Rail Accident Investigation Branch

Rail Accident Report

Incident involving a container train at Basingstoke station 19 December 2008

Department for Transport

Report 21/2009
August 2009

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

Incident involving a container train at Basingstoke station, 19 December 2008

Contents

Preface

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.

Key Definitions

3 Throughout this report, reference is made to the sizes of standard shipping containers, which are designed to conform to International Standards Organisation (ISO) requirements. Standard industry terminology defines such containers by their nominal length, width and height in feet with no metric equivalents. The containers referred to in this report are 40 feet (12.2 m) long, 8 feet 2 inches (2.5 m) wide, and 8 feet 6 inches (2.6 m) or 9 feet 6 inches (2.9 m) high. Containers which are more than 8 feet 6 inches high are known as '*high-cube*'.

4 The company which operated the train involved in the incident which is the subject of this report, English Welsh & Scottish Railway (EWS), changed its name to DB Schenker from 1 January 2009. It is referred to throughout this report as EWS, the name that it was trading under at the time of the incident.

5 Mileages are defined from a zero datum at London Waterloo station. The 'Up' direction is towards London, and the 'Down' direction is away from London.

6 Appendices at the rear of this report contain the following:

- 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 incident

7 At 10:13 hrs on 19 December 2008, a shipping container which was loaded on a freight train travelling from Wakefield Europort to Eastleigh, struck the canopy above platform one at Basingstoke station as the train passed through at about 25 mph (40 km/h).

8 The canopy was damaged over a length of 130 m, and pieces of wood were scattered along the platform. No-one was hurt.

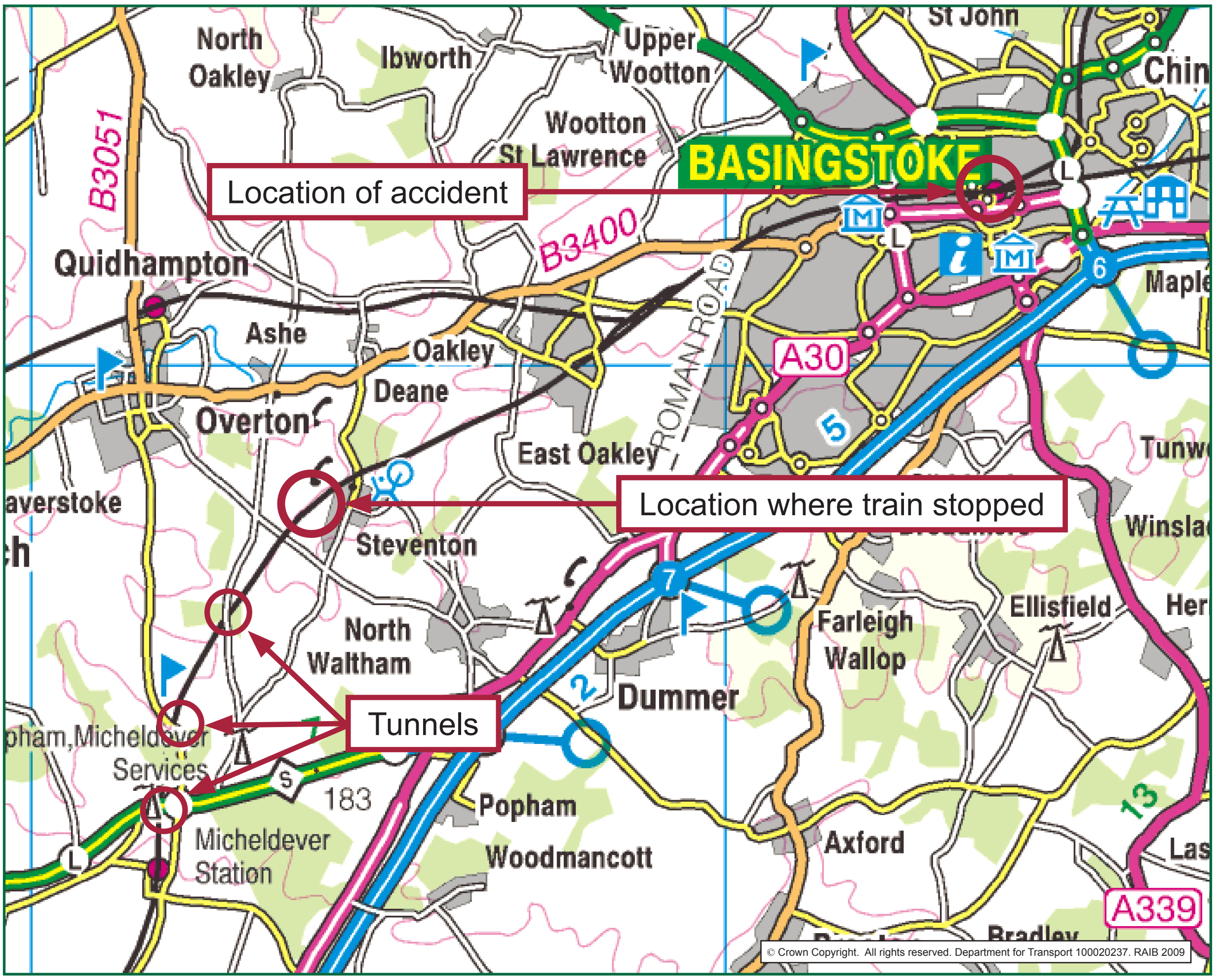

Figure 1: Extract from Ordnance Survey map showing area in which events took place

Immediate cause, causal and contributory factors, underlying causes

9 The immediate cause of the incident was that the combination of the container and the type of wagon it had been loaded onto was too high for the route on which the train was travelling, and the left-hand top corner of the container struck the platform canopy.

10 A causal factor was that the system for identifying container types and container/ wagon combinations on trains departing from Wakefield Euroterminal was prone to human error, in that:

a. the high-cube container was loaded onto an FIA wagon, which was a combination not permitted on the route the train was due to take;

b. incorrect information about the container was recorded by the train preparer at Wakefield, who did not notice during his train examination that the container type was incorrect;

c. the decision of the consistor to change the type code of container MSKU8748843 without checking with the Wakefield terminal; and

d. the load gauge at Wakefield was not operational.

11 A second causal factor was the absence of black/yellow chevrons from the high-cube container involved in the incident.

12 Contributory factors were :

- the restricted view of the loader driver when lifting and placing containers.
- the method of checking the train, from a van, adopted by the train preparer at Wakefield.
- the lack of monitoring and supervision of staff at the Wakefield terminal.
- the poor training and inexperience of the controller, acting as consistor, and the absence of a supervisor at Southampton.
- the nature of the warning messages generated by the ERIC computer system.

Recommendations

13 Recommendations can be found in paragraph 171. They relate to the following areas:

- review of the activities at container terminals, focusing on the consequences of human error, and the introduction of systems to minimise the incidence of out of gauge loads and other safety related operating irregularities;
- revision of the container storage and handling arrangements at Wakefield Europort to reduce the likelihood of confusion between different box sizes; and
- revisions to the warning messages generated by the ERIC computer system.

The Incident

Summary of the incident

14 At 10:13 hrs on 19 December 2008, a shipping container which was loaded on train 4O53, the 04:33 hrs Wakefield Europort – Basingstoke service, struck the canopy above platform one at Basingstoke station as the train passed through at about 25 mph (40 km/h).

15 The wooden ornamental valance of the canopy was damaged over a length of 130 m, and pieces of wood were scattered along the platform (Figure 2). No-one was hurt.

16 The train was stopped after travelling about seven miles (11 km) beyond Basingstoke, and after an assessment of the situation by Network Rail it was moved to a location where the container could be safely removed.

Figure 2: Canopy of platform one, Basingstoke, showing damage

The parties involved

17 The train was operated by English Welsh & Scottish Railway (EWS) (since renamed DB Schenker – see paragraph 4), and its driver was an EWS employee. It had been loaded at the Wakefield Europort terminal, which is owned and staffed by EWS.

18 The railway infrastructure over which the train travelled from Wakefield to Basingstoke was owned, operated and maintained by Network Rail.

19 EWS and Network Rail freely co-operated with the investigation.

Locations

Basingstoke

20 Basingstoke station is on the main line from London Waterloo to Southampton, and is the junction for Reading. The station in its present form has four through platforms and dates from around 1901, when the route from Woking was widened from two tracks to four. At this time Basingstoke station was extended and reconstructed, with new canopies over the platforms.

21 These canopies are supported by cast-iron pillars. On top of the pillars is a riveted steel frame, with a wooden, partly glazed canopy roof. The sides and ends of the canopy are finished with decorative wooden valances. On some platforms these valances had been trimmed in connection with *gauge enhancement* work, but at the time of the incident those on platform one remained in their original condition (Figure 2), although they were due to be altered by 2011 (paragraph 57).

22 Platform one at Basingstoke serves the Down Slow line, and is on a gentle right-hand curve (Figure 3). The permitted speed for this line is 65 mph (105 km/h). The platform is approached from the Reading direction, by crossing over all four tracks of the line from London to reach the Down Slow line. The permitted speed for this movement over the junction is 25 mph (40 km/h).

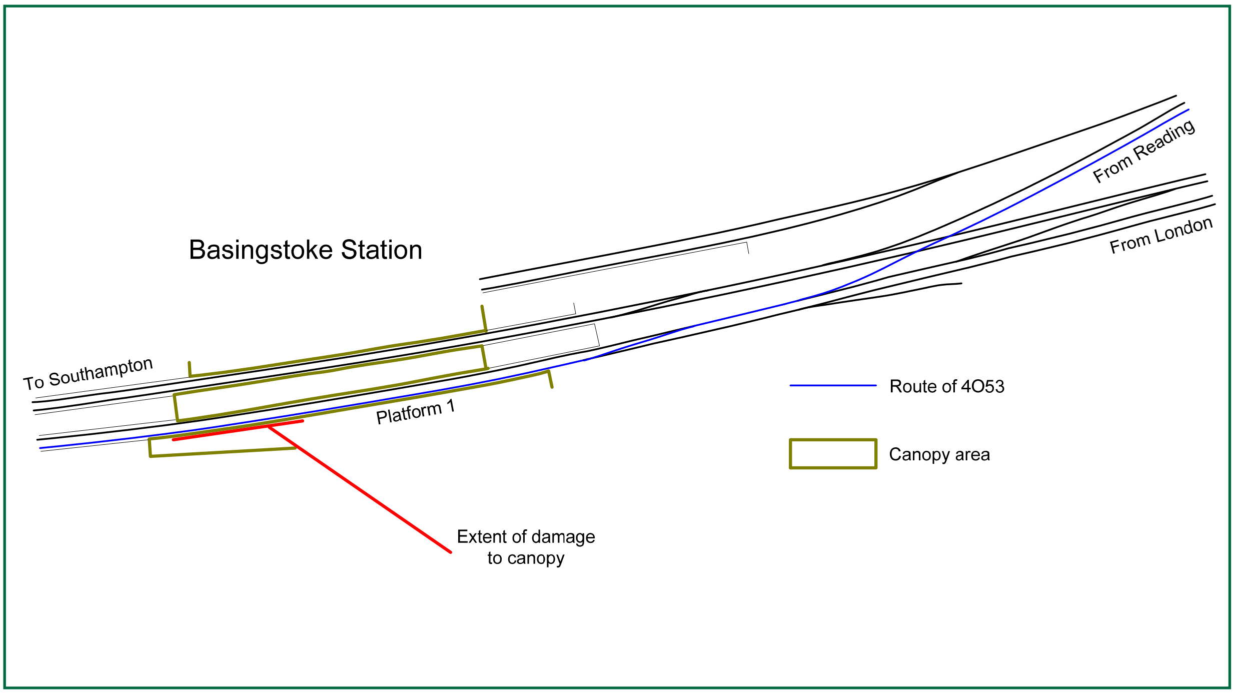

Figure 3: Basingstoke station showing route of train

23 Signalling in the area is controlled from Basingstoke (New) Area Signalling Centre.

24 West of Basingstoke the line to Southampton passes through four bridges over the line in seven miles (11 km), before reaching the short tunnels at Litchfield (181 m/198 yds), Popham No. 1 (242 m/265 yds) and Popham No. 2 (182 m/199 yds). After passing through these, there are loop sidings where freight trains can be stopped clear of the main line at Waller's Ash (12 miles (19 km) from Basingstoke).

