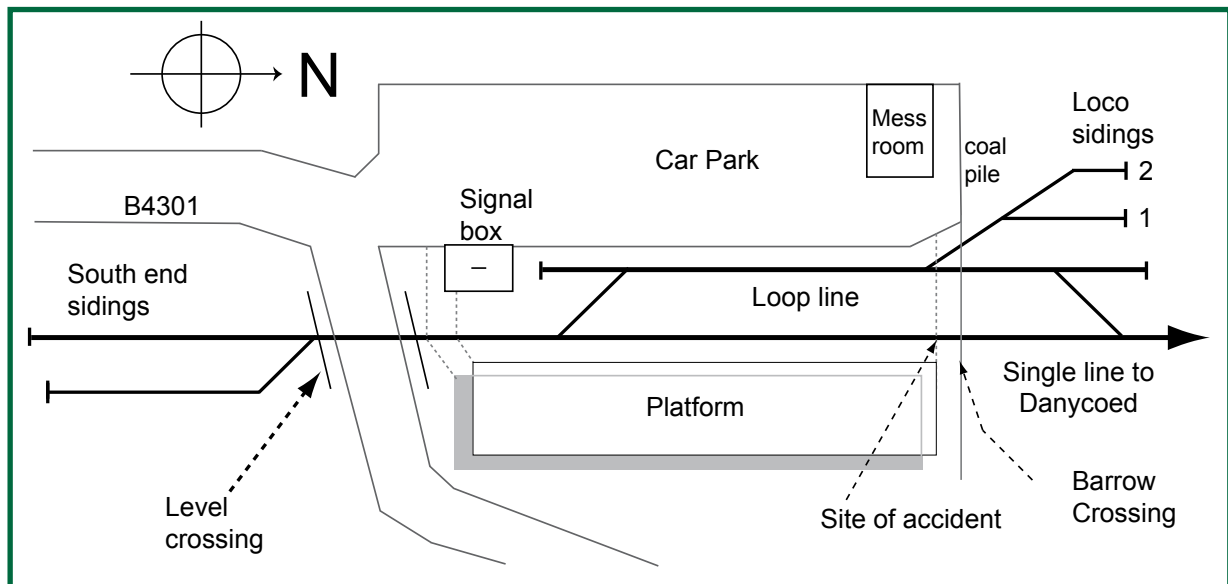


Figure 3: The track layout at Bronwydd Arms station

- 18 The platform is on a very slight curve from west to east as a train approaches the station from the north. This curve is visible in the photographs in Figure 4.
- 19 The station area is fully signalled with semaphore signalling, typical of that found in the 1960s at a country station. The signal box is opposite the platform, adjacent to the level crossing. The fixed signalling system played no part in the accident.
- 20 The Gwili Railway is operated by volunteer staff.

The parties involved

- 21 All parties involved were volunteer part time staff of the Gwili Railway Company Ltd.
 - The locomotive driver had worked at the railway for 19 years and had been qualified by the company to drive steam and diesel locomotives for 15 and 10 years respectively.
 - The locomotive fireman had worked at the railway for 5 years and had been qualified by the company to drive steam and diesel locomotives for 3 years.
 - The train guard had worked at the railway for 8 years and was qualified by the company as a passenger train guard.
 - The signalman had worked at the railway for 31 years and was qualified by the company as a signalman and in several other positions.
 - The catering vehicle attendant was a student and a seasonal worker.



Figure 4: The views from the locomotive cab windows showing the slight curvature of the track at the north end of the station

External circumstances

22 The weather on the day was very warm and sunny, and visibility was good.

Train equipment

- 23 At the start of operation on 19 July 2006 three carriages were standing at the platform at Bronwydd Arms. They were (north to south) ex BR *Mark 1* 24825, ex BR *Mark 1* 35012 and restored vintage Taff Vale Railway carriage 220.
- 24 At the south siding prior to the move commencing was ex BR *Mark 1* carriage 4420 which was coupled to another ex BR *Mark 1* carriage.
- 25 Ex BR class 03 diesel mechanical shunting locomotive D2178 was stabled at the locomotive shed. The locomotive is of a single driving cab design, and the cab was at the south end of the locomotive. It is capable of being driven from either side of the cab.
- 26 Steam locomotive *saddle tank* 0-6-0 locomotive 71516 'Welsh Guardsman' was also stabled at the locomotive shed.
- 27 The location of the above vehicles are shown in Figure 5.

Events preceding the accident

- 28 The usual train formation for summer midweek services on the Gwili Railway is the steam locomotive, three ex BR *Mark 1* carriages, and at certain periods the 'Taff Vale' four wheel carriage.
- 29 On the previous operating day, 16 July, the steam locomotive had not been available to haul the train, and the Class 03 diesel had been used. However the 03 locomotive only operates with a maximum of two carriages and the 'Taff Vale' carriage so the train length had been reduced and the spare carriage stabled in the south siding. The steam locomotive was repaired in time for 19 July and a note left by a member of the maintenance staff in the mess room to advise the *footplate staff*.

