Issue:	Issue 2
Date:	May 2014

Training Course for Driver Certificate of Professional Competence: Prevention of Bridge Strikes

Training plan

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Introduction

This document specifies the subject matter to be covered in the Prevention of Bridge Strikes Training Course for Driver Certificate of Professional Competence (CPC) Course and gives guidance on how this is to be delivered. This Trainer's Plan and associated documents have been endorsed by the Bridge Strike Prevention Group.

Any use of this course for driver CPC training is subject to approval from the Joint Approvals Unit for Periodic Training (JAUPT).

The plan details the minimum recommended content. Additional material may be used to supplement this package to meet specific company needs.

Issue Record

This document will be updated when necessary by the issue of a complete replacement. Revisions will be identified by a vertical black line in the margin.

Issue	Date	Comments
1	July 2012	New Issue
2	May 2014	Endorsed by Road Haulage Association. Revisions to bridge strike statistics Traffic Signs Manual published July 2013

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Supply

Copies of this training plan and the associated training presentation may be downloaded from Network Rail's web site:

www.networkrail.co.uk/bridgestrikes.

Course Overview

1.1 Target audience

This course is designed to be used by companies to train professional drivers in the freight transport industry and construction plant-hire sector as part of the requirement of the Driver CPC European Union Directive 2003/59 for drivers to be provided with a minimum 35 hours training each 5 years.

The training course may also be suitable for other individuals in a freight transport or construction plant-hire company who may have a role to play in the prevention of bridge strikes or reporting a bridge strike.

It is designed to develop a person's knowledge, understanding and skills to prevent bridge strikes.

1.2 Aim

- to outline the Regulations in force to prevent bridge strikes;
- to advise of the various types of bridges on Network Rail infrastructure at risk of bridge strikes;
- to identify the procedures and actions to be taken by professional drivers before and during a journey to prevent bridge strikes;
- to advise of the action to be taken if a bridge strike occurs;
- to indicate the possible consequences of a bridge strike.

1.3 Pre-requisite requirements

Delegates should be professional drivers of large goods vehicles.

1.4 Learning objectives

At the end of the training course the delegate will:

- understand the procedures to be undertaken prior to commencing a journey that will prevent a bridge strike;
- be able to identify the various types traffic signs at bridges;
- understand the actions to be taken to prevent bridge strikes when driving on the road;
- be able to take appropriate action to report a bridge strike;
- be aware of the possible consequences of a bridge strike.

1.8 Trainers

Trainers shall be currently registered and approved by Joint Approvals Unit for Periodic Training.

1.9 Delivery

This training course is designed to be classroom based led by the trainer and includes a mix of lecture style presentations and group discussions together with appropriate question and answer interaction with the delegates.

The course may also include practical training to reinforce the information provided in the classroom.

Suggestions for practical training are given in session 1.

The recommended number of delegates at any one session is **10**.

1.11 Timetable

Recommended Course Duration: ½ day

Session	Description
1	Introduction and background to the course
2	The Law
3	Vehicle height measurement
4	Journey planning and routing
5	Traffic signs and road markings
6	On the road
7	Reporting a bridge strike
8	Consequences of a bridge strike

1.12 Preparaton

Before running a course from this pack it is necessary to prepare the materials and equipment required. The following list suggests possible requirements.

Classroom facilities with desks and chairs laid out to enable all delegates to participate
Computer and projector
Whiteboard or flipchart
Note paper and pen/pencil for each delegate
Network Rail Good Practice Guide NR/CE/GPG/004: *Prevention of bridge strikes - A good practice guide for professional drivers* Issue 2 April 2012

Height measuring pole (A telescopic pole may be obtained from Belle Trailers (http://www.belletrailers.co.uk), RHA (http://www.rhaonline.co.uk/shop.php), Recovery World (http://www.recoveryworld.co.uk/index.php) or FTA (http://www.shop.fta.co.uk)

The Good Practice Guide NR/CE/GPG/004 and the Good Practice Guide NR/CE/GPG/003: *Prevention of bridge strikes - A good practice guide for transport managers* Issue 2 April 2012 may be downloaded from Network Rail's web site www.networkrail.co.uk/bridgestrikes.

