



Rail Accident Investigation Branch

Rail Accident Report



**Fatal accident at Grosmont, North Yorkshire
Moors Railway
21 May 2012**

Report 23/2012
October 2012

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.

© Crown copyright 2012

You may re-use this document/publication (not including departmental or agency logos) free of charge in any format or medium. You must re-use it accurately and not in a misleading context. The material must be acknowledged as Crown copyright and you must give the title of the source publication. Where we have identified any third party copyright material you will need to obtain permission from the copyright holders concerned. This document/publication is also available at www.raib.gov.uk.

Any enquiries about this publication should be sent to:

RAIB	Email: enquiries@raib.gov.uk
The Wharf	Telephone: 01332 253300
Stores Road	Fax: 01332 253301
Derby UK	Website: www.raib.gov.uk
DE21 4BA	

This report is published by the Rail Accident Investigation Branch, Department for Transport.

Fatal accident at Grosmont, North Yorkshire Moors Railway, 21 May 2012

Contents

Summary	5
Introduction	6
Preface	6
The accident	7
Context	8
Key facts and analysis	12
Background information	12
Sequence of events	14
Identification of the immediate cause	16
Identification of causal factors	16
Observations	18
Previous occurrences of a similar character	18
Summary of conclusions	20
Immediate cause	20
Causal factors	20
Additional observation	20
Actions reported as already taken or in progress relevant to this report	21
Learning points	22
Recommendation	23
Appendices	25
Appendix A - Glossary of terms	25
Appendix B - RAIB Urgent Safety Advice issued on 1 June 2012	26

This page is left intentionally blank

Summary

At around 12:20 hrs on 21 May 2012, a volunteer train guard was fatally injured after becoming trapped between two coaches at Grosmont station on the North Yorkshire Moors Railway. The coaches had just been uncoupled and the accident occurred when the steam locomotive that was reversing the uncoupled coach away from the stationary coaches changed its direction. The driver applied the brake as soon as he realised this, but there was insufficient distance to stop and avoid trapping the guard who had moved back between the vehicles to complete the work associated with the uncoupling.

The locomotive changed direction because its screw reverser was not locked and moved under the weight of the valve gear from reverse to forward gear. It is likely that the guard moved back between the coaches because he had no reason to believe that the locomotive and coach moving away from him would change its direction.

The RAIB has identified two key learning points relating to the locking of screw reversers and not going between railway vehicles unless they are stationary. It has also made a recommendation to the North Yorkshire Moors Railway relating to the competence management system covering shunting.

Introduction

Preface

- 1 The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability.
- 2 Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.
- 3 The report contains technical terms (shown in *italics* the first time they appear in the report). These are explained in appendix A.

The accident

- At around 12:20 hrs on 21 May 2012, a volunteer train guard became trapped between two coaches after they had been uncoupled during shunting at Grosmont station, on the North Yorkshire Moors Railway (figure 1).

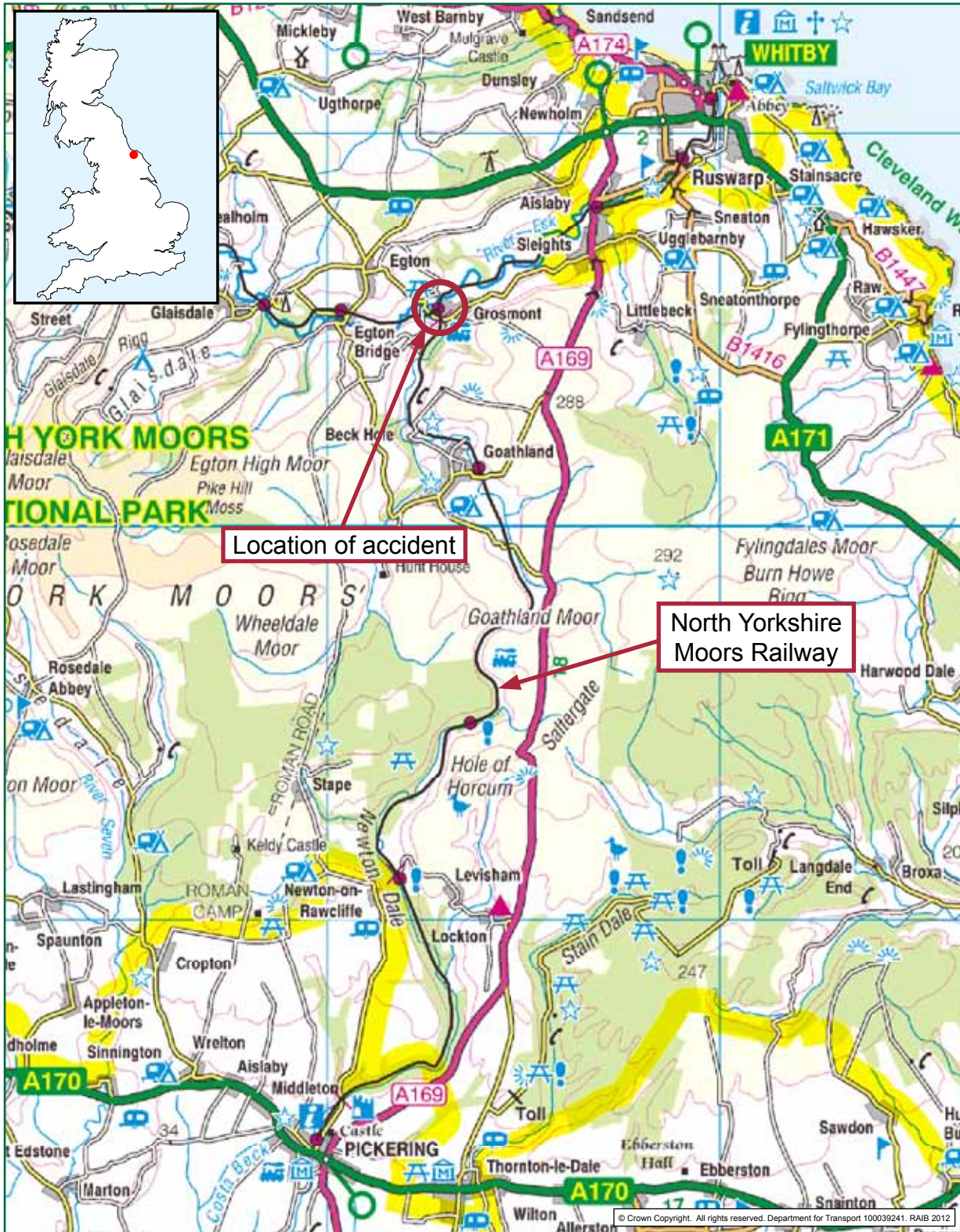


Figure 1: Extract from Ordnance Survey map showing location of accident

- 5 As one of the coaches was being drawn away by a steam locomotive, to be coupled to another rake of coaches, the locomotive changed direction and pushed the coach back towards where the uncoupling had just taken place. Meanwhile, the guard had gone between the coaches to complete the work arising from the uncoupling. The guard was trapped between the coaches and was fatally injured. Figure 2 shows the site of the accident.