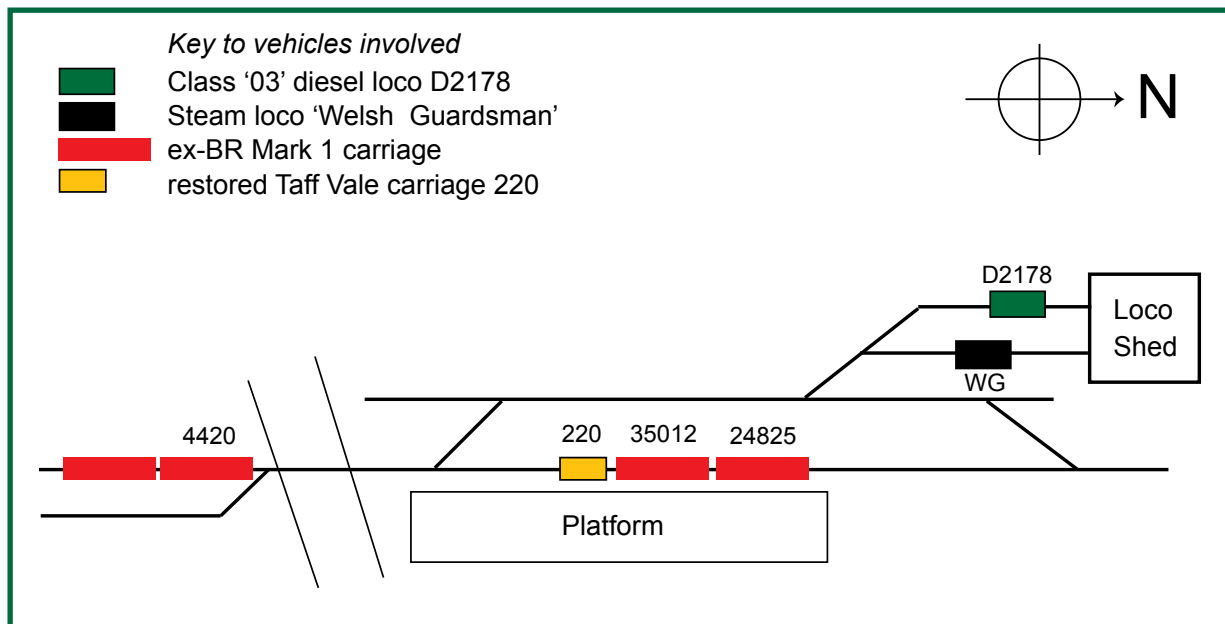


Figure 5: Location of relevant rail vehicles prior to the shunting manoeuvre

- 30 On the morning of the accident the driver on duty decided to strengthen the train back to three carriages and the 'Taff Vale' carriage, in the knowledge that there was a school party booking that day. This strengthening was to be achieved by using the diesel locomotive to collect carriage 4420 from the south siding, hauling it to the north end of the station via the loop line and propelling it back towards the platform (Figure 5).
- 31 The locomotive driver and fireman were due to start duties at 06:50 hrs that day. The rostered fireman did not turn up as expected, and when this became apparent the driver telephoned a colleague who agreed to work at short notice. Until the colleague arrived at 09:25 hrs, the driver undertook steam locomotive preparation duties, doing the tasks of both driver and fireman.
- 32 When the replacement fireman arrived, he agreed to continue the preparation of the steam locomotive while the driver went to collect the extra carriage. Both volunteers were qualified to fire and drive both locomotives that were to be used that day.
- 33 It is normal practice at the Gwili Railway for the fireman on duty to perform all shunting, coupling and uncoupling tasks.
- 34 When enough staff members to man the level crossing were on site the shunting manoeuvre commenced. As the steam locomotive had not built up enough steam pressure to operate, the diesel locomotive was started up by the driver. It hauled the steam locomotive to the coal pile where the replacement fireman started the task of loading coal onto the locomotive.
- 35 The driver then moved the diesel locomotive to the south end of the station.
- 36 The guard had arrived on duty at 09:30 hrs. A short while later he was asked by the signalman to undertake shunting duties for the manoeuvre because the fireman was busy coaling the steam locomotive. The guard agreed to do this and donned his high visibility vest. Qualified guards are trained and passed as competent in shunting, coupling and uncoupling tasks at the Gwili Railway. No line manager was present, so the signalman, by being the longest standing volunteer present decided to allocate this task to the guard.

- 37 The signaller and another two colleagues operated the level crossing gates and the diesel locomotive crossed the road to collect the carriage. The guard attached the locomotive to carriage 4420 and then uncoupled 4420 from the adjacent carriage; however, because of the curvature in the siding he could not see the driver from his position when holding the *coupler release chain*. The signaller helped him by relaying the 'move away' hand signal to the driver. This is permitted if the driver and shunter do not have direct sight of each other. The locomotive hauled the carriage back to the station side and proceeded along the loop line towards the north end of the station.
- 38 As the locomotive passed the coal pile, the fireman called to the driver that he would act as shunter for the coupling manoeuvre.
- 39 The guard walked along the platform to the north end of the carriages stabled there and it is unlikely that he heard the fireman speak to the driver.
- 40 When the locomotive and carriage had passed the points at the north end of the station, the signaller set the route and cleared the signal for the vehicles to propel back towards the platform line. The driver then commenced the propelling move (Figure 6).

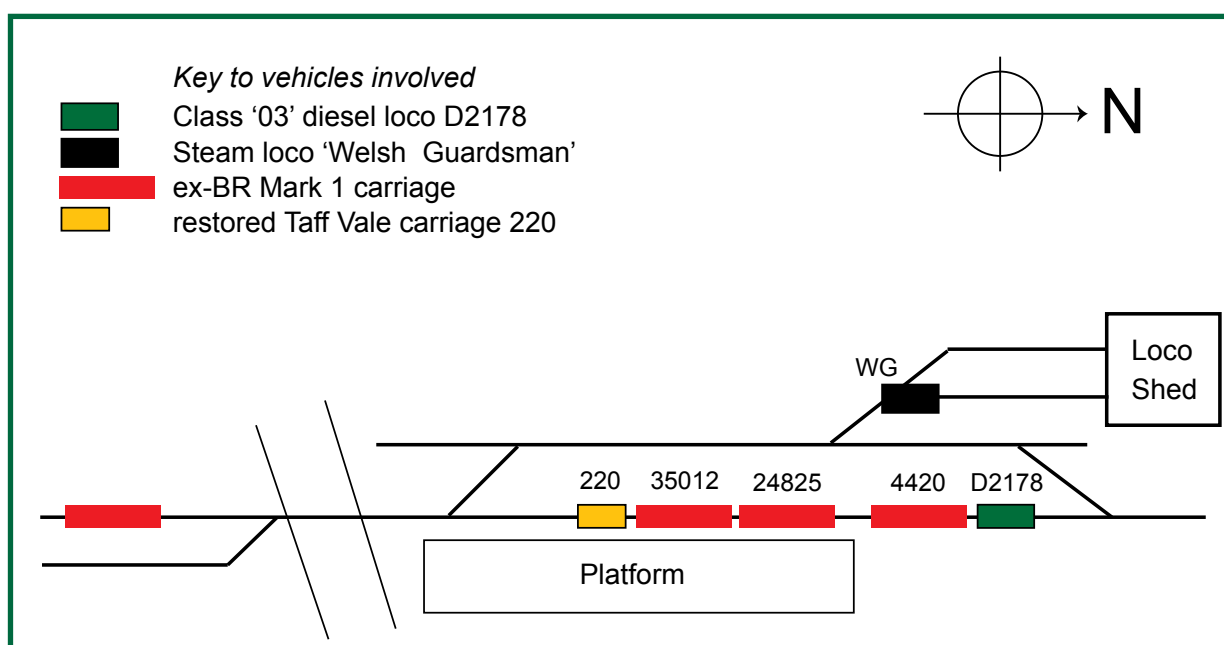


Figure 6: Location of relevant rail vehicles during the shunting manoeuvre, immediately prior to the accident occurring

Events during the accident

- 41 Whilst the carriage was being propelled back towards the other carriages the driver started taking instructions by hand signals from the fireman who was standing adjacent to the end of the first carriage on the train on the non-platform side. The fireman's position is indicated as position 2 on Figure 7.
- 42 The catering vehicle attendant had booked on duty at 10:20 hrs and knew that the guard had the keys for the catering vehicle. She walked to the point in the car park opposite the end of the platform to collect the keys from the guard. This location is indicated as position 4 on Figure 7.

- 43 The fireman saw the guard arrive at the bottom of the ramp (position 3a on Figure 7) and advised the guard that he (the fireman) would stop the carriage and attend to the connection on carriage 4420. The fireman did not specifically inform the guard that he had adopted the role of shunter.
- 44 The carriage was stopped approximately five metres short of the train by the driver acting on the fireman's hand signal. See Figure 8 for Gwili Railway handsignal descriptions.
- 45 Unbeknown to either the driver or fireman, the train guard moved from the bottom of the ramp on the platform side of the train to a position at the end of carriage 24825, the first carriage of the stationary train (position 3b on figure 7). It is probable that he started to take the retaining pin out of the door lock (refer to Appendix D) on the end of that carriage. He was facing this stationary carriage and had his back to the other carriage 4420 and locomotive.
- 46 At the same instant the train driver (position 1 on Figure 7) saw a hand signal from the fireman which he interpreted as an 'ease-up' or 'couple-up' instruction and started the movement forward at low speed.