1.14 Reference documents

Statutory Instrument 1997 No. 530: Road Vehicles (Construction and Use) (Amendment) Regulations 1997
Statutory Instrument 1998 No. 1188: Road Vehicles (Construction and Use) (Amendment) (No.3) Regulations 1998
Statutory Instrument 2002 No. 3113: Traffic Signs Regulations and General Directions 2002
Statutory Instrument 2011 No. 3041: The Traffic Signs (Amendment) (No.2) Regulations and General Directions 2011
Traffic Signs Manual Chapter 4 'Warning Signs', (30 July 2013), London: TSO for DfT, the Scottish Executive, the Welsh Assembly Government and the Department for Regional Development NI
Traffic Signs Manual Chapter 5 'Road Markings', (7 November 2003), London: TSO for DfT, the Scottish Executive, the Welsh Assembly Government and the Department for Regional Development NI
Traffic Signs Manual Chapter 7 'The Design of Traffic Signs', (31 July 2013) London: TSO for DfT, the Scottish Executive, the Welsh Assembly Government and the Department for Regional Development NI
Network Rail Good Practice Guide NR/CE/GPG/003: *Prevention of bridge strikes - A good practice guide for transport managers* Issue 2 April 2012
Network Rail Good Practice Guide NR/CE/GPG/004: *Prevention of bridge strikes - A good practice guide for professional drivers* Issue 2 April 2012

1.15 Key to delivery methods

💻 01	View slide number
🗣 Group discussion	Facilitate a group discussion

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TRAINING COURSE FOR DRIVER CERTIFICATE OF PROFESSIONAL COMPETENCE: PREVENTION OF BRIDGE STRIKES

TRAINING PLAN

Issue: May 2014

Foreword

This training course is intended to be used by companies in the freight transport industry and construction plant-hire sector to form the basis a training course for CPC periodic training.

Any use of this course for drivers' CPC periodic training is subject to approval from the Joint Approvals Unit for Periodic Training (JAUPT).

In addition to professional drivers, this course may be provided to other individuals in a freight transport or construction plant-hire company who may have a role to play in the prevention of bridge strikes or reporting a bridge strike. This includes but is not limited to:

- Office support staff (who may have to determine and advise drivers of alternative routes around obstructions);
- Transport Managers.

Subject to company policy, this training course may also be suitable as ad-hoc training or briefings for drivers who have had bridge strikes or near misses.

Companies should add additional requirements or otherwise adapt this training course presentation as necessary to accord with company policy.

Session 1: Introduction and background to the course

Session objectives

At the end of this session, the trainees will understand:

- the nature and objectives of the training course;
- the number of bridge strikes reported annually;
- the type of bridges that may be struck;
- the possible causes of a bridge strike to the railway.

Key Points	Contents	Ref
1.1	AGENDA	
1.1.1	The course is broken into eight sessions which provide the necessary information required to enable drivers to have the basic knowledge to understand the how to prevent bridge strikes and the consequences of bridge strikes. These are: • introduction and overview; • the law; • vehicle height measurement; • journey planning and routing; • traffic signs; • driving on the road; • reporting a bridge strike; • consequences of a bridge strike.	💻 **02**
Trainer's note	*Adjust as necessary to include additional sessions as necessary for company policy in the course.*	
Drivers' beliefs	Tell the drivers that this course will address several misconceptions commonly thought to be held by drivers such as: • it won't happen to me; • I can drive slowly under the bridge and see if I get through.	