25 Further south on the route, there are tunnels at Waller's Ash and St Cross, before reaching the train's terminating point at Eastleigh East Yard, and a further tunnel at Southampton before the final UK destination of the containers at Southampton Western Docks (Figure 6).

Wakefield Europort

26 The train originated at the Wakefield Europort container terminal, which is located near Altofts, West Yorkshire. The terminal has four sidings, and a storage and handling area adjacent to the northernmost siding, which is paved and provides storage space for containers awaiting onward shipment (Figure 4).

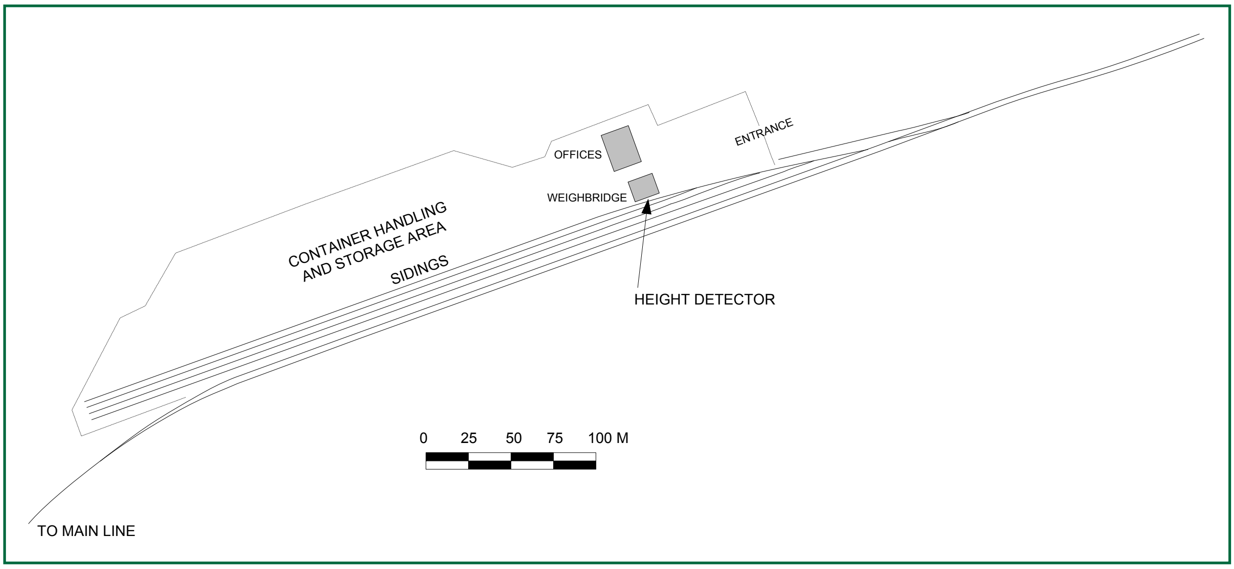

Figure 4: Layout of Wakefield Europort container terminal

27 While many larger container terminals are equipped with gantry cranes, Wakefield Europort terminal uses *reach stackers* for container handling. These machines have a telescopic arm with a spreader lifting attachment, which grips the top of the container. The machines are able to reach over the nearest siding to load and unload wagons standing on the second siding from the loading area (or further, depending on the weight of the container being handled) (Figure 5).

Figure 5: Reach stacker as used at Wakefield Europort

28 The loading area is floodlit at night, providing an adequate general level of lighting. The terminal offices and staff accommodation are at one end of the loading area, close to the point where the sidings converge.

29 There is an infra-red height detector, designed to detect over-height containers, positioned at the side of the track close to the point where the sidings converge. This detector was not in use on 19 December 2008 (paragraph 143).

External circumstances

30 The night of 18/19 December was cloudy but dry while the train was being loaded at Wakefield. The weather conditions played no part in the incident.

Train(s)/rail equipment

31 The train consisted of diesel locomotive 66139 hauling 17 container wagons. The first nine were type FIA twin-unit flat wagons. These are made up of two *bogie vehicles* permanently coupled together, and can carry two 20 foot or a single 40 foot or 45 foot container on each unit. Because of the coupling between the units, two 40 foot containers will have a gap of about 4 m between them when loaded on an FIA wagon. The first eight FIA wagons in train 4O53 were empty. The ninth wagon, FIA type number 7049385004, carried two empty containers, the leading one of which, MSKU8748843, was the 40 feet long and 9 feet 6 inches high (high-cube) container which struck the Basingstoke canopy. The container belonged to Maersk Container Industry Group.

32 The following eight wagons, type FAA bogie well wagons, each carried a single high-cube container. One of these was empty, and another was loaded with dangerous goods. Because these wagons carry containers in a central well between their bogies, the high-cube containers were within gauge for the route.

33 Neither the train nor its load was damaged in the incident.

Events preceding the incident

34 Train 4O53 left Wakefield Europort on time at 04:33 hrs and had an uneventful journey as far as Basingstoke, which it reached at about 10:13 hrs.

35 On its journey of 214 miles (344 km) from Wakefield the train had followed a route which took it through, or close to, Chesterfield, Derby, Birmingham, Banbury, Oxford, and Reading (Figure 6).

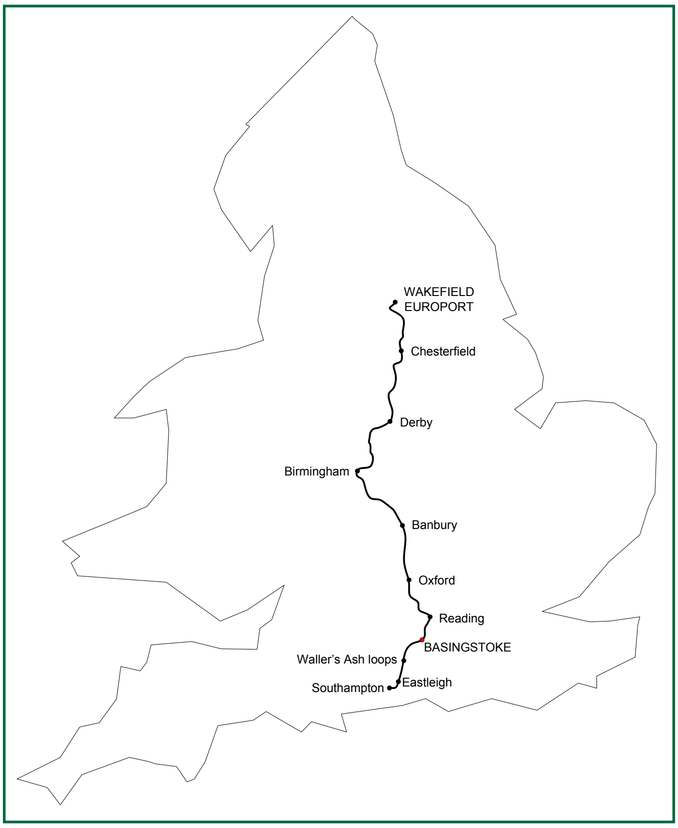

Figure 6: Route of train 4O53

36 On this route it passed under many bridges, and through tunnels at Clay Cross, Wingfield, Toadmoor and Milford (between Chesterfield and Derby), and Harbury (between Birmingham and Banbury).

Events during the incident

37 The train crossed over the junctions at Basingstoke from the Down Reading line onto the Down Slow line at 25 mph (40 km/h), and passed through platform one. The first container on the train struck the valance of the platform canopy, breaking and dislodging segments of the decorative edging. Some of these fell onto the platform, while other debris lodged on top of the container.

38 The driver, in the leading cab of the locomotive which was about 350 m ahead of the first container, noticed nothing unusual, and applied power to accelerate the train once its rear end had passed over the junction.

39 Station staff heard the sound of the canopy being struck, and on investigating, found wooden debris on the platform. They contacted the signalling centre by telephone.

Consequences of the incident

40 About 130m of the canopy valance was damaged, with severe damage over about 20m (Figure 2). Debris from the canopy was spread along the platform, and some also lodged on top of the container.

41 There were few, if any, people on the platform at the time, and no-one was hurt.

42 There was no visible damage to the container.

Events following the incident

43 The signaller at Basingstoke received a message from the platform staff that a freight train had “clipped” the canopy and that there was debris on the platform. By the time the message had been received and the train concerned had been identified, 4O53 had passed Worting Junction, three miles (5 km) from Basingstoke, and was leaving the area controlled by Basingstoke signalling centre.

44 The Basingstoke signaller contacted the Network Rail control office at Waterloo to ask for an emergency ‘stop’ radio message to be sent to the train over the National Radio Network system, and spoke to the adjacent signalling centre, at Eastleigh, whose control area 4O53 was just entering, to ask for the train to be stopped.

45 The signaller at Eastleigh used signals to stop the train before it reached Litchfield tunnel, eight miles (13 km) from Basingstoke. Network Rail staff attended the train. The Wessex Area Integrated Control Centre at Waterloo took charge of the management of the incident. The control manager evaluated the situation and, based on his previous experience of over-height trains on this route and after consultation with the Network Rail structures engineer, decided that the train could be taken forward as far as the loop siding at Waller’s Ash, five miles (8 km) away. To reach this point it would have to pass through the three tunnels described in paragraph 24. Authority was given by the control manager for the train to pass through these tunnels at walking pace, observed by operations staff walking alongside, while the opposite line was blocked to trains.

46 The train arrived at the loops at Wallers Ash at 12:34 hrs, over two hours after passing through Basingstoke (Figure 7). It remained there until the end of traffic that evening. Special authorisation was then given by Network Rail for the train to be moved back up the line to a siding at Micheldever, where the container which had struck the canopy was removed by a road crane, following which the train departed for Eastleigh.