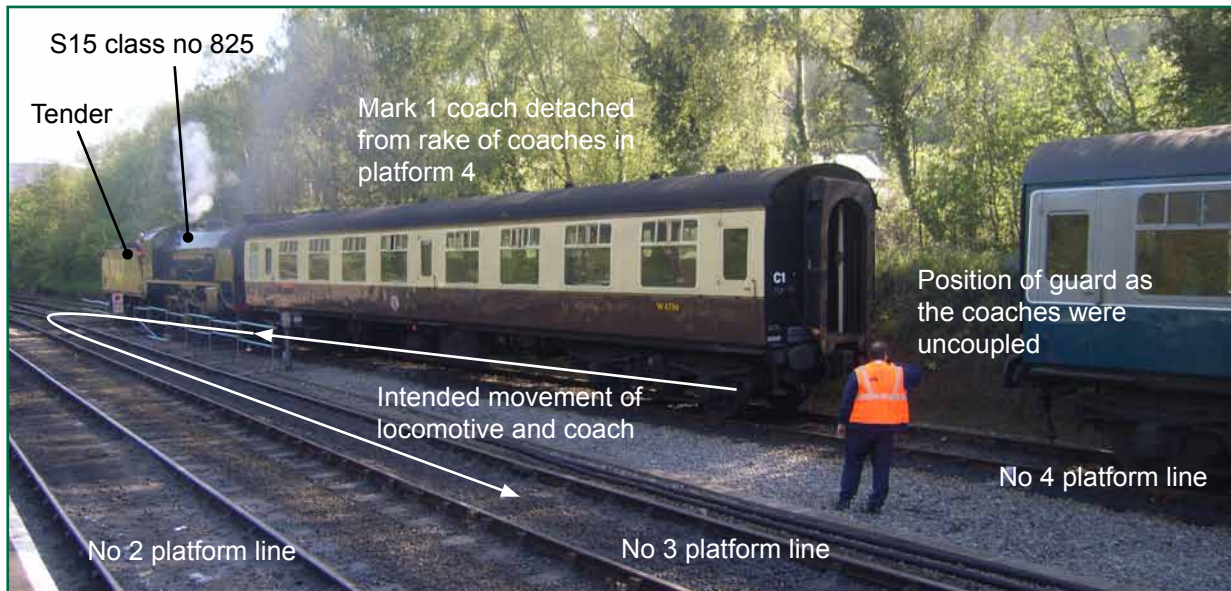


Figure 2: The accident site at Grosmont station showing a reconstruction by the RAIB of the accident circumstances

Context

Location

- 6 The North Yorkshire Moors Railway (NYMR) is a major heritage railway that runs 29 km (18 miles) from Pickering to Grosmont. It connects with the Middlesbrough to Whitby route (the Esk Valley line) of the national network at Grosmont, and certain NYMR services are extended over the national network to run through to, and from, Whitby. Most trains are operated using a variety of different types of steam locomotives and *Mark 1 coaches*.
- 7 The station track layout at Grosmont (figure 3) consists of one platform to serve the Esk Valley line and three platforms to serve the NYMR. At the north end there are three NYMR sidings and a connection between the NYMR and the national network. Immediately south of the station there is a level crossing, followed by a short tunnel, and then the locomotive shed. Through the station, the gradient falls away at 1 in 126 towards Whitby.
- 8 The south end of the station is fully signalled and controlled by the signal box which is adjacent to the level crossing. There are fixed stop boards at the north end of the station which require the signaller's permission to pass them. Movements onto, or from, the national network are undertaken by operating a *groundframe* at the north end of the station.
- 9 The NYMR has around 100 full-time paid employees (including the functional managers of the railway). It also relies heavily on volunteers to carry out many of the roles, such as drivers and firemen, required to operate the railway.