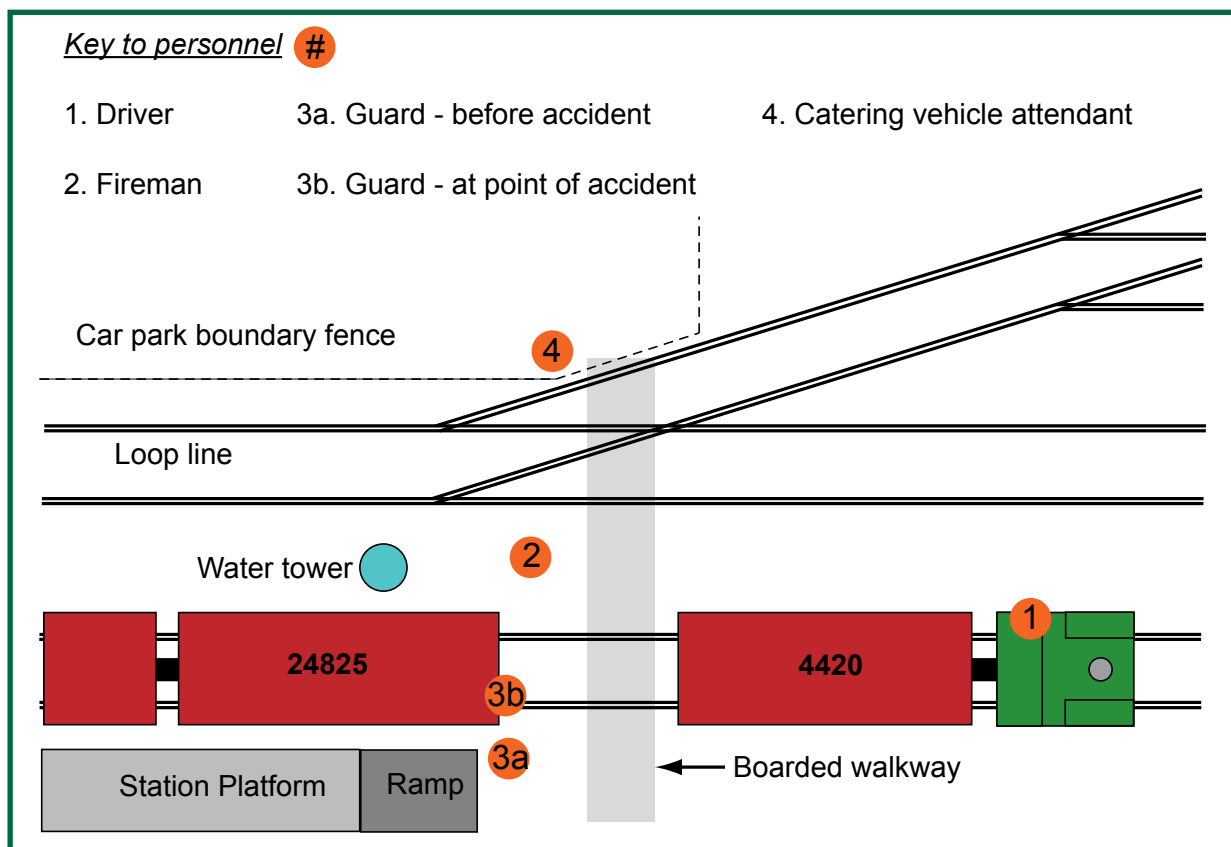


Figure 7: Location of relevant staff during the shunting manoeuvre, immediately prior to and at the time of the accident

- 47 The fireman had not intended this hand signal to be read as 'ease-up', he was moving his arms in preparation to give the 'I am going in between the vehicles' hand signal. As the vehicle moved, the fireman remained (in position 2) looking in the direction of the driver. He did not give a 'stop' hand signal immediately as the train began to move.
- 48 The catering vehicle attendant saw the danger and screamed a warning. The fireman looked round, saw the guard and immediately gave the stop signal to the driver, but this was too late to prevent the carriages coming together and trapping the guard.

- 49 The guard became trapped between the *rubbing plates* and *corridor connections* of the two carriages and suffered major injuries.

Events following the accident

- 50 The guard was released within two minutes by the locomotive driver and fireman uncoupling and drawing the carriages apart.
- 51 The emergency services were summoned almost immediately and an ambulance arrived within 5 minutes of being called. Prior to the arrival of the ambulance the catering vehicle attendant, who had had some first aid training and the locomotive fireman attended to the guard. The guard was taken to West Wales General Hospital for emergency treatment, but later died from his injuries.
- 52 The Dyfed-Powys Police (D-PP) and the British Transport Police (BTP) attended. The BTP arranged for the train driver and fireman to be screened for alcohol, the results proving to be negative. The Gwili Railway line manager, if present, should have instigated the screening process.
- 53 HMRI was advised of the accident and an Inspector arrived at about 13:00 hrs. The D-PP and HMRI interviewed several of the witnesses and took photographs and statements. These were passed to the RAIB the following day.
- 54 The railway was closed immediately following the incident, and all the rail vehicles and signalling equipment left in the position that it was after the guard had been released. HMRI placed a 'Leave undisturbed' direction upon the railway.
- 55 Gwili Railway staff were released to go home later in the afternoon, and the scene was taped off by the D-PP.
- 56 Whilst HMRI had been advised of the accident promptly, news of the guard's passing away did not reach the railway until late that afternoon. After discussion with the HMRI the Gwili Railway only advised the RAIB at 09:15 hrs the following morning, 20 July, when a director of the Gwili Railway reported the accident. Inspectors were dispatched, arriving at Bronwydd Arms at 16:30 hrs. That there was a delay in advising RAIB is contrary to the Railways (Accident Investigation and Reporting) Regulations 2005 which require immediate notification of fatal accidents with moving trains, and of incidents which in slightly different circumstances could have led to a serious accident such as a fatality.

Consequences of the accident

- 57 The volunteer guard suffered fatal injuries.
- 58 The Gwili Railway was immediately closed, and the line did not reopen until the next scheduled operational day, Saturday 22 July 2006.

The Investigation

Sources of evidence

- 59 The Gwili Railway does not have data, state or condition monitoring recording equipment fitted to any rolling stock, signalling or communications equipment. Therefore there was little corroborating evidence to back up witness information on train movements and communications as given to the RAIB.
- 60 Evidence was obtained by:
- examination of the scene and the immediate environment;
 - photographs and video recordings taken by RAIB and the D-PP;
 - interviews with relevant persons;
 - statements obtained by the D-PP;
 - breathalyser tests undertaken by the BTP;
 - the post mortem examination report, supplied with the permission of HM Coroner;
 - examination of the rule book and methods of working in force at the Gwili Railway; and
 - examination of the relevant training, competency and medical records held by the Gwili Railway's Officers.
- 61 HMRI, D-PP and BTP made the evidence they had obtained available to RAIB.
- 62 RAIB did not conduct a full *post incident brake test* on the class 03 locomotive and carriage as the locomotive had been shut down and inoperative since the time of the accident. However, when a reconstruction of the manoeuvre was undertaken the locomotive brakes responded in the manner that the driver expected.