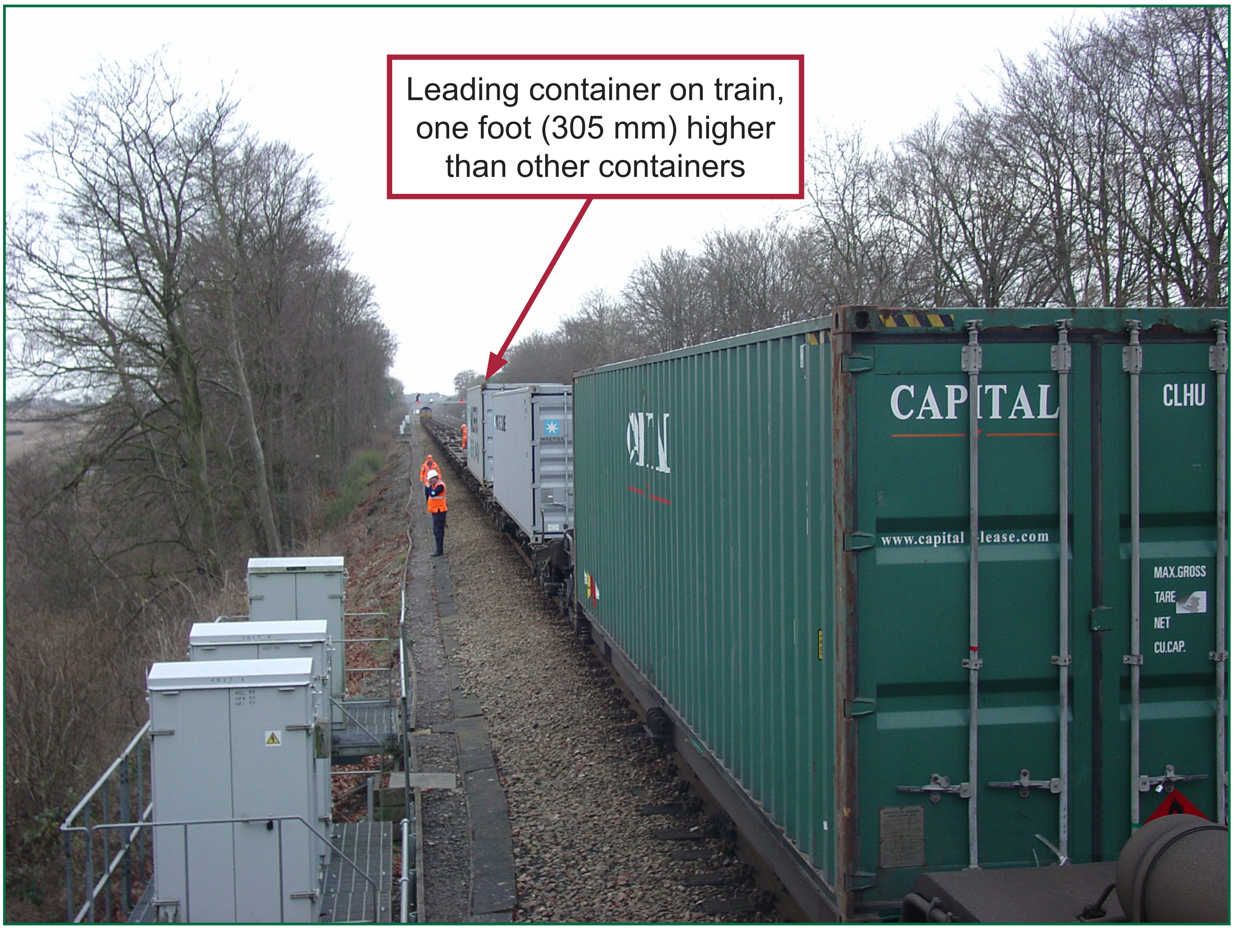

Figure 7: Train at Waller's Ash loop, showing overheight container

47 Following examination by Network Rail engineering staff, the canopy debris was cleared from platform one at Basingstoke by 12:27 hrs, and trains were permitted to use the down slow line with a temporary speed restriction of 5 mph (8 km/h) through the platform. Later in the day, the down slow line was blocked from 15:32 hrs to 16:20 hrs so that the canopy could be made stable by removing the damaged sections of valance, following which normal train operations resumed.

48 The EWS staff responsible for loading the train and entering the details of it onto the computer systems were identified and screened for drugs and alcohol, in accordance with the usual procedures required by the railway industry following an incident, and found to be clear of these substances.

The Investigation

Sources of evidence

49 Evidence gathered by the RAIB has included:

a. examination of the train;

b. interviews with witnesses;

c. CCTV images from Wakefield Euroterminal;

d. examination of Wakefield Euroterminal;

e. inspection of tunnels between Basingstoke and Micheldever;

f. discussion with other operators of container trains; and

g. records from of the computer systems and other processes used in container train operations.

Key Information

Container train operations

Background

50 The carriage of freight in the present design of steel shipping containers began on Britain's rail network in 1965. The network of services has developed to focus on routes to and from the main ports. Container traffic now forms a substantial proportion of total rail freight. A recent study[1] has found that the volume of containers passing through UK ports increased by 140% between 1985 and 2004, and 28% of containers leaving the port of Southampton do so by rail.

51 At the time of privatisation of rail freight operations in 1996, all container traffic was being handled by Freightliner Ltd. Other companies have since entered the market, and EWS began carrying port-based container traffic in 2001. Both EWS and Freightliner run container trains to and from Southampton docks.

Gauges

52 While the distance between the rails (the track gauge) is the same throughout the national network in Great Britain, the permissible overall size, or vehicle gauge, of the trains able to run on the network is not the same everywhere. The overall size is limited by the dimensions of the tunnels, bridges, platforms and other structures adjacent to the tracks. The size of the clear path that exists between these structures for trains to pass through varies significantly between routes, for historical reasons, and this means that not all trains are able to run over the whole of the network.

53 Gauge, in the context of the relationship between rail vehicles and lineside structures, is defined as an envelope in which a vehicle is to remain, or within which a structure is not to intrude[2]. These are known respectively as the vehicle and structure gauges. They are separated by a clearance to allow for, for instance, aerodynamic effects that occur when trains pass other trains or structures at speed. In current practice, a vehicle gauge is considered to be the maximum envelope that a vehicle (including the load, such as a container, carried on it) conforming to that gauge is permitted to occupy statically and dynamically. This prescribes maximum permissible vehicle and load dimensions, certain suspension displacements, and certain curve overthrow limitations (curve overthrow is the distance that the centre and ends of a vehicle move sideways relative to the centre of the track as the vehicle moves round a curve).

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[1] Woodburn, Allan G. (2007) The role for rail in port-based container freight flows in Britain. Maritime Policy and Management, 34 (4). pp. 311-330. ISSN 0308-8839

[2] Railway Group Guidance Note GE/GN8573 Guidance on Gauging, section 3.1.2.1

54 The 'standard' freight vehicle gauge with which most of the network in Great Britain complies is what is now known as W6a. This does not accommodate low-cube 8 foot 6 inch containers on 945 mm high FIA wagons, for which the enhanced gauge known as W8 is required. The difference between the two is that the W6a gauge is essentially an arch shaped profile, while the W8 gauge uses the same basic shape with cutouts in the 'arch' to accommodate the top corners of the container (Figure 8). Modernisation of routes over the last forty years, particularly in connection with electrification by the overhead system, has generally included structure gauge enhancement to accommodate W8 vehicle gauge, and it has also been carried out for specific routes on which container train services run, such as those leading to Southampton.

55 There are still significant restrictions on the sizes of containers that can be carried by rail. The original network of routes to W8 gauge was based on 8 feet 6 inches high containers carried on 945 mm high wagons. However, there is a general trend away from this size, and 9 feet 6 inches high containers are becoming increasingly dominant (the industry expects that virtually all 40 foot containers will be 9 feet 6 inches high by 2011, since almost no 8 foot 6 inch containers are now being manufactured).

56 To carry a 9 foot 6 inch container on a route that is only cleared for W8 gauge requires a wagon with a low-height deck, such as the FAA wagon, on which the container is accommodated between the bogies. This restricts each wagon to a single 40 foot container, or one or more shorter containers with a total length of up to 40 feet, and results in 33% of the vehicle's length being unusable for load-carrying. For efficient train loading and container handling, it is desirable that the usable length is maximised by being able to carry 9 foot 6 inch containers on 945 mm high flat wagons, which can be loaded over their whole length. This requires the capacity of the route to be enhanced to accommodate the W10 gauge, which is 273 mm higher than W8 at the top corners (Figure 8). Route enhancement may involve modifications to structures such as bridges, tunnels, signal gantries and station canopies.

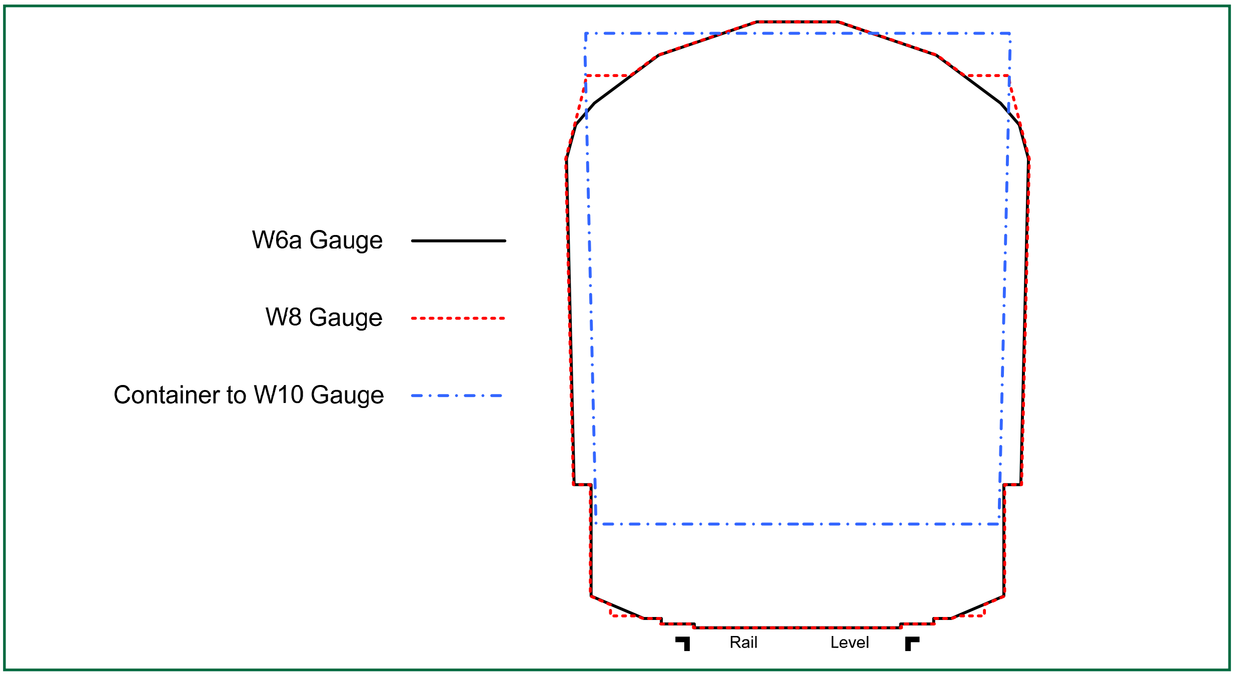

Figure 8: Standard vehicle gauges (incorporating dynamic movements)

57 At present, the only routes in Britain cleared for W10 gauge are the West Coast Main Line (London – Birmingham, Manchester, Liverpool and Glasgow), and London – Felixstowe. The route from Yorkshire, via the West Midlands to Southampton, through Banbury, Reading and Basingstoke, is currently cleared for W8 gauge. A programme to enhance the West Midlands to Southampton section of this route to accommodate W10 gauge was announced by the Department for Transport in December 2006. The work is currently in progress, and is due to be completed by March 2011.

Container train operating arrangements

Exceptional loads

58 A train that conveys loads which do not conform to the Network Rail W6a standard gauge is required by the relevant section of the 'Working Manual for Rail Staff'[3] to be treated as an 'exceptional load'. Such a train, if it conveys containers, must be accompanied by a form RT3973CON, issued by Network Rail's train planning centre, which gives details of restrictions relating to the routes it can travel on and the special speed limits which may apply on certain sections. These forms may be specific to particular trains on specified dates or, as in the case of the one applying to the train involved in this incident, they may be generic, applying to trains conveying a defined range of similar loads over a group of routes.

59 Relevant extracts from the RT3973CON form applicable to train 4O53 on 19 December 2008 are shown in Appendix D. The form was issued by Network Rail in March 2008 for continuing use by both EWS and Freightliner. The form covers a large number of combinations of container size and wagon type, and authorises trains conforming to the W8 gauge to travel over a range of routes between terminals in north-east England and Yorkshire and the Southampton area. Train 4O53 consisted of the wagon/container combinations (a) and (e) within group (1), shown on page 1 of this document, and the route it was permitted to take is shown at (F) and (G) (page 3).