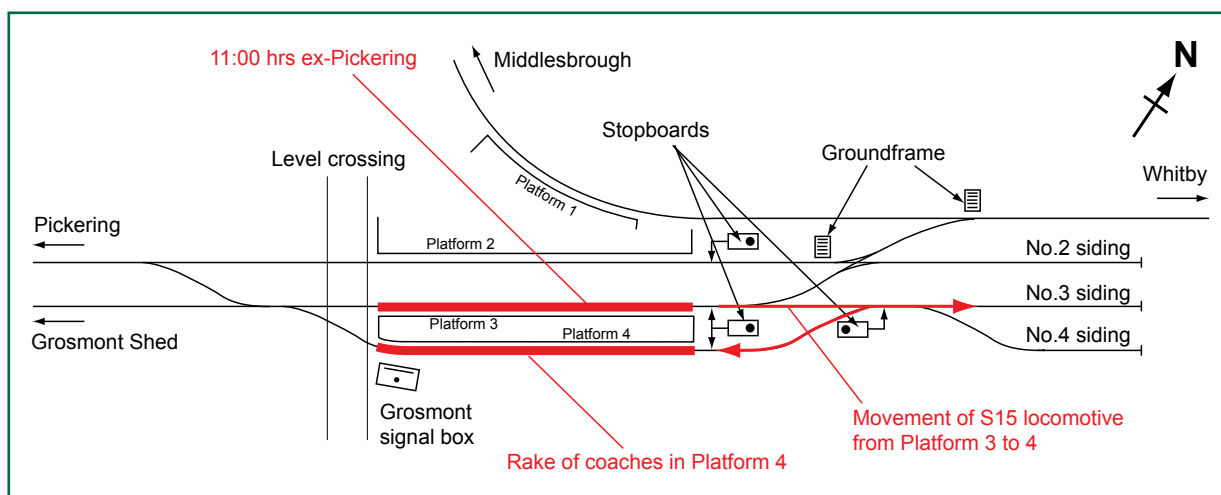


Figure 3: The track layout at Grosmont station

Locomotive and coaches involved

- 10 The locomotive employed for the shunting move was an ex-Southern Railway S15 class 4-6-0, no.825 (figures 2 and 5), built in 1927, which had worked the 11:00 hrs train from Pickering *tender* first (ie with the locomotive working in reverse) and was then due to work the 13:30 hrs train from Grosmont to Pickering. In between arriving at Grosmont and departing again, the locomotive was scheduled to be coaled and watered, and to receive a routine visual inspection at Grosmont shed. There was sufficient time for this even allowing for the shunting that was to be carried out.
- 11 In common with many other types of steam locomotive, the S15 locomotive is fitted with a *screw reverser* (figure 4) which the driver operates to alter the setting of the *valve gear*. The valve gear consists of a set of rods and links moved by the rotation of the locomotive's driving wheels, which in turn controls the admission and exhaust of steam to and from the locomotive's cylinders by opening and closing valves. Changing the setting of the valve gear can alter the direction of the locomotive from forwards to reverse (or vice versa) and alter the quantity of steam being admitted to the cylinders during each piston stroke. The S15 locomotive has two sets of valve gear; one on each side of the locomotive; the valve gear fitted to the right-hand side of the S15 is shown in figure 5.
- 12 When the reverser is operated to alter the position of the valve gear from full forward gear towards mid-gear and then (if the locomotive is required to go backwards) into reverse (back) gear, its mechanism lifts one end of both radius rods, each of which is able to slide in its associated expansion link (figure 6). If the reverser is not restrained, the weight of the radius rods then acts to try and pull the valve gear to full forward gear, altering the position of the reverser. To prevent this movement, screw reversers are fitted with locking devices.
- 13 Two locking devices are fitted to the S15 locomotive to prevent the reverser changing position when the locomotive is moving. These are a mechanical latch (figure 4), which is spring loaded with an over centre spring and, when operated, engages with a toothed disc fixed to the reverser shaft; and a steam operated lock. It is only necessary to use the mechanical latch during shunting movements, whereas during service running both locking devices should be used. Use of the mechanical latch alone in these circumstances would cause it to rattle resulting in wear and a noise distraction to the driver as a result of the higher forces when the locomotive is working at higher loads.

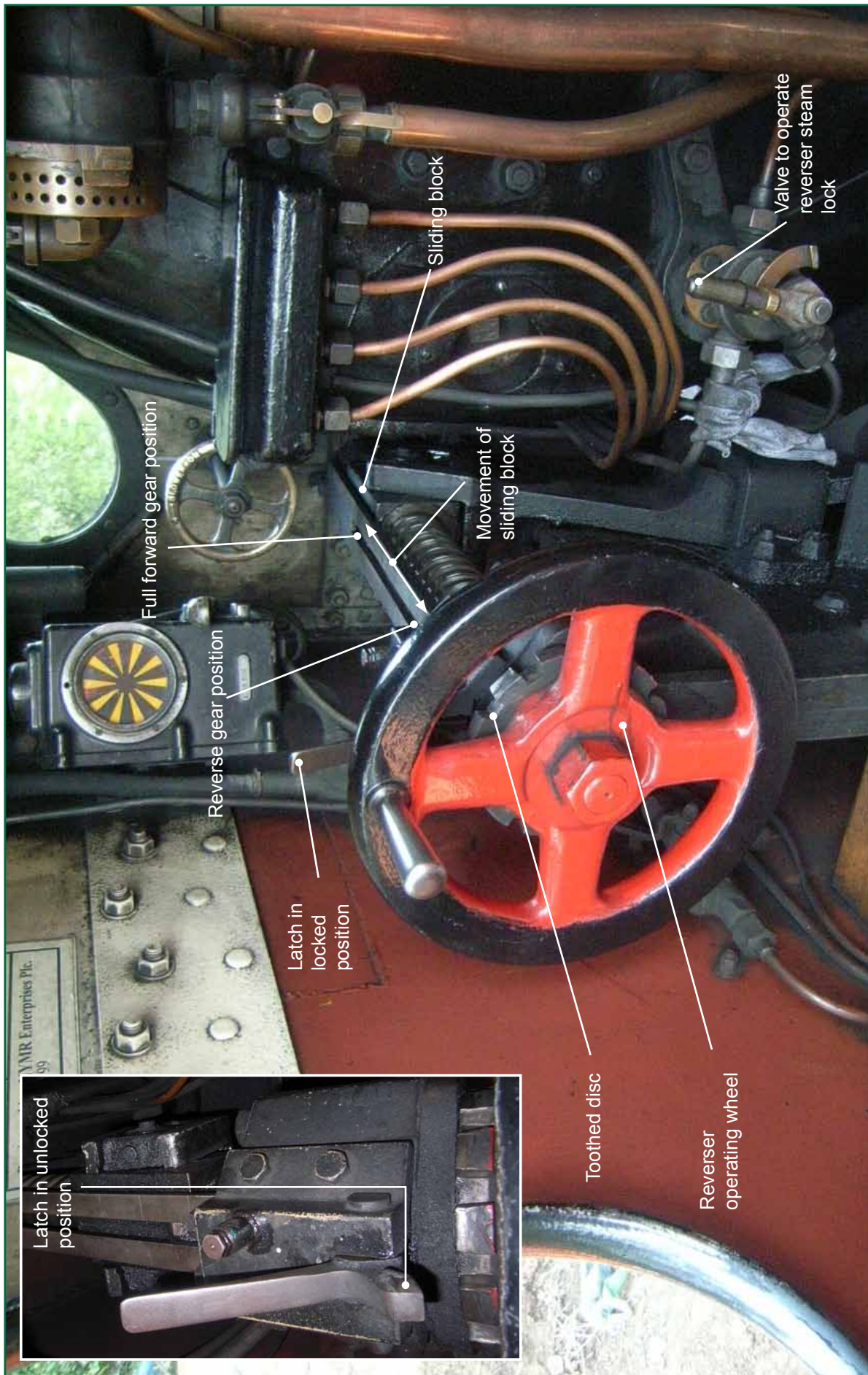


Figure 4: The screw reverser and its locking mechanism in the cab of S15 class locomotive no.825