Factual Information

- 63 Due to the non-appearance of a crew member, the personnel on duty had to work outside their anticipated operational roles on the day in order to get the steam locomotive and train prepared for service on time. However, all were operating within their certificated competency limits.
- 64 A reconstruction was undertaken to determine the viewing lines of the driver, the fireman and the guard, based on their positions as denoted in Figure 7. The results of this were:
- the driver could clearly see the fireman in position 2;
 - the driver could not see the guard in either of positions 3a or 3b;
 - the fireman, when looking towards the carriages could see the guard clearly in positions 3a and 3b;
 - when the fireman turned to face the driver he was no longer able to see the guard in either position 3a or 3b;
 - the guard could not see the driver from either of his positions;
 - the guard could see the fireman from position 3a, but not from position 3b because he was facing the stationary carriage. From position 3b he would not be able to see the carriage moving towards him as it was directly behind him; and
 - the guard would be able to see the catering vehicle attendant only when in position 3a.

- 65 The guard's general practitioner medical records and post mortem results did not reveal any issues of vision, hearing, balance or mental instability.
- 66 There was no evidence to indicate that the guard was under the influence of alcohol at the time of the accident. Post mortem results showed the blood alcohol level to be less than 10 mg / 100 ml. There was no evidence that he was a user of non-prescribed drugs.
- 67 The driver's and fireman's optical records did not reveal any issues of sub-standard eyesight.
- 68 Medical fitness records for staff at the Gwili Railway were of poor quality; this is explored in paragraph 97.
- 69 There was no evidence that excessive train speed was a factor.
- 70 The carriage being propelled was *loose coupled* ie only connected to the locomotive by means of the link coupling. There were no *brake pipes* connected, thus rendering the carriage's *vacuum brake* inoperative. There was no evidence that this contributed to the accident.
- 71 There was no one person in overall charge on the day at the Gwili Railway. The railway's rule book requires there to be a line manager who oversees operations, but nobody was appointed to this role (see also paragraph 90).
- 72 The operations notice board in the signing-on portacabin has a list of job roles and names for each operating day, and not only was there no line manager name against 19 July 2006, there had been no names posted for the week previous or the week still to come. Witnesses confirmed that the role was often left unfilled.
- 73 The Gwili Railway's 1996 risk assessment for its Railway Safety Case exemption (paragraph 16) states that 'All hand and audible signals are standard BR / Railtrack signals to avoid confusion'. With the passage of time the Gwili Railway rule book has not kept pace with the national rail rule book (GE/RT8000) module SS2. Relevant divergences are discussed below.
- 74 The hand signals applicable on the Gwili Railway are defined in its 1992 rule book amendment No.2, section J4. There is reference to the 'move away', 'move towards', 'slow down' and 'stop immediately' hand signals, with accompanying pictures. That for 'stop immediately' is shown here in figure 8 as 'A'. For comparison with GE/RT8000 module SS2 4.2a the 'stop immediately' hand signal is referred to in Figure 8 picture as 'B'.
- 75 Nowhere in the Gwili Railway documentation is there any reference to the 'ease-up' / 'couple-up' hand signal. However, both the driver and fireman, and other operations staff interviewed were aware of and demonstrated such a signal. 'Ease-up' is an action generally undertaken before physically coupling vehicles in order to close the gap. 'Couple-up' is pushing the vehicles closer together in order to get the coupling made. The hand signal for both actions requires the same response from the driver. This hand signal is described as both hands raised above the head and palms clapped together two or three times, and is the same signal found in GE/RT8000 module SS2 4.2a. It is referred to there as the 'ease-up' signal. The accompanying picture is shown in figure 8 as 'C'.

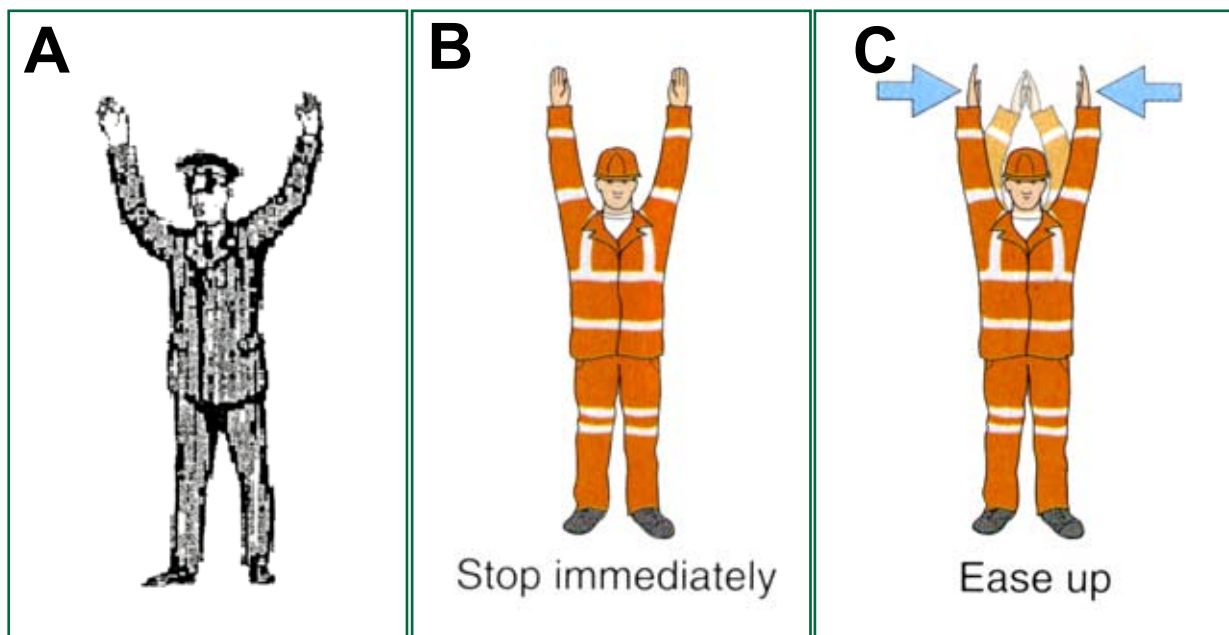


Figure 8: Relevant shunting hand signals described in the Gwili Railway rule book and national rail network rule book GE/RT 8000

- 76 GE/RT8000 module SS2 4.2a further states that drivers must not start or continue with a movement unless they clearly understand the shunter's hand signal. There is no equivalent rule in the Gwili Railway rule book. However in section J6 there is the following instruction:

'Safety of Shunters. When necessary to go between vehicles, the shunter must first advise the driver and obtain an assurance that he understands that he must not make a movement until the shunter has come out from between the vehicles and given him permission to move. This may be done by raising an arm horizontal and making a low sweep towards the buffers. This signal must be acknowledged by the driver. The shunter must not remain between vehicles during an 'ease-up' movement'.

This is the low sweep or 'scooping' hand signal as referred to in paragraph. 81 sub section 4. There is no picture provided. This 'scooping' hand signal does not exist in GE/RT8000, shunters are required to 'display a danger hand signal to the driver or instruct the driver not to move' (module SS2 5.3a).

Previous occurrences of a similar character

- 77 There are no records of accidents within the last ten years to staff trapped between vehicles resulting in serious injury or death on heritage railways (source HMRI). Two shunters employed by English Welsh and Scottish Railway Ltd (EWS) have died as a result of being trapped between vehicles within the last ten years, and an employee of Freightliner Heavy Haul Ltd died in a shunting accident at Dagenham on 17 July 2006, two days before the accident at Bronwydd Arms.
- 78 The two EWS fatal accidents were investigated by HMRI. The first, a shunter crushed between a locomotive and postal vehicle in 2000 resulted in an Improvement Notice being served on EWS with 7 control measures. The second, a shunter trapped between carriages in 2005 attracted 12 recommendations which were directed at EWS. Most control measures and recommendations concerned training and communications. The Freightliner Heavy Haul fatality at Dagenham is the subject of a RAIB investigation.