The ERIC system

60 The Enhanced Railfreight Distribution Intermodal Control (ERIC) system was developed by British Rail (BR) in the early 1990s to provide a computerised system for handling container traffic. It is now owned by ATOS Origin, which manages it for the two rail companies which continue to use the system (DB Schenker (EWS) and Freightliner Ltd).

61 There is a *System Safety Case* for ERIC, which is accepted by Network Rail for use in the loading of container and *intermodal* trains.

62 EWS uses the ERIC system to record the movement of containers to and from the company, to track them while they are in the care of EWS, and to match containers to train services and to individual wagons within trains. It provides internal checks on the size of containers, to ensure that they are loaded on the correct type of wagon. The system is also designed to check that loaded containers are correctly distributed to ensure that, as far as possible, wagons are evenly loaded.

[3] Railway Group Standard GO/RT/3056/E 'Movement of Freight Trains', Issue 2, December 2003, Section E3.1. RSSB, London.

63 The system is pre-loaded with information on wagon types (linked to wagon serial numbers) including the compatibility of each wagon with the different sizes of container.

64 EWS uses other computer systems for commercial functions such as quotation of rates, receipt of traffic from customers, invoicing and accounting. There is no automatic transfer of information from these systems to ERIC: all entry of container details is done manually.

65 Each EWS train service is assigned a 'profile' within ERIC which defines the gauge restrictions for the routes over which it will travel. For container traffic, the limiting factors are height and width of the containers themselves (paragraphs 52 to 57).

The TOPS system

66 The Total Operations Processing System (TOPS) was developed in the United States and adopted by British Rail in the late 1960s to record and store data on rolling stock and train movements throughout its network. It continues to be used as the basis for train movement authority on the national network.

67 ERIC interfaces with TOPS to supply it with basic information on each container train: the numbers and loading details of wagons, the identity of the locomotive(s), and the origin and destination of the train. Some of this data, such as the locomotive and wagon numbers, is validated by TOPS, but container numbers and type codes are not checked after being processed through ERIC.

Coding, identification and marking of containers

68 Almost all containers worldwide are identified by the ISO 6346 international standard for coding, identification and marking. The identification system is in two parts. The first part consists of a three-letter owner code, a single letter equipment category identifier ('U' for all freight containers) and a seven-digit serial number, none of which are linked in any way to the size of the unit. The last digit of the serial number is the 'check digit', which is often shown separately from the rest of the number on the container. The check digit is generated by a mathematical formula using the preceding ten letters and numbers.

69 The check digit provides a means of validating that the rest of the owner code and serial number has been entered correctly. The formula is arranged so that any single incorrect letter or digit in the serial number itself will throw up an incorrect check digit. If the company or agency processing the data uses a computer program to verify check digits, a warning message will be generated. The action taken when this warning appears will depend on what instructions the person entering data has been given.

70 ERIC includes software to verify the check digit. However, warning messages can be over-ridden, because containers which do not follow the ISO 6346 identification system sometimes arrive in the UK.

71 The second part of the ISO 6346 identification is a four-character size and type code which is marked on the sides and ends of the container (Figure 9). For the containers involved in this incident, the size and type codes are:

- 42G1 General purpose ventilated container 40 feet long and 8 feet 6 inches high.
- 45G1 High cube container 40 feet long and 9 feet 6 inches high.

72 However, ERIC does not use this size and type code. Instead, the UK rail system has adopted a three-letter code for each type of container which the ERIC system uses to check the container's compatibility with the wagon, and the suitability of the combination of wagon and container for the route on which a train is scheduled to run. These three-letter codes are also used in the TOPS system. The three-letter codes corresponding to the ISO codes listed above are:

- 42G1 PZQ
- 45G1 PZU

73 In addition to the serial number and type code, ISO 6346 also requires containers to be marked with their tare and gross weight, and with height warning markings if the container is taller than 8 feet 6 inches. The marks now required consist of black/yellow stripes and a height marking. The yellow and black stripes must be affixed in the upper part of each side and end. They must start at the corner castings and extend at least 300 mm (12 inches).

74 The height marking must be at least 155 mm high and 115 mm wide (6 inches x 4.5 inches), and consists of black characters on a yellow ground (Figure 9). The characters should be as large as possible, so that they are clearly visible. The sign should be affixed at least on each side of the container, in each case in the vicinity of the right-hand edge no more than 1.2 m (4 feet) from the top edge of the container and no more than 0.6 m (2 feet) from the right-hand edge (beneath the identification number).

75 The stripes became a mandatory marking in the 1996 edition of ISO 6346, and were not required by the previous (1985) version.

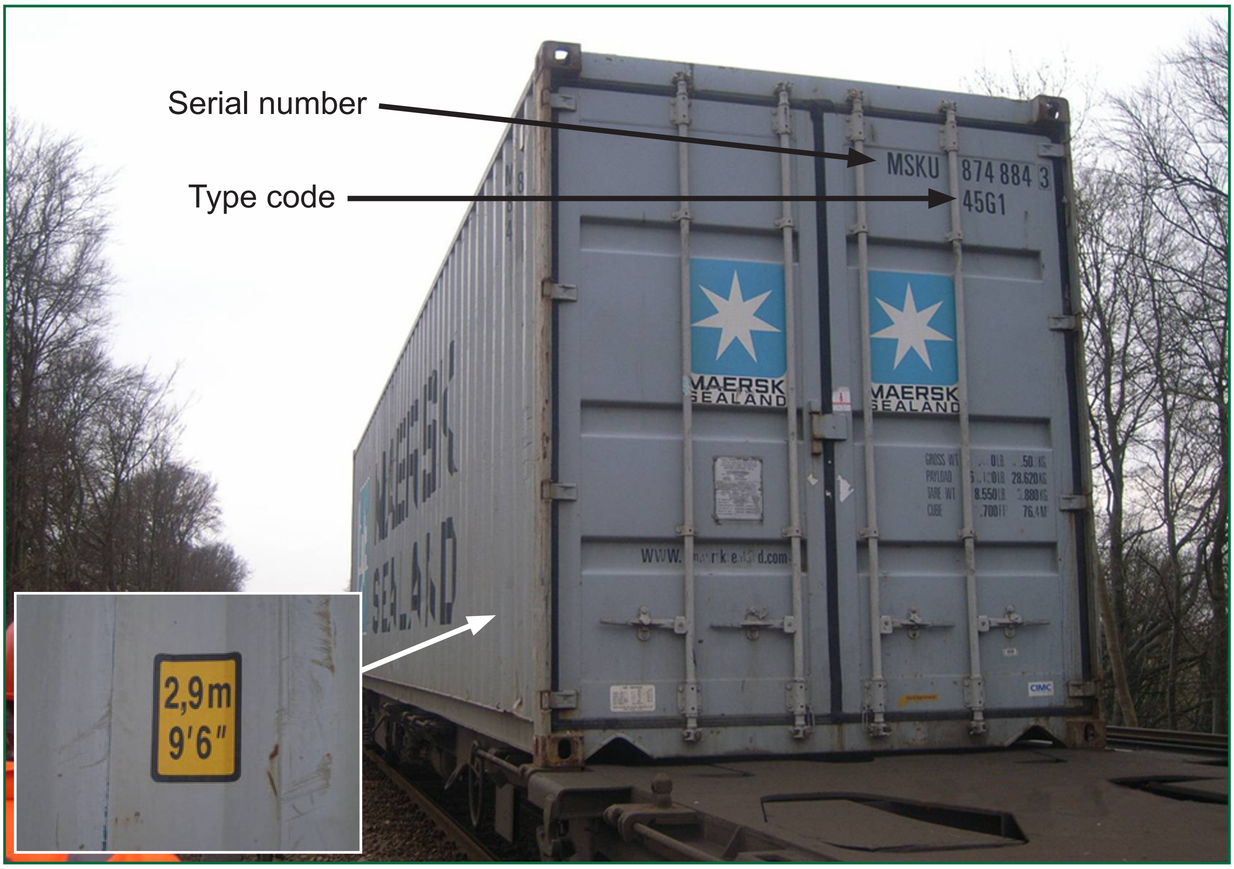

Figure 9: Incident container showing serial number, type code, position of height marking (on sides), and absence of black/yellow stripes

The booking-in process

76 Containers are sent by customers to EWS terminals for onward carriage by rail, and arrive either by road or by sea. The normal process is for the customer to telephone the terminal, and specify the size and weight of containers that are to be forwarded. Where possible, the customer gives the serial numbers of the containers, but for containers arriving by road, serial numbers are not always known at the time the booking for carriage is made. This information is entered onto the Trainload Master Booking Form, which is an EWS spreadsheet computer program, not linked to any other systems. The Spreadsheet (as it is known by EWS staff) is preloaded with information on the wagon types allocated to each train service, and enables staff to check the loading and available space for each service.

77 Details of the container types, weights and numbers (where known) are also entered, manually, onto the Maritime International Master Booking Sheet system, and this system handles the commercial aspects of the transaction, including rates, charges and invoicing. There are no compatibility checks for either containers or wagons in either of these systems.

78 The EWS staff known as Port Office Controllers (controllers) at the Southampton terminal enter data onto the Spreadsheet and Maritime International Master Booking Sheet. Each controller deals with a group of train services, and is responsible for all data processing in connection with them. The controller uses the Maritime International Master Booking Sheet system to generate an 'order to move' form, listing the containers to be despatched on each train. The controller manually checks the order to move against the Spreadsheet data, and then either prints a hard copy of the order to move for use locally, or faxes the order to move to the terminal where the train is to be loaded. If the actual container serial numbers are still unknown at this stage, a booking reference number is used instead.

79 When the containers arrive at the terminal, the road haulage driver quotes the booking reference number to the terminal clerk, who then matches it to the container serial number. The details of the containers are entered onto the ERIC system by the terminal clerk using the information supplied by the driver. Containers which cannot immediately be loaded onto trains are stored in stacks in defined areas within the terminal.

80 The EWS reach stacker or crane driver loads containers onto the train in accordance with the instructions on the order to move form and EWS standing instructions which define the appropriate types of wagon for each container and the weight distribution criteria. The EWS train preparer (or, at larger terminals, the supervisor) then records the loading details (which container is on which wagon) manually on a hard copy order to move form, known as a 'release', which may be pre-printed with the wagon numbers. The train preparer or supervisor must enter the container numbers, the container gross weights, the position of the containers on the wagons and any dangerous goods information for the container loads. The 'release' is passed back to the Southampton office, usually by fax, for entry of the train loading information onto the ERIC system.

81 Data entry at Southampton is done by an EWS employee known as a *consistor*, who enters the details from the 'release' onto the ERIC system. Once this has been done, the data is transferred to TOPS and a train list is generated. A TOPS train list (which is validated by the system before it can be printed) must be produced for the train to be permitted to depart from the terminal and run over Network Rail lines.

82 Information about the size and tare weight of individual containers is held on ERIC for as long as the container is within the control of EWS, and for three months after it is booked out from the system. After three months the details of the container are deleted from the system, to reduce the amount of data storage required, and if and when it arrives again at an EWS terminal, it will be treated by ERIC as a new container.

83 To get a container on the the ERIC system it must go through the process known as an '*ingate*', if the container is not yet allocated to a train service, or a '*combined ingate and booking*' if it is already known that the container is to be sent out on a particular train. The consistors at the Southampton office always use the 'combined ingate and booking' process. In order to do this, they first '*outgate*' all container numbers that are already on the system, to bring them to a consistent state for the next stage of the process.

84 In both processes the system checks that, firstly, the serial number is of a valid form. If the system detects that the check digit (paragraph 69) is incorrect, the operator is prompted to verify the serial number.