Figure 5: Valve gear fitted to S15 class locomotive no.825 with the locomotive in reverse gear

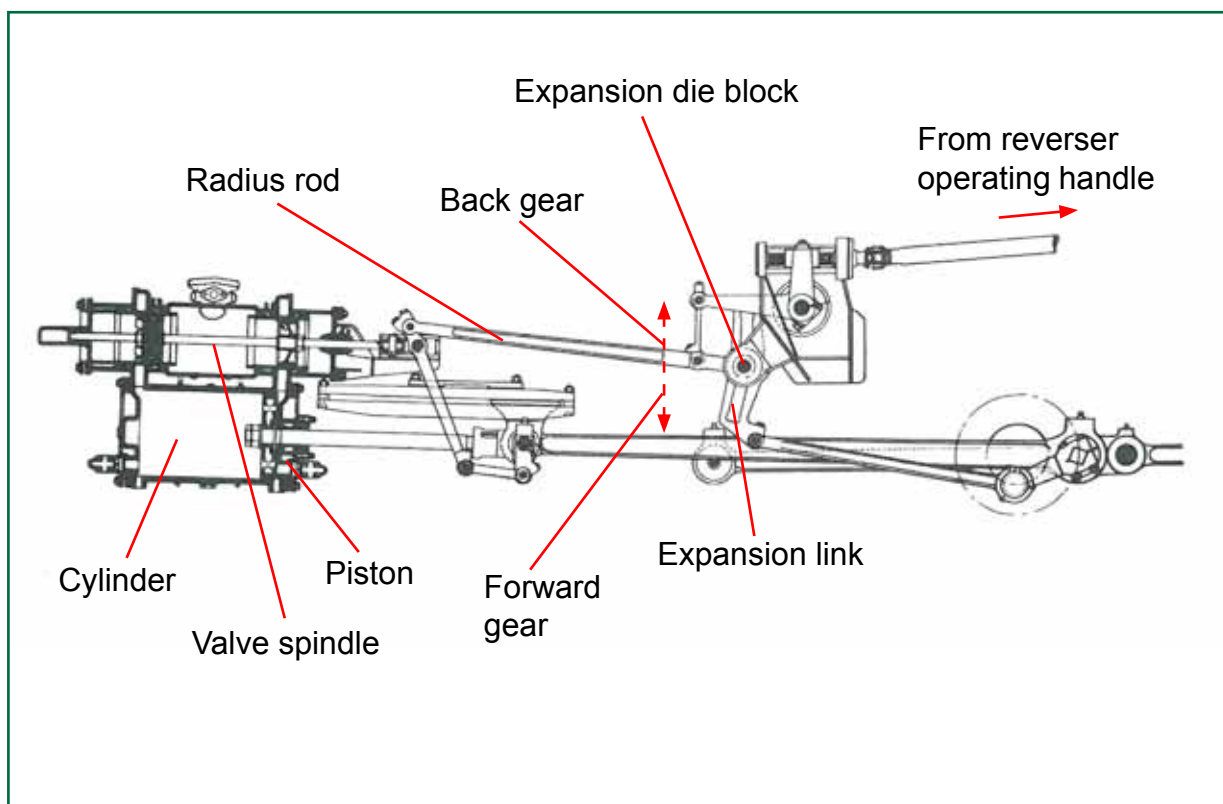


Figure 6: Diagram of typical valve gear (as fitted to S15 class locomotive no.825) shown in the mid-gear position

Key facts and analysis

Background information

- 14 The personnel involved in carrying out the shunting move were all volunteer part-time staff. The locomotive was crewed by a driver and fireman who had brought the train from Pickering. The guard who undertook the shunting move had joined the train at Goathland (figure 1) and, following arrival at Grosmont, was due to work the 13:10 hrs train from Grosmont to Whitby.

The driver and fireman

- 15 The driver started his railway career in 1951 at Newport shed (Middlesbrough), with British Railways, and qualified as a fireman in 1953 and a steam locomotive driver in 1965. He then subsequently moved to the Southern Region of British Rail and drove diesel and electric trains until 1975 when he left and became employed by the NYMR to carry out driving duties, driver and firemen training and rostering. He had already been working as a volunteer driver on the NYMR since 1971 and then was appointed as the NYMR's operations manager from 1978 to 1980. In 1980, he left the NYMR's employment to work as a signaller with British Rail, and finally Railtrack¹. During this period, he continued to work as a volunteer driver on the NYMR.
- 16 In 2004, the driver started work as a driver on another heritage railway and eventually became its operations manager. The duties of this post included training new drivers. During this period from 2004, he drove less and less on the NYMR and his driving competence on that railway lapsed.
- 17 When the driver re-applied to drive on the NYMR in 2009, the NYMR decided that he should follow the qualification process from fireman to driver that new candidates for driver are required to follow. This required him to pass written examinations on the NYMR's rules, and on the mechanical aspects and working of steam locomotives. He was also required to undertake a practical driving assessment. He passed the written examinations but failed the practical driving assessment in May 2009 for reasons that were not relevant to this accident. He attempted to re-take the practical driving assessment in September 2010, but the train he was to drive for the assessment was hauled by a diesel locomotive so he was unable to be assessed on steam locomotive driving on that occasion. Further time elapsed before another assessment could be organised during which he continued working alongside other footplate crews to retain his knowledge and experience. It was not until 2 April 2012 that the driver successfully undertook and passed the practical driving assessment.
- 18 Records are not available to confirm on how many occasions the driver had driven steam locomotives, but given his long service record on the NYMR and regular driving turns, the NYMR considered him to be an experienced driver. Evidence also shows that he drove the S15 locomotive in the 1970s and it is likely that he would have continued to do so until he stopped driving on the NYMR. However, the day of the accident was the first time he had driven the S15 since re-qualifying as a driver on 2 April 2012, although (according to his own evidence) he had driven it, while accompanied by another driver, towards the end of 2011.

¹ The predecessor organisation to Network Rail.