Key Points	Contents	Ref
1.1.2	Explain that the course is classroom based using a PowerPoint presentation, with the opportunity for discussion and to ask questions.	
1.1.3	Ask the drivers to give examples of other occasions in addition to passing under a low bridge when it is necessary to know the height of their vehicle. Examples include: • loading bays; • dock areas; • depots; • freight terminals; • service station forecourts; • passing under overhead cables or pipelines; • road tunnels; • passing under overhead walkways or footbridges; • negotiating level crossings with overhead electrification.	Group discussion
Trainer's note	*If to be included advise the attendees that the course will include a practical section(s) and give details as the course proceeds.* *The following are proposals which may be incorporated in a training course either during an appropriate part of the course or at the end of the classroom part of the course.* • *use of a telescopic measurement pole to measure the vehicle height;* • *changing the in cab display and placing it in the cab;* • *planning a route using the Truckers' Atlas or satellite navigation equipment to avoid low bridges;*	

Key Points	Contents	Ref
	• *driving a route under a low bridge and asking the driver to tell you the signed height of the bridge after passing under the bridge.* *If as part of the course, you propose to take the driver under a low bridge as in the last bullet point, the signed height of bridges on the route and the height of the vehicle being used must be established to enable the chosen route to be confirmed to be safe.*	
1.2	COURSE OBJECTIVES	
1.2.1	Explain that at the end of this section attendees will have an appreciation of why it is necessary to understand the risk and possible effects of a bridge strike on the railway.	
Trainer's note	*This section does not include all the possible consequences of bridge strikes; that will be in session 8 towards the end of the course where it should have greatest impact on the delegates.*	
No driver immune from risk of bridge strikes Course objective	Tell the attendees that however good a driver, trainees may consider themselves to be, they are not immune to bridge strikes. Drivers who are involved in bridge strikes clearly don't set off from their depot with the intention of having a collision, and they are probably no more flawed than anyone in the classroom. Advise the attendees that the procedures such as route planning at diversions etc covered later in the course are designed as a safeguard, borne out of recognition that people can make mistakes whilst they are driving. State that this training course will provide the attendees with information to improve their: • knowledge of vehicle height; • route planning; • understanding of traffic signs for low bridges.	

Key Points	Contents	Ref
1.2.2 Definition	Explain that a bridge strike is when a road vehicle, its load or equipment collides with a bridge. This is usually a bridge carrying a railway over a road, but it is not unknown for strikes to occur at bridges carrying roads or footpaths over roads.	💻 **04**
1.2.3 Photographs	Tell the attendees that this session will explore three areas: • an understanding of the number of reported strikes and their frequency at some bridges; • the types of bridges which are struck; • possible causes of bridge strikes. Advise the trainees that the photographs of incidents shown in this course were taken by Network Rail response staff attending bridge strike incidents. Explain that photographs of bridge strikes taken by Network Rail response staff may also used as evidence for the recovery of costs from the companies involved.	
1.3	A FEW KEY QUESTIONS	
1.3.1	The key questions on this slide are designed to be used in a discussion or question and answer session with the attendees.	💻 **05**
	1. How many bridge strike incidents do you think happen each year? 2. Have you ever known of anyone who has experienced a bridge strike? Do you know what happened? Do you know what caused it? 3. If your vehicle hits a bridge, who might this affect? 4. A bridge with diminishing headroom and a skew bridge are particularly hazardous – why do you think this is? 5. What do you think causes bridge strikes?	💬Group discussion