- 79 The Rail Safety and Standards Board (RSSB) and its predecessors have not specifically explored the issue of shunting accidents as neither of the above EWS accidents occurred on Network Rail infrastructure.
- 80 Shunting injuries and fatalities are relatively rare, but the proportion of staff employed in shunting duties is very low in relation to the numbers employed as track workers and train crew. Normalised statistics reveal that the fatality rate is six times higher for shunting staff than it is for all railway track or operational staff. Refer to Appendix C.

Analysis

Identification of the immediate cause

81 There were two immediate causes that resulted in the guard being trapped between the carriages:

- The first immediate cause of the accident was the misunderstanding of hand signals between the fireman and driver. See paragraphs 73 to 76 for full details of approved hand signals.

This misunderstanding could have been due to any one or a combination of the following possibilities:

1. the hand signals were incorrectly given by the fireman;
2. they were correctly given but were misread by the driver;
3. the driver was anticipating the 'couple-up' signal and pre-empted it as soon as the fireman started to signal that he was going to go between the carriages;
4. the fireman gave the driver a further 'stop' signal (although the movement was already stopped) as a reinforcement prior to giving the 'I am going between the carriages' scooping signal. The first of these is both hands raised straight above the head with the palms facing the driver. The 'ease up' / 'couple-up' signal is both hands above the head with a clapping together movement, and it is possible that the driver took this further stop as an ease-up instruction, and moved before the scooping signal could be given; or
5. the fireman saw the guard move between the carriages and raised his hands above his head to tell the driver to remain stopped, and as the fireman turned to look at the guard the rotation of his body made the raised hands appear to move closer to each other from the drivers perspective, which was then interpreted as 'couple-up'.

Of the five possible reasons given above by analysis of witness interviews and analysis of the relative positions of the driver and fireman, it is most likely that 3 and 4 above are the cause of the miscommunication. 1 and 2 above are less likely because the driver and fireman had both been examined and found competent in hand signalling, and have operated together on a regular basis for a number of years. 5 is less likely because the fireman could have shouted a warning to the guard when the carriage started to move. However, it is not certain because witnesses had slightly different recollections.

- The second immediate cause was the guard stepping in between the two carriages, without carrying out the requirements of Gwili Railway rule J6 (paragraph 76) and not seeing them move together.

The reason the he considered it safe to step in between the carriages was because the fireman had told him that he was going to both stop the movement and also attend to the incoming carriage 4420. At the time the fireman spoke to the guard they were in positions 2 and 3a respectively as shown in Figure 7.

Identification of causal and contributory factors

- 82 It is probable that the guard considered himself still to be in charge of the movement, having been appointed earlier by the signalman, and nobody had formally removed that appointment nor had he transferred it to the fireman. This is a causal factor. **Recommendations 1 and 2 refer.**
- 83 The absence of a line manager meant that there was nobody carrying the responsibility to ensure a full brief was given to staff to ensure all knew what their roles were to be. This would have been important as there had been no fireman earlier and staff were improvising to ensure the tasks were completed. This was a contributory factor. **Recommendation 3 refers.**
- 84 The guard probably went between the carriages in order to check that 24825 was ready to be coupled to and that the gangway and corridor door connections were configured correctly (Appendix D). This is probably a contributory factor.
- 85 Alternatively, but less likely, the guard, knowing that he had the catering vehicle keys for the attendant, thought that he could cross the track to hand over the keys to her. As he passed the carriage end he noticed that the external locking pin on the stationary carriage needed to be removed and he stopped to do this simple task. Refer to the photograph in Appendix D for the location of this pin. This is a possible, but less likely contributory factor.
- 86 The Gwili Railway Rule Book is incomplete in its description of permissible hand signals and also on the restriction on starting or continuing when a hand signal is incorrectly given or not understood. Drivers and shunters routinely use a hand signal that is found on the national rail network but not in the Gwili Railway rule book (paragraphs 73 to 76). **Recommendation 4 refers.**

Identification of underlying causes

- 87 The railway applied for an exemption from the Railways (Safety Case) Regulations 1994. To gain this exemption a detailed risk assessment was carried out and certain risk mitigation undertakings were given to HMRI in 1996. The exemption was granted in 1997.
- 88 Amongst the undertakings given was that there should be a line manager appointed to check that the operational staff on duty comply with the Transport & Works Act 1992 and Railways (Safety Critical Work) Regulations 1994. There is also reference to observance of the Gwili Railway rule book and assurance that operations staff are examined before being passed as competent and then reassessed every two years.
- 89 In the 1996 risk assessment shunting movements are assessed thus: 'As per approved Rule Book. All shunters are trained and competent, with assessments every two years. All hand and audible signals are standard BR / Railtrack signals to avoid confusion. Only one shunter to control movement with, if necessary, an additional person to relay hand signals to the driver when curvature of the line requires it. If sight of shunter is lost, driver is to stop until another hand signal is given by shunter'.

90 Although there is supposed to be a line manager appointed for operational days, this post was not being regularly filled at the time of the accident. This led to staff undertaking duties as they saw fit to get the jobs done. The lack of a controlling mind led to:

- the signaller asking the guard to uncouple the carriages at the south end of the station; and
- the fireman appointing himself as shunter for the attachment at the north end of the station.

The line manager's job description includes the following sentence: 'He must ensure that vital posts (eg driver, fireman, guard, signaller) are covered, and if not, make suitable alternative arrangements.' This does not go as far as specifying that the alternative arrangements should be briefed to all concerned. **Recommendation 3 refers.**

91 The Gwili Railway is a heritage railway, and there is a relatively small cohort of volunteer staff and managers. Organisationally there is a board with five directors. There are three committees under the board, these comprise of operations, engineering and commercial. Due to insufficient volunteers coming forward to fill nominated positions, some board members take on multiple responsibilities.

92 The chairman of the Gwili Railway Company Board also undertakes the roles of company secretary, finance director and health & safety director. Even though he devotes a lot of time to the railway these combined burdens have limited his effectiveness on managing health and safety matters, and he has in the past appealed without success to the board for assistance for these duties. **Recommendation 5 refers.**

93 Directors and heads of departments have stated concern that volunteer numbers could be reduced if volunteers were pressurised into doing tasks that they did not like. The role of line manager is one such task, and few volunteers undertake it. The railway's chairman and director responsible for operations were both aware that the line manager position was often unfilled. No mitigating action was taken to address the associated risks.

94 In an atmosphere of willingness to get jobs done, the blurring of roles and responsibilities increased the potential of a simple mistake having serious consequences.

Other factors for consideration

The following matters were observed during the investigation but did not contribute to the accident:

95 The competency management system at the Gwili Railway was incomplete. For example the driver's Certificate of Competence was dated October 1999, and had a validity of two years. However there was evidence of a bi-annual rules exam taken in July 2005. The replacement fireman's competency paperwork was in-date. There were a number of other staff who were rostered for duty on the operations notice board who - according to the master footplate staff record sheet supplied by the railway - had competencies which had lapsed.