- 19 In accordance with the NYMR's procedures, the driver was medically examined on an annual basis because of his age (75 years). His last medical before the accident, at which he had been judged fit to undertake operational duties, was on 9 February 2012.
- 20 The fireman started work as a volunteer *engine cleaner* on the NYMR in 2009. He attended a footplate familiarisation course in August 2010 and passed a written examination covering rules, locomotive knowledge and route knowledge in February 2011. The final stage in qualifying as a fireman was to pass the practical assessment on locomotive handling which he completed on 19 April 2011. His last medical examination was on 10 May 2011, when he was declared fit for normal duties, and he was not due a further medical for ten years.
- 21 NYMR medicals were undertaken in compliance with *Railway Group Standard GO/RT3451 'Train Movement – Staff Suitability and Fitness Requirements'*. This was in line with the management policy that the NYMR's staff should meet the same standards as apply to other railway operators on the national network and allowed them to work trains between Grosmont and Whitby (paragraph 6).

The guard

- 22 The guard started work on the NYMR in 1996 and qualified to act as a guard in 1999 following successful completion of a rules examination. On 15 February 2009, he was assessed as competent to undertake the role of guards' inspector in which he was responsible for assessing the competence of other guards. Guards on the NYMR are expected to carry out shunting duties, in addition to the usual guard's duties of dispatching trains and carrying out on-train duties, such as checking passengers' tickets.
- 23 Training staff to undertake shunting is generally undertaken 'on the job', although specialist training courses on operational matters including shunting are run as part of the NYMR's winter training programme. Attendance on these courses is voluntary. The NYMR reported that the guard helped to run the shunting courses, including the one during the winter of 2010/11.
- 24 Assessment of shunting competence is done by testing knowledge of the rules covering shunting in the NYMR's rule book². The initial rules assessment and subsequent two-yearly assessments are undertaken verbally with no written records produced, other than an initial competence certificate updated with the results of re-assessments as they are carried out.
- 25 Guards who operate trains between Grosmont and Whitby (paragraph 6) are required to comply with the relevant provisions of the rule book covering the national network (Railway Group Standard GE/RT8000). These personnel must therefore understand the differences between the two rule books and should be tested on the relevant provisions of the national network rule book at the initial and subsequent two-yearly assessments.
- 26 Early in 2012, the NYMR introduced a procedure defining the lead responsibility in safety-related communications. In the case of drivers and guards carrying out shunting, this lead responsibility was deemed to be the guard's. Guards were advised of this change in the Monthly Operating Notice for April 2012, which the guard signed to record receipt of on 3 April 2012.

² The NYMR's rule book is based on the British Rail 1972 rule book that was used on the national network. The NYMR judged that this rule book is most relevant to the nature of its operations.

- 27 Guards were not briefed verbally about this procedure, so it is unclear whether the guard in the accident had read and understood its meaning although the witness evidence is that the guard did take the lead role in the shunting that was being carried out.
- 28 The guard's last re-assessment on the rules before the accident was on 10 July 2011 and his certificate of competency was updated accordingly.
- 29 The guard's last medical (also to Railway Group Standard GO/RT3451) was on 24 July 2009 when he was assessed fit for normal duties. He was on a two-yearly cycle of medicals because of his age (65 years) and therefore due a further routine medical on 23 July 2011. This was not carried out because the NYMR's administrative process covering medical records did not identify that he was overdue. The RAIB has found no evidence that this was a factor in the accident, and since then the NYMR has put in place an improved system to monitor when medicals are due and to record when they have been carried out.
- 30 In addition to these assessments, the NYMR's safety management system requires ad hoc checking of guards undertaking shunting. This guard was subject to such observational checks on 10 April 2011 and 18 September 2011 with no recorded concerns. Before then, there had been no checks on him since 2008, although the NYMR reported that he had been absent during this time because of sickness. There was no specification of what was required to be checked or how often although one was being introduced around the time of the accident (paragraph 73).

Sequence of events

Events preceding the accident

- 31 Following the arrival of the 11:00 hrs train from Pickering into platform 3 at Grosmont at 12:05 hrs, the S15 locomotive was required to detach a Mark 1 coach from the north (Whitby) end of the rake of coaches in platform 4 and couple it to the rake of coaches in platform 3 (figure 2). The coach to be shunted to platform 3 was required at Pickering for examination by carriage maintenance staff.
- 32 The guard told the driver the details of the shunt move to be carried out and confirmed that he had obtained permission from the signaller to pass the *stop boards* at the north end of the station (figure 3 and paragraph 8). The fireman had uncoupled the locomotive, in accordance with his normal duties, and when he returned to the driving cab the driver told him the details of the shunting required. The driver then drew the locomotive away from the coaches (tender first) into no.3 siding (figure 3). The fireman climbed down from the engine and changed the *points* to allow the locomotive to proceed forwards (chimney first) towards the coaches in platform 4, and then climbed back on to it. The guard (who was standing on the ground on the fireman's side³ of the locomotive at the end of the rake of coaches) then indicated by hand signal (which the fireman relayed to the driver) that the S15 locomotive should draw forwards to the coaches so that it could be coupled to them. The locomotive moved forwards and the fireman climbed down from the driving cab to carry out this coupling while the guard walked back to where the first and second coaches of the rake were to be uncoupled.

³ While working chimney first, the fireman is on the right-hand side, in the direction of travel, of an S15 class locomotive.

- 33 So that the guard could release the buckeye couplings to uncouple the first coach from the rest, the tension in the couplings had to be eased. The guard therefore made a hand signal, which the fireman relayed to the driver, to apply some forward pressure to ease the couplings so they could be released. The guard was then able to pull the chain provided to release the couplings and then gave a hand signal to the fireman that the S15 locomotive, now hauling the first coach, should reverse away back to no.3 siding. It was then intended that the fireman should change the points so that it could push the coach back into platform 3 to couple onto the coaches in that platform which had previously formed the 11:00 hrs train from Pickering.
- 34 The driver stated he believed that the guard would go straight to platform 3 to control the movement towards the stationary coaches in that platform and to undertake the coupling operation.
- 35 To carry out the movement away from the remaining coaches in platform 4, the driver adjusted the screw reverser to reverse gear and slightly opened the *regulator* to allow steam from the boiler to the cylinders.