Key Points	Contents	Ref
	6. Does anyone know what the law is in relation to displaying the vehicle height in the driver's cab? 7. Why are round and triangular signs used at low bridges?	Group discussion
Trainer's note	*Slide 5 has been animated so that each question appears on the click of the mouse.*	
1.3.2	Tell the trainees that the answers (except that to the second question) will be given as the course proceeds.	
Trainer's note	*Answers are on the following slides:* *1. Slide 8;* *3. Slide 46;* *4. Slides 11, 49 and 50;* *5. Slide 12;* *6. Slides 14 and 23;* *7. Slides 30 and 32.*	
1.4	WHY BRIDGE STRIKES	
Derailment risk Ireland derailment Bridge dislodged	Tell the attendees that the risk of a train derailment causing loss of life and injuries is an ever present risk. This course has been designed so that drivers can understand the risks to the railway, to themselves, the vehicle owner and members of the public who may be in the vicinity. Explain that the incident in the slide shows an aerial view of a derailment that occurred at Clogh (pronounced Cain) Bridge, Gorey, County Wexford in Eire on 31st December 1975. Gorey is approximately 60 miles south of Dublin on the Dublin to Rosslare mainline. A vehicle carrying construction plant struck the bridge completely dislodging two bridge girders leaving the track unsupported. Despite the efforts of the lorry driver it was not possible to stop the approaching Rosslare Harbour - Dublin train.	**06**

Key Points	Contents	Ref
5 fatalities	The train hit the bridge at an estimated 60 mph and derailed resulting in 5 fatalities and 30 people were injured. The casualty figures could have been significantly higher had the first two carriages not been closed and empty because it had been intended only to open the two carriages for passengers joining the train further along the line. These leading vehicles and the baggage car were completely shattered when the train came upon the unsupported rails. Miraculously the driver survived, sustaining a back injury while the majority of the injured were located in the third carriage, with the five fatalities occurring to passengers travelling in the fourth carriage.	
1.5	OYNE 12th MAY 1978	
1.5.1 Oyne derailment Severe damage to bridge Seven injuries	Advise the attendees that there has been no similar derailment causing such loss of life or injuries as a result of a bridge strike in the UK. The only derailment in the UK due to a bridge strike occurred near Oyne, Aberdeenshire at a bridge over the B9002 known as the Torries Burn Turnpike near the junction with the A96. Similar to the Gorey derailment, the vehicle involved was conveying an excavator on an articulated low loader trailer. The upper portion of the excavator boom struck the bridge causing severe damage to the outer girder and a track misalignment. Although the train driver on the approaching Aberdeen to Inverness train made an emergency brake application, the train crossed the bridge at 40 mph and derailed. Unlike the Gorey derailment, the coaches were not damaged significantly. Fortunately there was no loss of life or severe injuries caused, although seven persons sustained minor injuries.	💻 **07**

Key Points	Contents	Ref
1.5.2 Major accidents rare	Emphasise that major accidents, such as those illustrated are extremely rare, but there have been several recent incidents when the track has been moved but there has been no derailment. Add that lorries or their loads and other vehicles frequently collide with bridges and each time that a bridge strike is reported, approaching trains may have to be stopped until the bridge is examined to confirm that it is safe for trains to pass over or under the bridge.	
1.6	BRIDGE STRIKES AT RAIL OVER ROAD BRIDGES	
1.6.1 400 bridges Four fold increase 4 strikes per day	Tell the attendees that the Railway Inspectorate report into the Oyne derailment records that 'between 1972 and 1974 some 400 bridges were being struck each year'. This graph shows the number of strikes reported to Network Rail in the last ten years, and shows approximately a four fold increase at end of 2013 compared to 1974. Strikes are also reported to other rail authorities such as London Underground although these are much fewer in number. Point out that in 2013 there were more than 4 reported bridge strikes each day, and that this is significantly greater than those reported in 1974.	💻 **08**
1.6.2	Ask the attendees why this might be. Possible reasons include: • greater number of vehicles on the road; • improved reporting of strikes.	🗣Group discussion
1.6.3 Majority involve LGVs	Point out that the majority of strikes are reported following a collision of a large goods vehicle with a bridge. Point out that the trend of strikes by LGVs mirrors the overall trend for reported bridge strikes.	