85 Once the form of the serial number has been checked, the system examines its own database to see if the number is already recorded, ie if that container has been processed in any way by EWS within the last three months. If the system does not already hold the details of the container, the number and type code are not cross-checked, and accurate recording of the type code relies on the operators noting the details from the container correctly, and inputting them correctly to the system.

86 If the container details are already held on ERIC, the system next checks that the number and type match the existing record of this container. If there is a conflict, the system tells the user what type is recorded for the container, and asks if this should be updated, with the default being to keep the original type. At this point the user should check the description of the container before making any change to the information held on the system.

87 If the data entry is being done at the terminal where the container is located, the consistor may make this check themselves by going outside and finding the container, or by asking the duty supervisor to make the check. However, data entry usually takes place at the Southampton port office, remote from any train loading area, and in this case the consistor must contact the sending terminal by phone or e-mail, alert staff there to the discrepancy, and ask for the details to be checked.

88 Once these details have been accepted by the ERIC system, the next stage in the processing of the container is to book it onto a particular train service (if this was not combined with the 'ingate' process). The train service details are held on ERIC, and are maintained by EWS staff at the Doncaster HQ. The service details include times, gauge restrictions and wagon types. Service times are 'notional', meaning that they reflect an intention to run a service between two terminals at an approximate time in the day, but the detailed timings may vary with each timetable change and are not necessarily kept up to date on ERIC, as long as the general nature of the service has not changed.

89 The consistor then enters the container loading details (using information supplied by the terminal staff) onto the ERIC system (the 'loading' process). This work usually needs to be done at night, and against a strict deadline, to produce the TOPS train list which is required before a train is permitted to depart. About 45 minutes are normally allowed for the whole process.

90 During this part of the process the system checks that each container is loaded on an appropriate wagon, using the type code that the system currently holds for the container. If a discrepancy is detected, the system informs the user that the container/wagon combination exceeds the profile for the service. Unlike the type code check described in paragraph 86, it is not possible for the consistor to override this warning at this stage. Before the 'loading' process can be completed on the system, the consistor must establish where the error has occurred and ensure that the containers and wagons are compatible. If a compatible type code has already been arrived at during the 'ingate' process, there will be no problem for the consistor at the 'loading' stage.

91 Once loading is complete, ERIC produces a train list. This is then passed electronically to TOPS, which checks that the wagon numbers are valid and that the wagons are currently authorised to run on Network Rail (eg they have not been recorded as defective), but does not perform any checks on the combinations of containers and wagons. Acceptance of the data by TOPS gives authority for the train to run on the Network Rail system. A hard copy of the TOPS train document, signed by the train preparer, must[4] be given to the train driver as confirmation that this authority exists.

92 The departure of the train and its arrival at its destination are recorded on ERIC by the consistor. When containers are collected by or delivered to a customer, or loaded onto a ship, they are 'outgated' on ERIC by the consistor and cease to be the responsibility of EWS. Details of the container are stored on ERIC for three months after 'outgating', and then deleted.

Inspection and despatch procedures

93 The EWS Operations Manual EWS/OM/003 'Loading and Securing Manual' requires two stages of examination before a train is permitted to depart. The first is known as the In-gate Inspection, and is carried out by terminal staff, who may not (at some terminals) be EWS employees. EWS requires this at all terminals where curtain sided or loaded open containers are forwarded (ie where an internal or formal load inspection is required), but this is not the case at Wakefield and this check is not carried out there.

[4] Required by Railway Group Standard GO/RM3056 Working Manual for Rail Staff (White Pages) section C5.1

94 The second check, the Intermodal Train Preparation Check, must be carried out before departure by 'competent staff who generally undertake the train preparation duties'.

95 Train preparation includes making a record of the numbers and loading details of the containers and wagons on the train. EWS/OM/003 states:

> 'Load unit and vehicle combinations may have conditions of travel relating to route clearance applied to them by an RT3973CON and a check must be carried out to ensure that these conditions are not exceeded.'

96 This second stage of train preparation also includes a number of other checks, which are not relevant to this incident.

97 On completion of these checks, after the train has been loaded, the train preparer must carry out the rest of the checks detailed in the Working Manual for Rail Staff, a visual examination of the wagons themselves. For this type of train, this includes checks that:

- the vehicles are coupled correctly, and that air brake pipes are connected;
- couplings not in use are correctly stowed;
- handbrakes are released; and
- a working tail lamp is fitted correctly to the rear vehicle.

After this, once the locomotive has been coupled to the train, the driver and the train preparer must carry out a *brake continuity test*.

The loading of 4O53

Events at Wakefield

98 There were two staff on duty at Wakefield Europort terminal on the night of 18/19 December 2008: a train preparer and a reach stacker driver. The reach stacker driver collected an order to move form from the fax machine in the administration office. This form gave him a list of containers to load onto the train for that night's service to Eastleigh (the wagons from which would continue to Southampton later in the day).

99 The order to move provided details of the containers that were to be loaded, including their serial numbers and location in the terminal yard. It did not specify which containers should be loaded to which wagon, although the wagon types were listed. The printed form had used booking reference numbers instead of container serial numbers (paragraph 78): the serial numbers had been added by hand before the order to move was faxed from Southampton to Wakefield.

100 The reach stacker driver identified the containers in the yard and loaded them onto the wagons. All seven of the containers on the order to move were hi-cubes, which he knew, from the order to move and from his training, had to be loaded on the FAA wagons. The wagons to form the train were on two sidings, with the FAA wagons further away from the loading area, so these were loaded first by the reach stacker, reaching over the empty FIA wagons on the nearer siding.

101 Standing instructions at Wakefield were that any empty wagons on the Southampton service should be loaded with any empty containers that were waiting in the terminal for return to IKEA, in Sweden. The empty wagons remaining on 4O53 were one FAA and nine FIAs The FIA wagons can each carry two 40 foot standard height (8 foot 6 inch) containers. From looking at the stacks of containers, the reach stacker driver formed the impression that there were several high-cube and two standard size empty IKEA containers on hand in the terminal. He loaded one empty high-cube container to the last empty wagon of the FAAs, so that all those wagons now had containers on them. The FIA wagons in the nearer siding were still empty. The reach stacker driver then loaded what he thought were the two standard empty IKEA containers to the rearmost FIA wagon. The leading container of these two was MSKU8748843, which was actually a high-cube container, 9 feet 6 inches high.

102 When he had finished loading, at about 02:10 hours, the reach stacker driver returned to the office and told the train preparer that the train was ready for examination. CCTV evidence from the terminal shows that about twenty minutes later, at 02:29 hrs, the train preparer's van was driven down the loading area from the direction of the office block. It went to the far end of the wagons and then turned round and drove back alongside the FIA wagons, stopping at each wagon as it went along.

103 At 02:37 hrs the van returned to the office block. Almost an hour later, at 03:34 hrs, the train preparer walked from the office block towards the locomotive. The train preparer and the train driver then shunted the two rakes of wagons together to form train 4O53.

104 The train preparer had examined the train from his van, taking a note of the wagon numbers and container numbers and entering them onto a blank order to move form which was pre-printed with the wagon numbers (paragraph 80) (Appendix E). He assumed that the leading container on wagon 7049385004, the ninth wagon, must be standard size because it had been loaded onto an FIA wagon, and therefore entered its details on the order to move form as 2.6 m (8 feet 6 inches) high, instead of the correct value of 2.9 m (9 feet 6 inches). He did not notice the difference in height between the two containers on the wagon, which were separated by a gap of about 4 m (paragraph 31).

105 As well as this error, the train preparer had noted the number of two of the containers incorrectly. The container on the tenth wagon (CLHU 8687298), which was carrying dangerous goods, was written down incorrectly as CLHU 6687298, and the container on the sixteenth wagon (GATU 8634490) was recorded as GATU 8634990.

106 While the shunting of the train was taking place the information which the train preparer had recorded on the order to move form was being processed by the consistor at Southampton.

Data entry at Southampton

107 The train preparer at Wakefield faxed the handwritten order to move, or 'release' document, to Southampton. It arrived there along with about four other consists in a short space of time around 03:30 hrs. One of the controllers at Southampton was working alone on the night shift, and also carrying out the duties of consistor. He went through his usual ERIC routine of 'outgating' all the containers on the order to move, at 03:34 hrs. Two of the containers, whose numbers had been recorded incorrectly on the 'release' document by the train preparer at Wakefield, would have generated error messages at this stage. The consistor may have tried to contact Wakefield to query the discrepancy, but this cannot be confirmed. He then did a 'combined ingate and booking' to assign the containers to the train service on the ERIC system.

108 For the first container on the list, the consistor read the dimensions, including the height of 2.6m, which had been entered by the train preparer at Wakefield. From his experience of dealing with release documents, he interpreted this as a standard height 40 foot container, type PZQ, and input the serial number and these details to the computer. The ERIC system compared his input with data which it already held for this container serial number and generated the message:

CONTAINER TYPE FOR PRIVATELY OWNED CONTAINER MSKU8748843 IS PZU

INGATE WILL UPDATE CONTAINER TYPE TO PZQ (Y/N) N

109 This message meant that the system already had information on container MSKU8748843, and that it was recorded as a 40 foot high-cube container, type PZU (or 45G1 in the ISO system). The message asked the consistor if the type code should be changed to PZQ, describing a standard height container, but defaulted to retaining the existing type code if 'N' was entered.

110 The consistor again attempted, possibly more than once, to telephone the Wakefield terminal to query this discrepancy, but there was no reply. He decided that the container details must have been entered wrongly on a previous occasion, and at 03:40 hrs he entered 'Y' in reply to the ERIC system message.

111 This had the effect of over-riding the previous type code for the container and converting it to PZQ. This type code was compatible with the wagon type, and so the system did not generate a further alert when the consistor moved on from the 'combined ingate and booking' to the loading screen, and he was then able to 'load' the container onto the train on the ERIC system at 03:43 hrs, and completed the ERIC processing and generated a TOPS train list at 03:46 hrs.

112 Two of the containers on the 'release' document had been recorded with an incorrect serial number, and one of these was shown as being loaded with dangerous goods. The consistor entered the details shown on the release document onto ERIC. The system generated alerts for the incorrect numbers (using the check digit system) but these were overridden by the consistor. He also entered the load information from the release document onto the system. The result of this was that the information in ERIC did not fully describe the dangerous goods being conveyed in the container on the leading FAA wagon, and gave that container an incorrect number (paragraph 166).

Train despatch at Wakefield

113 The consistor at Southampton faxed the TOPS train list to Wakefield and a hard copy was printed off there.

114 After the two parts of the train were coupled together, they were shunted from the loading sidings onto the terminal access line, passing a laser height gauge (paragraph 143) near the entrance to the loading sidings. This gauge was not functioning, so it did not detect the over-height container. As the train passed the gauge, the train preparer was standing nearby and carried out a 'roll-by' inspection of the wagons, checking that the wheels were rotating (ie that all brakes were properly released), that the containers were properly seated on the wagons, and that the tail lamp was in place and alight. He did not notice that the leading container was higher than the others in the train.

115 The train preparer signed the TOPS train list as a correct description of the train that he had prepared and handed it and the RT3973CON form to the train driver. The driver and train preparer then carried out a brake continuity test, and on completion of this the train preparer telephoned the signaller at Castleford signal box and told him that 4O53 was ready to depart.

116 The signaller set the route and cleared the signals and the train departed.

Staff and working patterns – Wakefield

117 The reach stacker driver had joined EWS as a clerk in 2007, and after a short time he was transferred to outside duties as a reach stacker driver. He was given a three day training course and subsequent on-the-job training, and assessed by EWS as competent to operate reach stackers in December 2007. All his work with EWS had been at Wakefield Europort terminal.

118 The reach stacker driver had been verbally instructed on the permissible combinations of container and wagon, and was able to accurately describe what these were in the context of the work at Wakefield.