Events during the accident

- 36 The fireman continued to observe the guard's hand signal to move away and then momentarily looked forward, in the direction of travel. At this point, after the locomotive had travelled an estimated three to five metres, he became aware the locomotive had changed its direction, looked back and could no longer see the guard. The driver had already realised what had happened and made an emergency brake application.
- 37 The locomotive's change of direction occurred because the reverser moved position to forward gear causing the locomotive to push the coach back towards the other coaches in platform 4.
- 38 While the locomotive and coach were drawing away, the guard went from his position on the ground, adjacent to where the coaches were being parted, into the *four foot* at the end of the coaches left behind in platform 4 to lower the *buckeye coupler* head and extend the buffers. He did not go straight to platform 3, which was the driver's understanding. Following the change of direction of the locomotive and coupled coach, they moved back towards where the guard was standing and he became trapped between the vestibule ends of the coaches.

Events following the accident

- 39 The locomotive was put into reverse gear and moved backwards to release the trapped guard. Unfortunately, his injuries were fatal.
- 40 The Grosmont signaller dialled 999, following a phone call from the driver, and a paramedic arrived at 12:28 hrs, followed by an ambulance at 12:31 hrs.
- 41 In accordance with the NYMR's normal procedures following an accident, the driver and fireman were tested for drugs and alcohol by the NYMR's nominated medical practitioner. This was done around an hour after the accident occurred and the results were found to be clear.
- 42 The brakes of the locomotive and the coach it was coupled to were tested by the NYMR's maintenance staff following the accident and found to perform to the NYMR's post accident brake test standard.

Identification of the immediate cause⁴

- 43 **The immediate cause of the accident was that the guard was between vehicles during a shunt move when the locomotive and a coupled coach that were moving away unexpectedly changed direction.**

Identification of causal factors⁵

44 The accident occurred due to the following causal factors:

- as the locomotive was drawing away the reverser moved from reverse into forward gear causing the locomotive to change its direction (paragraph 45); and
- the guard went into the four foot at the end of the rake of coaches in platform 4 while the locomotive and a coupled coach were close by but moving away (paragraph 54).

Each of these factors is considered in the following paragraphs.

Unintended movement of the reverser

- 45 **As the locomotive was drawing away the reverser moved from reverse to forward gear causing the locomotive to change its direction. This is a causal factor.**

46 The RAIB carried out a series of tests following the accident using the S15 locomotive and the same Mark 1 coach involved in the accident. These sought to replicate the conditions that existed at the time of the accident (paragraph 35). The tests showed that if the screw reverser was not locked, it would move freely from reverse to forward gear. A subsequent small opening of the regulator was then enough to cause the locomotive to stop going backwards and then move forwards in one smooth movement.

47 The RAIB has concluded that the reverser was able to move because the driver had not used the mechanical latch to prevent it, even though the evidence was that he fully understood the purpose of the latch and when it should be used. This almost certainly resulted from a lapse, the reasons for which the RAIB has been unable to determine. The examination which qualifies drivers as competent when converting from fireman to driver (paragraph 15) includes questions on the valve gear, which he answered competently. The driver's practical driving assessments provided no evidence of any issues concerning his use of the screw reverser locking devices.

48 The RAIB found no evidence that the driver's age (paragraph 19) or any associated medical conditions were a factor in him not using the mechanical latch.

⁴ The condition, event or behaviour that directly resulted in the occurrence.

⁵ Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

- 49 None of the personnel involved reported that the driver had failed to lock off the reverser while driving the engine from the yard onto the coaches at Pickering (when he would have been likely to use the mechanical latch), or while driving the 11:00 hrs train to Grosmont (when he would have used the steam operated lock – paragraph 13).
- 50 There was also no evidence that the driver had been distracted either on the footplate or as a result of other issues. Although the time for the shunt move and subsequent servicing of the locomotive was limited by the planned departure time for the locomotive (paragraph 10), both the driver and the fireman reported that they did not feel under pressure and were not in a hurry to complete the shunt.
- 51 The RAIB examined the latch mechanism, and the condition of the toothed disc with which it engages, and found no apparent deficiencies in its operation. The records show that the reverser, including the latch mechanism, was last examined as part of the routine annual examination of the locomotive on 20 March 2012. The latch is also used daily by maintenance staff as part of the safety precautions associated with the daily examinations; any defect in the operation of the latch should be identified from these examinations. There are no records of any defects having been found.
- 52 The possibility that the latch was initially engaged to prevent the reverser moving but was then forced out by the reverser mechanism has been discounted by the RAIB. The tests carried out by the RAIB could not cause this to happen and the RAIB has not been able to conceive any situation where this would occur under the actual working conditions of the locomotive just prior to the accident. The latch has a positive engagement with the reverser and, with only a small opening of the regulator, the force acting on the latch through the reverser is limited.
- 53 The reverser movement would not have been observed by the driver because he was facing the other way, looking out over the tender, in the intended direction of travel of the locomotive. The fireman would also not have seen the reverser movement because, at the time, he was observing the guard's hand signal to move away (paragraph 36).

Actions of the guard

- 54 **The guard went into the four foot at the end of the rake of coaches in platform 4 while the locomotive and a coupled coach were close by but moving away. This is a causal factor.**
- 55 It is likely that when the guard saw the S15 locomotive and coach start to move away from the remaining coaches in platform 4, he had no reason to believe that they would change direction and move back towards him.
- 56 The NYMR rule book states that persons must not go between vehicles for any purpose unless the vehicles are at rest. Although the guard did not adhere to this rule, it is likely that in seeing the locomotive and coach moving away he believed that it was safe to go between the coaches. It is unlikely that he would have seen or heard the change in direction of the moving vehicles.
- 57 It is probable that the guard fully understood the applicable rules as he was also responsible for assessing the competence of other guards (paragraph 22).

- 58 The driver stated that the guard had told him that he would go to the coaches in platform 3, following the uncoupling of the coaches in platform 4 (paragraph 34), and did not mention that he would first complete the work at the end of the rake of coaches in platform 4. This evidence therefore suggests that the driver was unaware of the presence of the guard at the end of the rake of coaches in platform 4 when the S15 locomotive and coach moving away changed its direction.