- 96 The guard was initially passed competent in that role in August 2001, and retested in May 2003. There is evidence that prior to the 2003 retest the guard lacked confidence in shunting and coupling and the examiner had recommended that the guard be given some familiarisation opportunities. The guard attended a training day in February 2005 and according to the syllabus for that day there was shunting practice. He was successfully retested and his competency records were updated. The guard had received and signed for the latest Gwili Railway rule book amendment in September 2003.
- 97 The Gwili Railway does not retain all training, competency and medical records in a central location. Some records of safety critical staff are retained by the individual personnel in their own homes. **Recommendation 8 refers.**
- 98 There are no mandatory medical standards for staff undertaking safety critical duties on a heritage railway. The Heritage Railway Association issues guidelines that *footplate staff* should meet the same standards as national main line drivers – GO/RT 3251. Other operational heritage railway staff such as guards and shunters can self-certify on an irregular basis that they are fit to undertake their duties. Main line guards and shunters should be medically tested to standard GO/RT 3255.
- 99 On the national main line system there is a prescriptive periodicity for employers of safety critical staff confirming their medical fitness for duty. However this does not take account of staff working beyond the ‘normal’ retirement age of 65. Both the ORR (HMRI) and the HSE have a policy that there is no upper limit on age for staff undertaking safety critical work. There is a duty of care on the railway that all staff (permanent and volunteer) are able to carry out their duties without imposing any extra risk either to the public, or themselves. Current advice from the ORR (HMRI) to heritage railways is that as members of staff progress beyond 65 years of age they should be examined for operational fitness on at least an annual basis. There is no advice about staff returning to work following surgery or significant illness or injury, or assessment of continuing in service with deteriorating health. **Recommendation 6 refers.**
- 100 The Gwili Railway does not have an adequate procedure for ensuring that operational staff are medically fit. A (volunteer) medical officer was appointed in October 2001, and commencing in 2002 he undertook to conduct medical examinations for any volunteers who wished it. The standard adopted was that of a road LGV/PCV driver and comprised of checks on: general eyesight, colour vision, hearing and blood pressure. A certificate was to be issued which would cover the duties that the volunteer worked. Alternatively a volunteer could demonstrate fitness by producing a similar certificate issued by another railway, or by another doctor. This scheme was not enforced and only partially implemented. A number of personnel underwent examination. The guard who lost his life in this accident was one of those examined, being seen on 3 November 2002. **Recommendation 7 refers.**
- 101 During 2005, the guard’s eyesight deteriorated sufficiently for him to need an operation to remove a cataract. He acted responsibly and removed himself from operational duty until in his own opinion his eyesight had recovered sufficiently. The Gwili Railway did not require a ‘return to work’ medical examination. He judged himself to be fit at the point he recommenced driving on the highway. **Recommendation 6 refers.**
- 102 In common with many voluntary organisations, a significant percentage of the Gwili Railway staff are people of state pension age or older. In the heritage railway context volunteers may be responsible for undertaking safety critical duties.
- 103 There was no designated first aid person on duty.

- 104 It is a feature of many British main line carriages that there is a continuous permanent gangway plate to facilitate through passage for staff and customers walking internally from carriage to carriage. Had it been other than two gangwayed passenger carriages coming together, the guard might have had a safe refuge (sometimes known as the 'Berne triangle') between the vehicles.
- 105 The accident was not reported to RAIB within the mandated time (paragraph 56).
Recommendation 9 refers.

Summary of the event chain

- 106 The chart in Figure 9 shows the causal analysis of the accident on a 'why - because' chain of events, starting from the accident event and working backwards. The two initiating events are highlighted, both of which had to happen at the same time for the accident to have the consequence of the guard being trapped between the carriages.

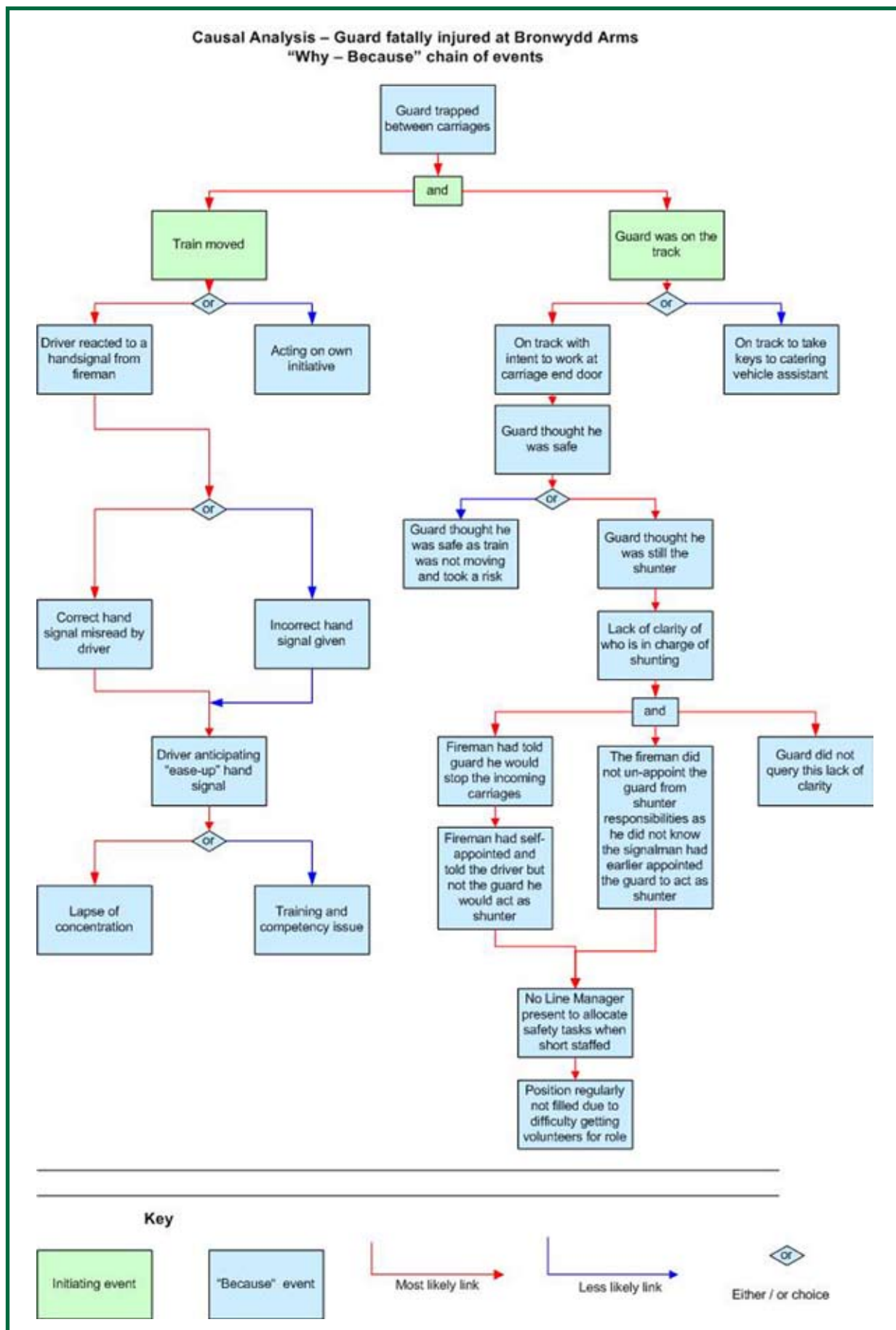


Figure 9: Causal analysis diagram

Conclusions

Immediate causes

107 The immediate causes of the accident were:

- a misunderstanding of hand signals between the fireman and driver resulting in the driver moving the locomotive and carriage towards the stationary carriages; and
- at the same time the guard stepping in between the carriages to perform a task without advising the fireman, in the belief that the vehicles would not move.