119 The train preparer joined British Rail in 1990. He was initially employed as a messenger, and became a shunter after two years' service. He had been working at Wakefield Europort for four years at the time of this incident, and his duties involved shunting and train preparation. He had at one time also driven reach stackers, but his competency on these machines had lapsed at the time of the incident. He had been trained and assessed by EWS in loading and examining trains, and held a current certificate of competence in this area.

120 At Wakefield Europort the shunter and reach stacker driver were the only staff present on the night shift, and so on this shift they normally worked unsupervised. They worked a shift system on which they rotated between early, late and night shifts, and were subject to supervision during office hours when working on early and late shifts.

Staff and working patterns – Southampton

121 The EWS office at Southampton Docks was established in April 2008, and staff were recruited from non-railway sources, including freight forwarding companies and employment agencies. The present manager, whose background is in container operations, began working for EWS in November 2008, and had no previous experience of the ERIC system.

122 There are four controllers at Southampton. The controller who was involved in the events leading to this incident began working at the EWS offices at Southampton in April 2008 as an agency-employed temporary clerk, and became directly employed by EWS as a controller at the beginning of November 2008.

123 He was given a three-day course in the ERIC system by EWS staff at Dollands Moor terminal, Kent. Following this course, no formal assessment of his competence was carried out, but other staff at Southampton assisted him to gain familiarity with using ERIC for processing containers and train services, and to act as a controller and also as a consistor when required.

124 The controller was working his first week of night shifts. He had worked on the night shift, carrying out the duties of a consistor, since Monday night (the incident occurred on Thursday night/Friday morning). In this role he was covering the duties of the night shift supervisor, who was absent. Because of this the controller was alone on the night shift.

Previous occurrences of a similar character

125 There is anecdotal evidence of overheight containers reaching Southampton from Basingstoke in the past on a number of occasions, both on the direct route via Winchester, and also on the alternative route via Andover and Romsey. There are no tunnels on the route via Andover. It is believed that on all these previous occasions the trains passed through Basingstoke on the down fast line (platform 2), where the canopy valance was trimmed back many years ago, and no damage occurred.

126 The RAIB examined the tunnels at Litchfield and Popham (numbers 1 and 2), and found no verifiable examples of scrape marks on the tunnel lining in the area where the corners of overheight containers could have made contact. At the time of the incident, Network Rail's structures engineers believed, on the basis of data held by their department, that the container might make contact with Popham number 2 tunnel, but this did not happen when the train passed through the tunnel at walking pace (paragraph 45).

127 The railway industry's database of accidents and incidents (SMIS) shows four occasions between 1991 and November 2008 on which damage to structures was caused by overheight containers conveyed on trains. None of these were on the Basingstoke – Southampton route. Two of these incidents could be attributed to identified trains. The other two incidents were discovered some time after the damage had occurred, and the trains that had caused it could not be traced.

Analysis

Identification of the immediate cause[5]

128 The immediate cause of the incident was that the combination of high-cube container and FIA wagon was too high for the route on which the train was travelling, and the left-hand top corner of the container struck the canopy of platform one at Basingstoke station.

Identification of causal[6] and contributory[7] factors

Infrastructure

129 The track through platform one was relaid as part of the remodelling and resignalling of the Basingstoke area in 2007. There had been no other recent work carried out on the track or structures at Basingstoke that could have resulted in the loading gauge being infringed, and correctly loaded container trains had passed through platform one without incident in the weeks before the incident. There were no defects in the infrastructure at Basingstoke which contributed to the incident.

The loading of the train

130 The fact that the high-cube container was loaded onto a wagon on which it should not have travelled, and that this was not rectified before the train departed, demonstrates that there was not a reliable system in place for identifying container heights at Wakefield Euroterminal. This was a causal factor in the incident. The factors that contributed to this are discussed in paragraphs 131 to 145.

Selection of the container

131 The container was stored in a stack in an area which was normally reserved for empty IKEA containers, both 8 feet 6 inches and 9 feet 6 inches high. When the reach stacker driver went to the stack, he was under the impression that all the containers at the rear were high-cube, and the two at the front of the stack were standard size. He took one container from the rear of the stack and loaded it on an FAA wagon, took a standard size one from the front and put it on an FIA, and then returned to the stack and picked up the last container from the front row, which was MSKU 8748843.

[5] The condition, event or behaviour that directly resulted in the occurrence.

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

[7] Any condition, event or behaviour that affected or sustained the occurrence, or exacerbated the outcome. Eliminating one or more of these factors would not have prevented the occurrence but their presence made it more likely, or changed the outcome.

132 There were no black/yellow markings on the top corners of this container to indicate that it was a high-cube, although there were small labels (Figure 9), and the 45G1 code below the serial number on the side, which both indicated the height. The height markings were placed lower on the container side than required by ISO 6346, being about 2.5 m from the top, rather than the maximum of 1.2 m specified in the standard. The container is owned and maintained outside the European Union, and it has not been possible to establish the reason for these deficiencies.

133 Eight of the nine high-cube containers on the train had black/yellow striped markings on their top corners, and since 1996 these markings should have been used to indicate containers which are higher than standard (8 feet 6 inches) (paragraph 73). Examination of containers in service at Wakefield and other terminals showed that, despite their mandatory status on containers built since 1996, the stripes are not universal, and appear on only about 90% of containers.

134 The reach stacker driver had not had any training on the identification of container types. He had become accustomed to looking for the black/yellow striped markings on the top corners of high-cube containers, and their absence on this occasion was a causal factor in the incident.

Loading of the container

135 The reach stacker driver loaded the container onto an FIA type wagon on the train. He loaded a second container onto the same wagon, but did not notice that the two containers were of different heights. The view from the cab of the reach stacker was restricted by the telescopic supports for the lifting arm, the lighting on the machine was directed towards the container being handled, and there was a gap of about 4 m between the two containers on the wagon. The view from the cab is adequate for the task being undertaken, but these factors make it less likely that the driver of the reach stacker would detect a height difference, particularly after dark, and were contributory to the incident (Figure 10).

Figure 10: View from cab of reach stacker showing restricted vision after dark and black/yellow stripes on top corner of high-cube container

Checks on the train

136 The train preparer was required by the EWS Loading Manual EWS/OM/0003 to examine the train, checking that each container was correctly loaded onto the wagons, and noting their serial numbers. He carried out this examination from the driving seat of a car-derived van. From this position he would have difficulty checking that all container doors were properly closed (particularly on the wagons on the second siding away from the roadway), and that the container sides (particularly on the sides facing away from him) were not damaged or distorted. Visibility upwards was restricted by the roof of his van, and this is likely to have been a factor in his failure to notice that one of the containers on the FIA wagons was a high-cube, one foot (0.3 m) higher than the adjacent container, and therefore a contributory factor in the incident.

137 Because the train preparer remained in his van, he had to look past the FIA wagons on the siding nearest to the loading area to see the high-cube containers on the FAA wagons on the second siding. This distance, and the limited lighting level in the yard at night, is likely to have been a factor in causing him to incorrectly record the serial numbers of two of the high-cube containers.

138 The train preparer was working on the night shift and was unsupervised. It is not clear whether or not EWS managers were aware that train preparers at Wakefield were in the habit of collecting container numbers and carrying out train inspections from a van, but the practice was not officially sanctioned by the company. The way in which the train preparer carried out his duties was a contributory factor in the incident, and it is probable that the lack of supervision on the night shift was a factor in the method of work which the staff at Wakefield had adopted.

139 The final check on the train, the roll-by examination, was carried out by the train preparer standing near the train as it was being made up, and then as it was leaving the terminal. The position that he stood in, adjacent to the siding on which the train was moving, enabled him to check that containers were correctly in place and that the wheels of the wagons were rotating (ie that the wagon brakes were not applied or binding). However, this position close to the train, and the need to look down at the wheels, did not make it easy for him to notice any discrepancy in the height of the containers as they passed (although observing this is not a specific requirement of the roll by test).

Competence and fitness – Wakefield staff

140 Both the reach stacker driver and the train preparer had been given appropriate training for their duties. They both lived locally and did not have a long journey to work. The train preparer had over 16 years' experience of shunting and train preparing. He had been trained by EWS in intermodal train preparation, and had worked at Wakefield for four years.

141 The reach stacker driver had one year's experience of this work, but had not had formal training in train preparation.

142 The shift pattern worked by the reach stacker driver and train preparer has been analysed using the Health & Safety Executive (HSE) *Fatigue and Risk Index*, and gives a maximum fatigue value of 14.0, which is low. There are no fatigue issues arising from their work patterns, or their travelling to and from work, which are likely to have contributed to the errors made by the staff at Wakefield. However, the loading and checking of the train took place between 01:00 hrs and 03:30 hrs, the period in the 24-hour cycle when human alertness is at its lowest and errors are most likely to be made.

Height detector

143 The height detector at the convergence of the sidings in the Wakefield terminal had been out of use since 2006. It had been switched off by EWS because it was detecting locomotives as over-height, and was also going off and producing spurious alarms.

144 The reason that the detector was being set off by locomotives was that it used a horizontal beam, which was being broken by locomotives which are between 3873 mm (class 08) and 3912 mm (class 66) high. The maximum height for flat-topped containers to W8 gauge is 3618 mm, while the possible maximum height at the centre of the vehicle for locomotives and other vehicles is 3965 mm. A detector which will react correctly to all infringements of the W8 gauge would require a more complex configuration of detector beams or other sensor equipment.

145 If the height detector had been in use, the overheight container would have been identified and the incident would not have occurred.

The ERIC system

System features

146 The ERIC system incorporates features which check, as far as possible, the validity and in some cases the accuracy of the data which is input to the system. However, most of these checks can be over-ridden, in order to make the system flexible enough to accept containers which may not conform to the ISO standard.

147 The most significant check that cannot be over-ridden is the one that verifies the compatibility of container and wagon type codes when the consistor attempts to load a container onto a wagon (paragraph 90). If, at this stage, the consistor finds that the system will not accept the details which have been presented for input, he or she cannot proceed with the loading of the train on ERIC until the reason for the discrepancy has been identified and resolved. This is likely to involve contacting the terminal which produced the order to move which is being input to confirm the details of the unit which is causing the problem in ERIC.

148 If it is not possible to contact the terminal at this stage, there may be a delay which will prevent a train list being created on TOPS, meaning that the train will not be permitted to run on the Network Rail system until this problem is resolved.

149 It is therefore in the interests of system users to avoid the possibility of being blocked at this stage, by using the checking facilities in the ERIC system to ensure that container details are compatible with the wagons they are to travel on at the 'ingate' stage.

150 The ERIC system does not highlight alerts that may have implications for safety, such as a container that is too high; there is no distinction made between this condition and its converse, ie a container lower than expected, which would have no safety implications. It is therefore not obvious to staff who are using the system that there are additional risks associated with over-riding some alerts. This was a contributory factor in the incident.

Use of the system

151 The checks exist to alert the user to errors and potential conflicts. Evidence from staff who have worked with it suggests that users who have limited experience of the ERIC system may assume that the details they are currently being presented with are correct, and override information previously held by the system, on the basis that 'computer error' is a common problem. The consistor at Southampton had been told to believe what was written on the 'release' document (paragraph 110) and input what that document said. He had no written instructions on what to do about inconsistencies between the 'release' document and existing information on ERIC.

152 In reality, the existence of a record on ERIC provides, in itself, reassurance that the data has previously been checked at least once, because of the verification that occurs during input. However, it is theoretically possible that incorrect information could have been entered on a previous occasion, and the container was then transported without incident (paragraphs 125 – 127).

Training and competence

153 The staff at Southampton were all relatively new to ERIC and to rail container operations. They all had less than one year's experience at the time of the incident. The training that they had been given was not followed up by any effective assessment by experienced managers.