Observations⁶

The NYMR's competence management system and rules covering shunting

- 59 Although not causal to the accident, the RAIB found that the competence management system in place covering shunting could be improved.
- 60 The method of training guards to learn shunting by working 'on the job' (paragraph 23) has the potential to allow poor practices to be learned, and does not guarantee that all tasks are covered or sufficiently practised. There is no framework identifying the areas to be assessed and actual assessments are focused on knowledge of the rules which may not reflect actual understanding of safe methods of working. The only written records kept are certificates of competency, updated as required.
- 61 The rules covering shunting on the NYMR are adapted from the British Rail 1972 rule book that covered the national network. Although many of these are still current on the national network, new rules introduced since (and which may reflect learning from accidents) are not in the NYMR's rule book. Examples are the rules that require movements to be stopped immediately if the driver loses sight of the shunter, or the shunter's hand signals; and before starting any shunting, the driver and the shunter must reach a clear understanding with each other about what exactly needs to be done and how the shunting movements will be controlled. Neither of these rules is in the NYMR's rule book.
- 62 There was no specified frequency or scope of management observational checks on shunting being performed by guards.

Previous occurrences of a similar character

- 63 The RAIB investigated a fatal accident to a guard on the heritage Gwili Railway at Bronwydd Arms station on 19 July 2006 (report 22/2007). In this accident, the guard became trapped between two coaches as they were being coupled because of a misunderstanding of shunting hand signals and the guard stepping 'in between' coaches in the belief that the coaches would not move.

⁶ An element discovered as part of the investigation that did not have a direct or indirect effect on the outcome of the accident but does deserve scrutiny.

- 64 Immediately after this accident, and also as a consequence of a Freightliner Heavy Haul shunter fatality at Dagenham on 17 July 2006⁷, the RAIB issued an urgent safety advice to remind staff involved in shunting that:
- the shunter and driver must carry out a briefing before movements start, and have clear understanding between them of all moves to be undertaken;
 - 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; and
 - 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.
- 65 Following the issue of the urgent safety advice, the NYMR reviewed its rules covering shunting and issued an instruction that where a locomotive was to be coupled to a train, the locomotive must stop at least two metres away to allow the shunter to control the subsequent coupling to the train.
- 66 Also, in response to the accident on the Gwili Railway, the *Heritage Railway Association* issued a guidance note in August 2007 covering shunting, including coupling and uncoupling. The guidance sets out good practice in the way that shunting should be carried out but does not cover the elements that should make up a competence management system.

⁷ This accident was investigated by the RAIB (report no. 23/2007).

Summary of conclusions

Immediate cause

- 67 The immediate cause of the accident was that the guard was between vehicles during a shunt move when the locomotive and a coupled coach that were moving away unexpectedly changed direction (**paragraph 43**).

Causal factors

- 68 The causal factors were:

- a. As the locomotive was drawing away the reverser moved from reverse to forward gear causing the locomotive to change its direction (**paragraph 45**).

The following is a factor leading to causal factor 68a:

- i. the driver omitted to engage the mechanical latch with the screw reverser to prevent its movement (**paragraph 47, Learning point 1**).
- b. The guard went into the four foot at the end of the rake of coaches in platform 4 while the locomotive and a coupled coach were close by but moving away (**paragraph 54, Learning point 2**).

The following is a probable factor leading to causal factor 68b:

- i. the guard would not have had any reason to believe that the S15 locomotive and its attached coach would change direction and move back towards him (**paragraph 55**).

Additional observation

- 69 Although not linked to the accident on 21 May 2012, the RAIB observes that:
- a. the competence management system covering shunting on the NYMR could be improved (**paragraph 59, Recommendation 1**); and
- b. recent applicable changes to shunting rules as applied to the national network are not reflected in the NYMR rule book (**paragraph 61, Recommendation 1**).

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

- 70 Following the accident, the RAIB issued an urgent safety advice reminding operators of the need to lock screw reversers, and about safety while shunting (appendix B).
- 71 The NYMR carried out its own investigation and issued supplementary instructions on shunting. These included an instruction that shunters must not go between vehicles, even if there is a movement away following uncoupling, unless they are all stationary and confirmation has been obtained from the driver that no movement will take place.
- 72 The NYMR implemented an improved system to monitor when routine medicals are due and to record when they have been carried out (paragraph 29).
- 73 Around the time of the accident, the NYMR was in the process of introducing a more structured system of guards' re-assessments with records produced afterwards (paragraph 24). It also implemented a specification covering management checks of persons carrying out operational duties in which individuals carrying out shunting are required to be checked every two years (paragraph 30).
- 74 In early 2012, the NYMR started a trial in which trainee guards record their progress in an individual log book. This should provide an improved means of ensuring that all necessary tasks are learned and practised before assessment is carried out (paragraph 60).

Learning points

- 75 The RAIB has identified the following key learning points⁸ which are essentially a reiteration of the advice contained in the urgent safety advice issued following the accident (appendix B):

Learning point 1

Drivers, and those carrying out the practical driver assessments, of steam locomotives fitted with screw reversers need to be made aware of the risks associated with the unintended movement of the reverser while the locomotive is in motion and the control measures in place to prevent this. This should include the importance of remaining vigilant when shunting, and using the locking device to prevent the unintended movement of the reverser at all times the locomotive is moving and the reverser is not being operated (paragraph 68a.i).

Learning point 2

Staff carrying out shunting duties should be made aware that they should not go between vehicles until the vehicles are a safe distance apart; are at a stand; secured; and the shunter has reached a clear understanding with the driver about what they are doing and an assurance that the vehicles will not be moved (paragraph 68b).

Staff should also be made aware that they should never assume that a train moving away from them will continue to move away (paragraph 68b.i).

⁸ An issue which the RAIB wishes to draw to the attention of industry bodies and railway staff so that they can take appropriate action.

Recommendation

76 The following recommendation is made⁹:

1 *The intention of the recommendation is that the North Yorkshire Moors Railway should review and improve its safety management arrangements relating to shunting. In particular, it is important that the rules covering shunting represent best practice and that training ensures, and assessment tests, a correct understanding of the dangers inherent in shunting and the control measures in place to allow shunting to be carried out safely. As a minimum, it is intended that the review includes consideration of:*

- *updating the North Yorkshire Moors Railway's rule book to include relevant rules covering shunting contained in the national network rule book that may reflect learning from accidents that have occurred;*
- *improving the method of training so that it is more formalised and reflects a specific syllabus appropriate to the necessary competence to be achieved;*
- *how assessment and re-assessment should cover all the necessary areas of competence relating to shunting and how the outcomes of assessments should be documented; and*
- *the system of management checks and how they should be documented.*

The North Yorkshire Moors Railway should review its safety management arrangements with regard to shunting. The review should particularly take into account the adequacy of, and best practice in, the following:

- the rules covering shunting;
- the method of training staff to undertake shunting duties;
- the method of assessment of staff, which should include elements of both practical and written assessment, being passed out for shunting duties for the first time and on subsequent occasions; and
- the system of management checks confirming that safe methods are being applied.

continued

⁹ Those identified in the recommendation, have a general and ongoing obligation to comply with health and safety legislation and need to take this recommendation into account in ensuring the safety of their employees and others. Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, this recommendation is addressed to the Office of Rail Regulation to enable it to carry out its duties under regulation 12(2) to:

- (a) ensure that recommendations are duly considered and where appropriate acted upon; and
- (b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

Copies of both the regulations and the accompanying guidance notes (paragraphs 200 to 203) can be found on RAIB's web site www.raib.gov.uk.