Causal and contributory factors

108 Causal factors were:

- The driver interpreting the fireman's hand signal to mean 'ease-up' regardless of what was actually given, and not clarifying the intention (paragraph 81);
- The guard had acted as shunter during an earlier stage of the shunting manoeuvres and although the replacement fireman had taken over this responsibility, a lack of clear understanding between the guard and fireman probably left the guard with the impression that he was still partly responsible for the train preparation (paragraph 82);
- A lack of operational supervision on the day (paragraph 83);

109 In addition, the following factor was considered to be contributory;

- The non-appearance of the rostered fireman for the day which resulted in a replacement staff member being called in and staff doubling-up duties until he arrived (paragraph 31).

Underlying factors

Underlying factors were:

110 The overloading of duties on the chairman of the Gwili Railway, thus preventing him devoting enough time to safety management (paragraph 92);

111 Absence of management intervention to ensure that the line manager position was fulfilled (paragraphs 71 and 93);

112 Difficulty finding and retaining volunteers for taking on the line manager's responsibilities (paragraph 93).

Actions reported as already taken or in progress relevant to this report

- 113 The Gwili Railway appointed a health & safety director on 4 September 2006.
- 114 The Gwili Railway has identified a suitable medical practitioner and intends to recommence regular medical examinations of volunteer staff in 2007. The standard to be applied is still that shown in paragraph 99.
- 115 The Gwili Railway has addressed the lack of a line manager and since December 2006 the duty signalman at Bronwydd Arms has assumed this role whenever there has been no dedicated line manager.
- 116 RAIB issued an Urgent Safety Advice to all UK main line and heritage railways. This is attached as appendix E.

Recommendations

117 The following recommendations are made¹:

Recommendations to address causal and contributory factors

- 1 The Gwili Railway should ensure that all personnel involved in shunting operations are aware who is designated as the shunter (paragraph 82).
- 2 The Gwili Railway should introduce a procedure whereby if one shunter is replaced by another there is to be a positive transfer of responsibility between them. If this occurs during shunting operations the shunter giving up responsibility should advise the driver of the change (paragraph 82).
- 3 The Gwili Railway should ensure that a responsible person with the role of overseeing operational staff activity is present whenever there are movements of rail vehicles (paragraphs 83 and 111)
- 4 The Gwili Railway rule book should include a description of all hand signals in use, and that for 'ease-up' / 'couple-up' should be incorporated. There should also be instructions on stopping or not starting movements when hand signals are not understood (paragraph 86).

Recommendations to address other matters observed during the investigation

- 5 The Gwili Railway should ensure that a safety advisor is appointed and that he reviews compliance with legislation, and adequacy and conformity with standards (paragraph 110).
- 6 The Heritage Railway Association should issue new guidance on competence and medical standards for safety critical staff. This should be based on the views contained within the letter from the ORR (HMRI) to the HRA of 15 August 2006, ref 4004066. It should include the standards to be achieved for all staff that undertake safety critical duties, denoted on a role based model. Consideration should also be given to examination of safety critical staff of all ages when returning to duty after significant surgery, illness or injury; or if there has been a significant loss of physical health or mental acuity (paragraphs 98 and 99).
- 7 The Gwili Railway should ensure that all staff undertaking safety critical work take account of the medical standards outlined in Recommendation 6 (paragraph 100).
- 8 The Gwili Railway should manage and retain training and competency records for staff who undertake safety critical work in an orderly and centralised manner (paragraph 97).

continued

¹ Responsibilities in respect of these recommendations are set out in the Railways (Accident Investigation and Reporting) Regulations 2005 and the accompanying guidance notes, which can be found on RAIB's web site at www.raib.gov.uk

- 9 The Gwili Railway should ensure that line managers are briefed on the requirement under the Railways (Accident Investigation and Reporting) Regulations 2005 for advising RAIB of reportable incidents in a timely manner (paragraph 105).

Appendices

Glossary of abbreviations and acronyms

BTP

D-PP

EWS

HMRI

HSE

LGV

ORR

PCV

RSSB

Appendix A

British Transport Police

Dyfed-Powys Police

English Welsh and Scottish Railway Ltd

Her Majesty's Railway Inspectorate

Health and Safety Executive

Large goods vehicle

Office of Rail Regulation

Passenger carrying vehicle

Rail Safety and Standards Board

Glossary of terms

Appendix B

All definitions marked with an asterisk, thus (*), have been taken from Ellis' British Railway Engineering Encyclopaedia © Iain Ellis. www.iainellis.com

Brake pipe	An air or vacuum pipe that can release or apply the brakes of the vehicle on the train by controlled variation of pressure.*
Coupler release chain	Mechanism for opening the jaws of an automatic coupler to uncouple vehicles.
Drophead buckeye coupler	Passenger vehicle automatic coupling connection that can be dropped when not in use to expose a standard coupling hook.
Fireman	Person primarily employed to attend the fire of a steam locomotive.
Footplate staff	Driver and fireman.*
Gangway	Concertina covered access route between passenger vehicles.
Guard	Senior Conductor, Conductor or Train Man.*
Heritage Railway	A railway operated as a tourist or museum operation, predominantly using equipment from bygone times.
Loose coupled	Vehicles with couplers connected but without through brake controls.
Mark 1 carriage	The original British Railways coach design of the 1950s.*
Post incident brake test	A mandatory test of train or vehicle brakes following certain types of incident to determine the functionality against the standard.
Railway safety case	A submission in support of a system or process, providing evidence of compliance with relevant safety objectives.*
Rubbing plate	A flat vertical facing plate at a vehicle extremity that provides lateral stability and a consistent tension to the coupler when 2 such vehicles are coupled together.
Saddle tank	Steam locomotive with the water tank positioned over the boiler.
Safety critical activity	<i>(in this context)</i> As described in the Railways (Safety Critical Work) Regulations 1994, an act which 'as a driver, guard, conductor or signaller or in any other capacity in which he can control or affect the movement of a vehicle'. Note - these Regulations have been replaced by the Railways and Other Guided Transport Systems Regulations 2006.
Shunter	Person whose duties are directing and controlling <i>shunting</i> including coupling and uncoupling vehicles, and operating hand points in sidings.
Shunting	The act of moving vehicles within a defined locality for the purpose of constructing or splitting trains or positioning vehicles for work activities.
Sidings	Rail lines off the main line used for stabling, storage or loading / unloading of vehicles.