154 This lack of experience was reflected in the actions of the consistor when he was faced with system messages caused by errors on an order to move. When he could not get a response by telephoning the Wakefield terminal, he decided to override the system and accept the handwritten information as correct. The training he had been given had not equipped him to make appropriate and safe decisions in these circumstances. He was alone on the shift in the absence of the night supervisor, whose duties he was covering. The poor training and lack of experience of the consistor and the absence of a supervisor who could have given him guidance were a contributory factor in the incident.

155 The consistor was working his first week of night shifts (paragraph 124). Analysis of his shift pattern using the HSE Fatigue and Risk index gives a maximum fatigue value of 25.9, which is moderate. In view of this, and his lack of previous experience of night work, it is possible that sleepiness and/or fatigue may have affected the consistor's actions and decisions during the night of 18/19 December. However, the work was routine and the shift pattern is unlikely to have been demanding for someone who had become accustomed to night work.

Organisation of loading operations

156 The practice of EWS at Wakefield, as described above, is to load the train using data from the Maritime International Master Booking Sheet system and then manually transfer the details of the loaded train onto ERIC and TOPS.

157 An alternative system, employed by the other major container train operator, is to use ERIC to generate a list of containers to be loaded to a train. During loading, an operations supervisor monitors the process and provides information to the terminal office, who produce a wall-mounted visual display of the whole train using magnetic blocks known as 'dillys', which are sized and coloured to represent the different containers. This can then be reviewed by the operations supervisor to judge whether the wagons on the board are loaded correctly. This process is described in detail in the RAIB's report into the derailment at Duddeston Junction, Birmingham, on 10 August 2007 (report 16/2008)[8].

158 If this system had been in use at Wakefield, the train preparer would have had an additional indication, in the form of a distinctively coloured 'dilly', that the wrong size of container had been loaded to the FIA wagon, and it is possible that this might have prevented the incident.

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[8] Available at www.raib.gov.uk

Conclusions

Immediate cause

159 The immediate cause of the incident was that the combination of FIA wagon and high-cube container was too high for the structure gauge of the route (W8), and the left-hand top corner of the container struck the platform canopy at Basingstoke.

Causal factors

160 Causal factors were:

a. The system for identifying container types and container/wagon combinations on trains departing from Wakefield Euroterminal was prone to human error, in that:

   i. the high-cube container was loaded onto an FIA wagon, which was a combination not permitted on the route the train was due to take;

   ii. incorrect information about the container was recorded by the train preparer at Wakefield, who did not notice during his train examination that the container type was incorrect;

   iii. the decision of the consistor to change the type code of container MSKU8748843 without checking with the Wakefield terminal; and

   iv. the load gauge at Wakefield was not operational.

   (paragraph 130, **Recommendations 1 and 2**)

b. The absence of black/yellow chevrons from the high-cube container involved in the incident (paragraph 134).

Contributory factors

161 Contributory factors were :

a. the restricted view of the loader driver when lifting and placing containers (paragraph 135, **Recommendation 2**);

b. the method of checking the train, from a van, adopted by the train preparer at Wakefield (paragraph 136);

c. the lack of monitoring and supervision of staff at the Wakefield terminal (paragraph 138, **Recommendation 1**);

d. the poor training and inexperience of the controller, acting as consistor, and the absence of a supervisor at Southampton (paragraph 154, **Recommendation 1**); and

e. the nature of the warning messages generated by the ERIC system (paragraph 150, **Recommendation 3**).

Additional observations[9]

162 The way in which the ERIC system was being used could have had the effect of bypassing the features of the system which might have detected the error in the type of container. In particular, the use of the 'combined ingate and booking' screen meant that, if the container had entered EWS control at a terminal that did not use ERIC, and had been incorrectly identified by the shunter there, ERIC would not query the incorrect type code. If the 'ingate' is done at the actual time of entry of the container to the terminal there is an opportunity to confirm the type of container by the person booking it in, and then again by the shunter checking the loaded train.

163 Despite the various checks, two of the containers on the train (the one carrying dangerous goods and another) were recorded on ERIC and TOPS with an incorrect serial number (paragraph 105).

164 That container details held on ERIC are removed from the system after three months once the container has left EWS control was not directly relevant to this incident. However, the transit times for containers travelling to and from the far east make it likely that it will be more than three months before a container comes back to the UK. This increases the risk that incorrect details of a container may be recorded on the system if all details have to be re-input each time the container re-enters the UK.

165 Deletion of old data after three months was originally built into ERIC because of data storage capacity limitations when the system was designed in the early 1990s. These are less relevant today because developments in information technology since that time mean that ERIC now runs on computers with much greater data storage capacity than was the case then.

166 The details of the dangerous goods carried in one of the containers on the train (which had its serial number incorrectly recorded) were not properly recorded on ERIC or TOPS. The details had to be transferred manually from the consignment information provided by the client to the Maritime International Master Booking Sheet system and then to ERIC. This manual transfer was cumbersome and introduced opportunities for error, as occurred in this case. If the train had been involved in an incident or incident following which the emergency services had needed information on the contents of containers marked as conveying dangerous goods, there would have been no record on TOPS of the number of the container (because this had been written down incorrectly by the train preparer at Wakefield (paragraph 105)), or accurate details of the dangerous goods being conveyed on the train (**Recommendation 1**).

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

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

167 Immediately following the incident, EWS instructed its terminal staff that they must not make any changes to container description information held on ERIC (eg by over-riding warning messages) without reference to the duty operations manager, who is available continuously. Reach stacker drivers at Wakefield and at other terminals operated by the company were given training in the identification of container types by reference to the ISO codes on the sides.

168 During 2009, DB Schenker (as EWS has become) has carried out a programme of assessment of all staff who use the ERIC system. Staff whose understanding of the system was judged to be less than adequate were removed from ERIC duties and given additional training. Once this had been completed to the satisfaction of the assessor, they were permitted to resume normal duties.

169 DB Schenker have taken steps to stop staff from using vans to inspect trains.

170 Since the incident, DB Schenker has brought the height detector at the Wakefield terminal back into use, but it is reported by staff to be still unreliable and prone to spurious activations.

Recommendations

171 The following safety recommendations are made:[10]

Recommendations to address causal and contributory factors and other matters observed during the investigation

1 DB Schenker should carry out a review of the activities at its terminals, and introduce systems to minimise the incidence of out of gauge loads. This review and the subsequent actions taken should address, in particular:

- the arrangements for monitoring the performance of staff;
- the training and assessment of staff;
- methods of verifying the gauge compliance of trains leaving terminals;
- interfaces between the different systems used to manage container traffic; and
- the procedures used for processing information relating to dangerous goods traffic.

(paragraphs 160, 161c, 161d, 166)

2 DB Schenker should examine the feasibility of revising the container storage and handling arrangements at Wakefield Europort to reduce the likelihood of confusion between different box sizes, and implement any appropriate changes which are identified (paragraphs 160, 161a).

3 DB Schenker should, in co-operation with other system users as appropriate, request that the ERIC system be revised to highlight alert messages that may be safety critical (paragraph 161e).

[10] Those identified in the recommendations, have a general and ongoing obligation to comply with health and safety legislation and need to take these recommendations 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, these recommendations are addressed to the Office of Rail Regulation (ORR) 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 167 to 171) can be found on RAIB's web site at www.RAIB.gov.uk.

Appendix A - Glossary of abbreviations and acronyms

BR	British Rail
CCTV	Closed circuit television
ERIC	Enhanced Railfreight Distribution Intermodal Control
EWS	English Welsh & Scottish Railway
HSE	Health & Safety Executive
ISO	International Standards Organisation
SMIS	Safety Management Information System
TOPS	Total Operations Processing System

Appendix B - Glossary of terms

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

Bogie vehicle	A coach or wagon supported on two bogies (metal frames equipped with two or three sets of wheels and able to rotate freely in plan, used in pairs under rail vehicles to improve ride quality and better distribute forces to the track)*.
Brake continuity test	A test to confirm the application and release of brakes on the locomotive and other rail vehicles in a train when demanded by the driver*.
Combined ingate and booking	In the ERIC computer system, a single transaction which combines the operations of ingate (qv), or receiving a container into the system, and booking it onto a particular train service.
Fatigue and Risk Index	The Fatigue and Risk Index produced by the Health & Safety Executive provides a means of comparing different working patterns in terms of their tendency to produce fatigue, or sleepiness. If the fatigue index calculation gives a value of more than 35, sleepiness is likely to be a factor in an incident.
Gauge enhancement	Work carried out to enable a section of railway to accommodate trains with a larger vehicle gauge.
High-cube	A container whose height is greater than 8' 6" (2.6 m)
Ingate	In the ERIC computer system, the transaction which accepts a container into the system when it arrives at a terminal, or after it has been 'outgated'.
Intermodal	The movement of freight by more than one mode of transport (e.g. train, lorry, ship). Also used within the rail industry to describe the carriage of lorry bodies or trailers on rail wagons.
Outgate	In the ERIC computer system, the transaction which removes a container from the system, indicating that it has been moved to the care of a customer. Information about the container, including serial number and type code, is retained on the system for three months after an outgate.
Reach stacker	A material handling machine which uses a telescopic arm to increase the range at which it can pick up and deposit loads.
System Safety Case	A document describing how a system is designed, operated and maintained to comply with statutory and/or company requirements for processing safety critical information.

Appendix C - Key standards current at the time

GE/RT8073 Issue 1, April 2008	Requirements for the Application of Standard Vehicle Gauges
GE/GN8573 Issue 2 April 2008	Guidance on Gauging

Appendix D - Extracts from RT3973 form

NETWORK RAIL RT3973/ CON

ADVICE TO TRAIN CREWS
CONVEYANCE OF CONTAINERS
(To be handed to the TRAIN CREW at the starting point of the train, where load is attached or when signing on for duty)

Special Notes

(a) If you are relieved en route, this advice must be handed to the staff relieving you.

(b) If the load is staged without immediate relief of the train crew, this advice must be handed to the local yard staff who will be responsible for giving it to the train crew working the train forward.

(c) At the termination of the journey this advice must be handed to the staff at the destination.