The North Yorkshire Moors Railway should implement any necessary changes and should document the revised safety management arrangements (paragraphs 69a and 69b).

Note that the principles outlined in this recommendation may apply to other heritage railway operators.

Appendices

Appendix A - Glossary of terms

Buckeye coupler	An automatic mechanical coupler incorporating a pivoted knuckle which automatically engages with the knuckle of the buckeye coupler fitted to another vehicle being coupled to the first when the two vehicles are pushed together. The coupler head must be able to drop out of the way if the vehicle is required to be coupled to a locomotive fitted with a screw coupling.
Engine cleaner	A person who assists with the preparation of steam locomotives for traffic and their disposal afterwards. A driver is usually required to start as a cleaner before passing out as a fireman and then a driver.
Four foot	The area between the running rails of railway track.
Groundframe	A small group of signal and point operating levers located close to a relatively infrequently used facility such as a crossover. The levers are locked by the controlling signal box, and only released when required.
Heritage Railway Association	A body that represents the majority of heritage and tourist railways and railway preservation groups within both the U.K. and Ireland
Mark 1 coach	The standard British Railways coach design introduced from 1951.
Points	Movable rails able to switch trains from one track to another.
Railway Group Standard	Documents that mandate technical and operational requirements to Network Rail and train operators that operate on Network Rail's infrastructure.
Regulator	The handle in the driving cab which opens or closes the regulator valve controlling the amount of steam to the cylinders.
Screw reverser	The reverser on a steam locomotive controls the amount of steam admitted to the cylinders on each stroke, as well as whether the locomotive will move in forward or reverse direction
Stop board	A sign at the lineside requiring trains to stop at it unless they have received permission from the signaller to pass it.
Tender	A separate, permanently coupled, vehicle attached to a steam locomotive which carries the coal and water.
Valve gear	The mechanism which controls the opening and closing of valves allowing the admission and exhaust of steam to and from a locomotive's cylinders.

Appendix B - RAIB Urgent Safety Advice issued on 1 June 2012

1. ACCIDENT DESCRIPTION	
ACCIDENT NAME	Fatal accident to a volunteer member of staff acting as a guard at Grosmont station on the North Yorkshire Moors Railway
TYPE OF ACCIDENT	The deceased person was crushed between coaches during shunting
ACCIDENT DESCRIPTION	Ex Southern Railway S15 class steam locomotive no.825 was being used to detach a Mark 1 coach from a rake of coaches stabled at Grosmont station. The locomotive was coupled chimney first to the coaches and while the locomotive was in the process of drawing off the leading mark 1 coach, following the release of the buckeye couplers by the deceased person, the locomotive changed direction and pushed the coach back onto the rake of remaining vehicles. Meanwhile, the deceased person had gone 'in between', presumably to drop the buckeye coupler, extend the buffers etc. and was crushed between the two coaches.
SUPPORTING REFERENCES	Nil

2. URGENT SAFETY ADVICE	
USA DATE:	1 June 2012
TITLE:	The safe operation of steam locomotive screw reversers and the safety of personnel while shunting
SYSTEM / EQUIPMENT:	Screw reversers and their locking mechanisms
SAFETY ISSUE DESCRIPTION:	<p>The RAIB supervised the testing of the S15 class locomotive no.825 during the day following the accident. The testing focussed on the reverser and its locking device – during shunting, a mechanical spring loaded latch is normally used. The testing found that if the reverser is not secured by the latch when running tender first and with the regulator closed the reverser's position can change from full back to full forward gear. If this occurs without the driver or fireman noticing, subsequent opening of the regulator will cause the locomotive to stop and immediately move in the opposite (forward) direction. This whole sequence of events was recreated, and it occurred as the locomotive moved over a distance of six metres.</p> <p>This unintended movement of the reverser is most likely to occur if the locomotive is moving tender first with the weight of the radius rods acting to try and pull the reverser into forward gear.</p> <p>Any unexpected movement of a locomotive/rolling stock is particularly hazardous to staff who may have moved back foul of that movement in order to complete their duties.</p>
CIRCUMSTANCES:	A sudden (unexpected) change in direction of a steam locomotive is a hazard.
CONSEQUENCES	The unexpected change of direction of the locomotive resulted in the person completing actions following the uncoupling of the coaches receiving fatal injuries.

SAFETY ADVICE:	<p>Operators of steam locomotives fitted with screw reversers should remind their staff about the risks associated with the unintended movement of the reverser while the locomotive is in motion and the control measures in place to prevent this. This should include reminding drivers of the importance of remaining vigilant when shunting and using a locking device to prevent the unintended movement of the reverser at all times the locomotive is moving.</p> <p>The circumstances of this accident also emphasise the need to check that:</p> <ul style="list-style-type: none">• the security of the reverser is included, as appropriate, in the training of drivers and their subsequent assessment; and• the continuing assessment of competent drivers includes the appropriate use of the reverser locking devices. <p>Operators should also remind all staff involved in shunting operations that they should not go between vehicles until the vehicles are a safe distance apart; are at a stand; secured; and the shunter has reached a clear understanding with the driver about what they are doing.</p>
-----------------------	--

This page is left intentionally blank

This report is published by the Rail Accident Investigation Branch,
Department for Transport.

© Crown copyright 2012

Any enquiries about this publication should be sent to:

RAIB	Telephone: 01332 253300
The Wharf	Fax: 01332 253301
Stores Road	Email: enquiries@raib.gov.uk
Derby UK	Website: www.raib.gov.uk
DE21 4BA	