Signaller / Signalman	Person employed to supervise or operate a signalling control system.
Standard gauge	British standard track width, nominally 1435 mm or 4'8½" .
Vacuum brake	An automatic vehicle braking system controlled by the operation of vacuum pressure in a cylinder.*

Fatal and Major injuries to all railway employees and contractors 1993 - 2006*

Year	Number of fatal injuries	Rate per 100,000 employees	Number of major injuries	Rate per 100,000 employees	Number of over 3 day injuries	Rate per 100,000 employees	Employee base (extrapolated from HSE figures) *
1993/4	8	5	262	177	3,590	2,426	148,000
1994/5	9	6	252	179	3,411	2,419	141,000
1995/6	5	4	225	184	4,144	3,397	122,000
1996/7	2	2	310	337	1,842	2,002	92,000
1997/8	4	3	351	456	2,088	2,712	77,000
1998/9	4	4	376	400	2,070	2,202	94,000
1999/2000	5	5	340	312	2,065	1,894	109,000
2000/1	8	6	300	244	2,135	1,736	123,000
2001/2	5	4	351	266	2,023	1,533	134,000
2002/3	5	4	349	268	2,080	1,600	130,000
2003/4	9	7	347	262	1,946	1,474	132,000
2004 (9 mths)	4	3	301	228	1,433	1,086	132,000
2005	6	5	250	332	1,464	1,947	75,000
2006							
Total 1993 - 2006	74		4,014		30,291		
Average 1993 - 2006		4		280		2,033	

Figs HSE 2004 report p 63, 64
2005 pp 63, 64

* Heritage railway staff figures are included, estimated at 10 full time equivalents per standard gauge line

Fatal and Major injuries to shunters 1993 - 2006*

All categories of shunting accidents in ORR/HSE Reports except "staff on board trains in a collision in sidings"

Year	Number of fatal injuries	Rate per 100,000 employees #	Number of major injuries	Rate per 100,000 employees #	Number of over 3 day injuries	Rate per 100,000 employees #	Estimated employee base *
1993/4	0	0	1	33	3	100	3,000
1994/5	0	0	1	34	1	34	2,900
1995/6	1	36	3	107	5	179	2,800
1996/7	1	38	1	38	15	577	2,600
1997/8	1	40	3	120	5	200	2,500
1998/9	0	0	3	125	2	83	2,400
1999/2000	0	0	3	136	13	591	2,200
2000/1	1	48	1	48	13	619	2,100
2001/2	0	0	0	0	14	700	2,000
2002/3	0	0	1	56	3	167	1,800
2003/4	0	0	0	0	1	59	1,700
2004 (9 mths)	0	0	3	188	8	500	1,600
2005	1	67	2	133	8	533	1,500
2006	2	133					1,500
Total 1993 - 2006	7		22		91		
Average 1993 - 2006		26		76		326	

(*Years until 2003/4 are 1 April to 31 March, 2004 is the 9 month period 1 April to 31 December, 2005 and 2006 are calendar years)
Source figures: ORR / HSE (HMRI) Annual Reports

No figures appear to exist on the number of shunters employed in the railway industry so an estimate of 3000 in 1991/2 reducing to 1500 in 2004 has been made, the reduction to recognise the decline in locomotive hauled operations and the increase in automatic couplers.

* Heritage railways staff are incorporated, rounded up to the equivalent of 2 full time employees per standard gauge line

Preparation of a Mark 1 carriage for coupling

Appendix D

There are several actions required to convert a stationary Mark 1 carriage from the configuration of being attached to a locomotive, to that of attaching to another carriage. A typical sequence of preparation is as follows:

- ensure that the vehicle will not be moved and that it is safe to go onto the track;
- raise the drophead buckeye coupler and insert the locking pin;
- retract the buffers to the short position;
- open the buckeye horizontal hook;
- remove the retaining pin from the external gangway door lock;
- remove vacuum or air brake pipes from dummy housings / receptors;
- remove train heat connectors pipes / cables from receptors;
- check there is no equipment or foreign object present that would prevent a coupling being made;
- return to a position of safety.

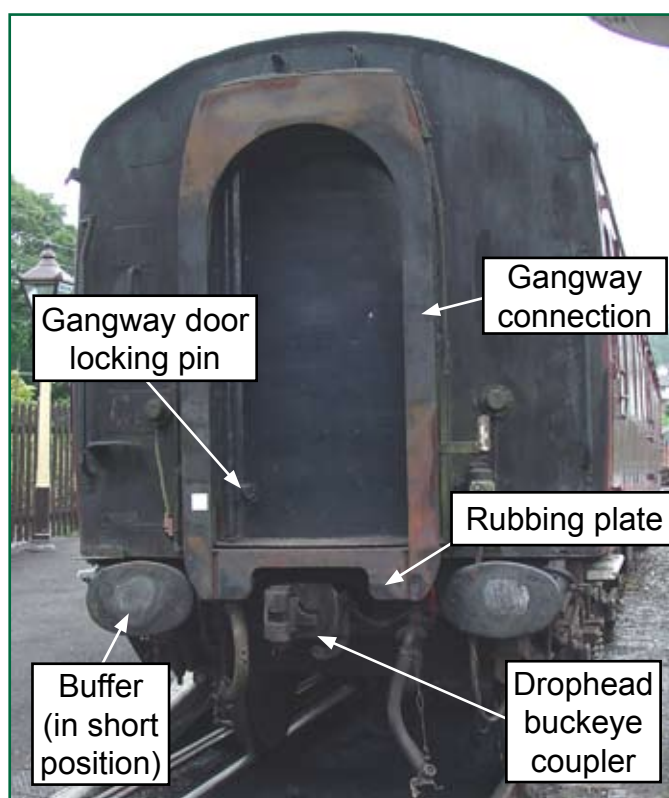


Figure 10: The carriage end showing the external features



Figure 11: the carriage end door locking pin in the unlocked position

The text of the U.S.A. is reproduced here

'Incident description:

On 17 July 2006 at approximately 12:20 hrs a shunter employed by Freightliner (Heavy Haul), who had been engaged in a shunting movement, controlled by radio, involving coupling a Class 47 locomotive and a single wagon at Dagenham, was found lying adjacent to the siding from which the train had just moved. The emergency services were summoned, but attempts to resuscitate the shunter failed and he was declared dead on site.

On 19 July 2006 at Bronwydd Arms on the Gwili Railway, near Carmarthen, a Class 03 locomotive was being used to add an additional carriage to a train. The move was controlled by hand signals. During this move the guard of the train was trapped between the carriage and the train, and sustained severe injuries as a result. He succumbed to these injuries a few hours later, despite the attempts of his colleagues and the emergency services and despite receiving hospital treatment.

Safety Issue Description:

In advance of completion of the investigations into these two accidents please remind all staff involved in shunting movements:

- Shunter and driver must carry out a brief before movements start, and have a clear understanding between them of all moves to be undertaken
- When using radios to control shunting movements the shunter must give the driver verbal or 'confidence tone' assurances that it is safe to continue throughout the whole movement
- If the shunter has to go between vehicles to deal with automatic couplings he / she must instruct the driver to stop at least two metres away
- The shunter must not go in between vehicles until they are at a stand and he / she is sure the driver understands they are going in between
- No other person than the driver and shunter may go between closely parked vehicles
- If a shunter goes in between vehicles for any reason he / she must never give permission for a train to move off until after he / she is clear of the train and in a position of safety

Circumstances:

Positioning of staff during shunting

Consequences:

Risk of staff being trapped during shunting moves with possible fatal consequences

Reason for issue:

Two fatal accidents to staff.'

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