PARTICULARS OF SERVICES USED

Date: Train Identity: From: **WILTON FLT/ SELBY POTTER GROUP/ LEEDS FLT/ WAKEFIELD EUROPORT/ DONCASTER RAILPORT** To: **WILLESDEN EUROTERMINAL/ WILLESDEN BRENT SIDINGS/ WEMBLEY YARD/ DIDCOT TC/ EASTLEIGH EAST YARD/ LUDGERSHALL MOD/ MILLBROOK FLT/ SOUTHAMPTON MCT/ SOUTHAMPTON WESTERN DOCKS/ MARCHWOOD MOD AND RETURN**

NATURE OF EXCEPTIONAL LOAD - W8 GAUGE:

(1) CONTAINERS up to **8ft 2½in** (2500mm) wide being conveyed on the following wagons:

(a) **FAA** loaded with ISO type containers up to **9ft 6½in** (2906mm) high
(b) **FLA** loaded with ISO type containers up to **9ft 6in** (2898mm) high
(c) **FKA** loaded with ISO type containers up to **9ft 2in** (2793mm) high
(d) **IKA** loaded with ISO type containers up to **9ft 2in** (2793mm) high
(e) **IFA** or **FIA** loaded with ISO type containers up to **8ft 9¼in** (2673mm) high
(f) **FSA** or **FTA** loaded with ISO type containers up to **8ft 7¾in** (2638mm) high
(g) **FEA** loaded with ISO type containers up to **8ft 7¾in** (2636mm) high
(h) **FRA** loaded with ISO type containers up to **8ft 7½in** (2628mm) high
(i) **KFA** loaded with ISO type containers up to **8ft 7in** (2618mm) high
(j) **FCA** loaded with ISO type containers up to **8ft 6in** (2591mm) high
(k) **FFA** or **FGA** loaded with ISO type containers up to **8ft 6in** (2591mm) high
(l) **IJA** loaded with ISO type containers up to **8ft 3½in** (2528mm) high
(m) **KHA** loaded with ISO type containers up to **8ft 3in** (2518mm) high
(n) **PFA** loaded with ISO type containers up to **8ft 6in** (2591mm) high

Page 1 of 13 LDS086 CON (03.03.2008)

NETWORK RAIL RT3973/ CON

Date: Train Identity: From: **WILTON FLT/ SELBY POTTER GROUP/ LEEDS FLT/ WAKEFIELD EUROPORT/ DONCASTER RAILPORT**

To: **WILLESDEN EUROTERMINAL/ WILLESDEN BRENT SIDINGS/ WEMBLEY YARD/ DIDCOT TC/ EASTLEIGH EAST YARD/ LUDGERSHALL MOD/ MILLBROOK FLT/ SOUTHAMPTON MCT/ SOUTHAMPTON WESTERN DOCKS/ MARCHWOOD MOD AND RETURN**

THE FOLLOWING ROUTES MUST BE OBSERVED:

Note: Unless shown otherwise, these routes apply in both directions

(A) **Wilton FLT**, Shell Jn, Grangetown Jn, Beam Mill Jn, South Bank Jn, Guisborough Jn, Newport East Jn, Tees Yard (if required), Thornaby East Jn, Bowesfield Jn, Stockton Cut Jn, Eaglescliffe South Jn, Northallerton East Jn, Northallerton High Jn, Northallerton Station, Longlands Jn, Green Lane Jn, Skelton Bridge Jn, Skelton Jn, York Yard South, Holgate Jn, Dringhouses North Jn, Colton Jn, Church Fenton North Jn, Church Fenton South Jn, Sherburn Jn, Milford Jn, Castleford East Jn, Castleford West Jn, Whitwood Jn, Methley Jn, Stourton Jn, **Leeds FLT**

(B) Eaglescliffe South Jn, Darlington South Jn, Darlington (reverse),

(C) Darlington South Jn, Northallerton High Jn,

(D) Skelton Jn, York Station, Holgate Jn

(E) Church Fenton North Jn, Micklefield Jn, Neville Hill East Jn, Neville Hill West Jn, Marsh Lane Jn, Quarry Hill Jn, Leeds East Jn, Leeds West Jn, Engine Shed Jn, Holbeck Depot Jn, Hunslet Station Jn, **Leeds FLT**

(F) Methley Jn, Altofts Jn, Turners Lane Jn, Calder Bridge Jn, Oakenshaw Jn, Crofton West Jn, Hare Park Jn, South Kirkby Jn, Moorthorpe Jn, Dearne Jn, Swinton Jn, Aldwarke Jn, Masborough Jn, Beighton Jn, Foxlow Jn, Barrow Hill North Jn, Barrow Hill South Jn, Tapton Jn, Clay Cross North Jn, Clay Cross South Jn, Ambergate South Jn, Duffield Jn, St Mary's South Jn, Little Eaton Jn, London Road Jn, Melbourne Jn, Stenson Jn, North Stafford Jn, Clay Mills Jn, Wetmore Jn, Horninglow Bridge Jn, Branston Jn, Leicester Jn, Barton North Jn, Barton South Jn, Wichnor Jn, Kingsbury Branch Jn, Kingsbury Jn, Water Orton East Jn (via Fast or Slow Lines and Whitacre Jn), Water Orton West Jn, Castle Bromwich Jn, Washwood Heath Yard (if required – including reversal), Duddeston Jn, Landor Street Jn, St Andrews Jn, Bordesley Jn, Small Heath South Jn, Tyseley South Jn, Hatton North Jn, Hatton Station Jn, Leamington Spa Jn, Fenny Compton Jn, Aynho Jn, Wolvercot Jn, Oxford North Jn, Kennington Jn, Didcot North Jn, Didcot East Junction (direct), Reading West Yard (if required), Reading West Jn, Oxford Road Jn, Southcote Jn, Basingstoke, Worting Jn, Shawford Down Jn, **Eastleigh East Yard** (if required), Eastleigh West Jn, St Denys Jn, Northam Jn, **Millbrook FLT**, Redbridge Arrival/ Departure Road (reverse if required), **Southampton MCT/ Southampton Western Docks**

(G) **Wakefield Europort,** Altofts Jn,

(H) Whitwood Jn, Altofts Jn,

Page 3 of 13 LDS086 CON (03.03.2008)

NETWORK RAIL RT3973/ CON

Date: Train Identity: From: **WILTON FLT/ SELBY POTTER GROUP/ LEEDS FLT/ WAKEFIELD EUROPORT/ DONCASTER RAILPORT** To: **WILLESDEN EUROTERMINAL/ WILLESDEN BRENT SIDINGS/ WEMBLEY YARD/ DIDCOT TC/ EASTLEIGH EAST YARD/ LUDGERSHALL MOD/ MILLBROOK FLT/ SOUTHAMPTON MCT/ SOUTHAMPTON WESTERN DOCKS/ MARCHWOOD MOD AND RETURN**

SUBJECT TO THE FOLLOWING RESTRICTIONS (Continued):

NO.	BETWEEN	LOCATION	DISTANCE/ MP	SPEED(MPH)
ROUTE F				
(6)	Wetmore Jn and Horninglow Bridge Jn	Bridge DBP1-30	10m 24ch	15 Down Main
(7)	Northam Jn and Southampton	Southampton Tunnel		20
ROUTES G AND H				
No special restrictions				
ROUTE I				
(8)	Huddersfield and Slaithwaite	Bridge MVL3-68	22m 45ch	15
(9)	Greenfield and Mossley	Bridge MVL3-20 (Wright Mill)	11m 60ch	15
(10)	Mossley and Stalybridge	Stalybridge Old Tunnel	08m 41ch - 08m 10ch	15
ROUTE J				
(11)	Stalybridge and Ashton	Bridge MVL1-29 (Mossley Road)	06m 60ch - 07m 00ch	15
ROUTES K, L, M, N, O AND P				
No special restrictions				
ROUTE Q				
(12)	Hexthorpe Jn and Conisbrough	Conisbrough Tunnel	19m 00ch - 18m 69ch	25
ROUTES R, S, T AND U				
No special restrictions				

Page 9 of 13 LDS086 CON (03.03.2008)

NETWORK RAIL RT3973/ CON

Date: Train Identity: From: **WILTON FLT/ SELBY POTTER GROUP/ LEEDS FLT/ WAKEFIELD EUROPORT/ DONCASTER RAILPORT**

To: **WILLESDEN EUROTERMINAL/ WILLESDEN BRENT SIDINGS/ WEMBLEY YARD/ DIDCOT TC/ EASTLEIGH EAST YARD/ LUDGERSHALL MOD/ MILLBROOK FLT/ SOUTHAMPTON MCT/ SOUTHAMPTON WESTERN DOCKS/ MARCHWOOD MOD AND RETURN**

SUBJECT TO THE FOLLOWING RESTRICTIONS (Continued):

NO.	BETWEEN	LOCATION	DISTANCE/ MP	SPEED(MPH)

ROUTE KKK

(37) Byfleet Jn and Clapham Jn

Note: Must travel on Up Fast Line

END

FOR NETWORK RAIL

Signed [redacted] Authorised Person Access Co-ordinatorDesignation

Printed Surname [redacted] Date of issue **03 March 2008**

FOR TRAIN OPERATING COMPANY

Signed... Authorised Person .... Designation

Printed Surname Date of issue...

NOT TO BE DIVERTED FROM THE ABOVE ROUTES WITHOUT AUTHORITY FROM NETWORK RAIL CONTROL

All speed restrictions lower than those shown above must be observed

ISSUED BY NETWORK RAIL TRAIN PLANNING CENTRE
FORM No.: LDS086 CON
REPLACES FORMS Nos: LDS086 CON, dated 18 December 2007
THIS FORM IS VALID UNTIL: **28 February 2010**

Page 13 of 13 LDS086 CON (03.03.2008)

Appendix E - Order to move form completed at Wakefield

EWS NETWORK

TRAFFIC TO BE FORWARDED BY EWS NETWORK

ORDER TO MOVE

Forwarder Contact Number (In case of query) Int: 56027 Ext: 0870 140 6027	Location Name Wakefield Europort	Location Code 17197	Date 17/12/2008	Time 0:07
Train Identity 4O53	Departure Date and Time 17/12/2008	Destination SOTON	Stanox 86604	Sheet 1 / Of 4

Wagon Number	Unit Number	Platform	Seal Number (CT Traffic)	Type Sub/Type	S Plate	Size L	Size H	Size W	Tare Weight	Gross Weight	Dangerous Goods UN/Number	Dangerous Goods Class	Dangerous Goods Flash Point
7049381252	M/T												
7049387109	M/T												
7049381237	M/T												
7049381443	M/T												
7049380650	M/T												

EWS NETWORK

TRAFFIC TO BE FORWARDED BY EWS NETWORK

ORDER TO MOVE

Forwarder Contact Number (In case of query) Int: 56027 Ext: 0870 140 6027	Location Name Wakefield Europort	Location Code 17197	Date 17/12/2008	Time 0:07
Train Identity 4O53	Departure Date and Time 17/12/2008	Destination SOTON	Stanox 86604	Sheet 2 / Of 4

Wagon Number	Unit Number	Platform	Seal Number (CT Traffic)	Type Sub/Type	S Plate	Size L	Size H	Size W	Tare Weight	Gross Weight	Dangerous Goods UN/Number	Dangerous Goods Class	Dangerous Goods Flash Point
7049382151	M/T												
7049387133	M/T												
7049380593	M/T												
7049385004	MSKU 8748843					40	2.6	2.5		4			
	MRKU 0286032					40	2.6	2.5		4.			
609039	CLHU 6687298					40	2.9	2.5		12.	1170	3	

EWS NETWORK

TRAFFIC TO BE FORWARDED BY EWS NETWORK

ORDER TO MOVE

Forwarder	Location Name	Location Code	Date	Time
Contact Number (In case of query) Int: 56027 Ext: 0870 140 6027	Wakefield Europort	17197	17/12/2008	0:07

Train Identity	Departure Date and Time	Destination	Stanox	Sheet / Of
4O53	17/12/2008	SOTON	86604	3 / 4

Wagon Number	Unit Number	Platform	Seal Number (CT Traffic)	Type Sub/Type	S Plate	Size L	Size H	Size W	Tare Weight	Gross Weight	Dangerous Goods UN/Number	Dangerous Goods Class	Dangerous Goods Flash Point
609038	GATU 8205388					40	2.9	2.5		25.			
609024	CAXU 4973314.					40	2.9	2.5		10.			
609044	FCIU 8129972.					40	2.9	2.5		25.			
609095	TGHU 7294856					40	2.9	2.5		25.			
609023	HLXU 4551092.					40	2.9	2.5		25.			

EWS NETWORK

Forwarder	Location Name	Location Code	Date	Time
Contact Number (In case of query) Int: 56027 Ext: 0870 140 6027	Wakefield Europort	17197	17/12/2008	2:17

Train Identity	Departure Date and Time	Destination	Stanox	Sheet / Of
4O53	17/12/2008	SOTON	86604	4 / 4.

Wagon Number	Unit Number	Platform	Seal Number (CT Traffic)	Type Sub/Type	S Plate	Size L	Size H	Size W	Tare Weight	Gross Weight	Dangerous Goods UN/Number	Dangerous Goods Class	Dangerous Goods Flash Point
609015	GATU 8634990					40	2.9	2.5		25.			
609061	MSKU 0903542.					40	2.9	2.5		4.1			

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