Key Points	Contents	Ref
Plant vehicles	Tell the attendees that although small in number (approximately 20 per year) strikes by vehicles carrying construction plant have a greater tendency to cause damage to the bridge structure as illustrated by the strikes at Gorey and Oyne.	
Trainer's note	*If this course is provided in- house, include here any statistics related to the company.*	
1.7	TIME OF REPORTED BRIDGE STRIKES	
1645 in 2013 Night Peak time Time of most strikes	This graph shows the distribution of bridge strikes reported at Network Rail bridges by each hour. Remind the attendees that there were 1645 bridge strikes reported in 2013. Point out that understandably there are fewer strikes at night as there is less traffic. Note that the peak time is just before the lunch period. Ask the attendees to suggest possible reasons, is it because drivers are thinking of where to take a break? Show that more than half the strikes occur between 10:00 and 16:00, and three quarters between 09:00 and 19:00.	💻 **09** Group discussion
1.8	BRIDGES OVER THE ROAD	
Two types – flat soffit and arches	Explain that generally bridges over roads at risk of bridge strikes may be categorised into two types: • flat soffit under which the vehicle may pass on the left hand side of the road and which are generally be signed with a single roundel traffic sign showing the permitted height; • arches under which the vehicle may have to move to the centre of the road to pass under the bridge safely, and which are usually signed with a triangular traffic sign giving warning of the limit on vehicle height, and corressponding road markings.	💻 **10**

Key Points	Contents	Ref
Headroom at arches	Tell the attendees that the headroom at arches diminishes towards the edge of the road. Accordingly a driver is likely to need to pass under the bridge along the centre of the road to pass under the bridge safely.	
Collision protection beams	Point out that some bridges are protected by beams erected slightly lower that the lowest part of the bridge spanning the road to arrest an errant vehicle. The protection provided by these beams is sufficient for the Rail Authority to permit train movements to continue if a strike is reported.	
Uphill gradient Wedged	Point out if no collision protection beam is present, the lowest part of the bridge over the road may not be that on the approach. Roads slope and if on an uphill gradient it is possible to pass under the bridge and become wedged under the bridge due to the reducing headroom.	
Reducing headroom along road	Point out that the railway was constructed level and where it crosses a road with a gradient the headroom will vary along the road under the bridge. The traffic sign will be based on the minimum headroom which may be on the opposite face from the driver's approach. Warn attendees that just because it appears possible to pass under the bridge on the approach side, they should not assume if their height is more than the signed height that they can exit from under the bridge.	
Wedged	Many vehicles have made this mistake and become wedged under the bridge where the headroom diminishes to the vehicle height. If bridges such as these are approached at speed not only will a vehicle strike the soffit of the bridge damaging both bridge and vehicle roof but there is a risk that the vehicle suspension will collapse and the under frame embed itself into the road surfacing.	💻 **11**

Key Points	Contents	Ref
Varying headroom along the road Skew bridges	Continue that in some cases the bridge over the road has been constructed at different times, and differing types of construction. It is not unknown for a flat metal span to abut a lower arch, or differing forms of construction with the lowest part of the bridge away from the edge of the bridge. In the example on this slide the railway was widened and the bridge extended using a metallic deck abutting a lower arch. Point out that the traffic sign is a triangular warning sign which shows the limiting height under the arch. This metallic deck is additionally protected by a collision protection beam. Skew bridges pose a particular risk as lorries involved in a bridge strike may overturn. Point out that the angle of the skew does not have to be particularly large to turn a vehicle over. The bridge shown regularly causes vehicles to overturn on to the opposite carriageway putting both the driver and occupants of approaching vehicles at risk of serious injury.	
Trainer's note	*This course focuses primarily on the risk of bridge strikes at bridges over the road, but bridge strikes can also occur at road bridges over the railway. A strike at a bridge over a road may result in debris from the vehicle or the parapet, particularly if the parapet is masonry falling onto the track with a possible risk of derailment to an approaching train. Strikes at these bridges will be covered in reporting of bridge strikes and consequences of bridge strikes.*	
1.10	CAUSES OF BRIDGE STRIKES	
Research	Explain that the information in the slide was obtained in research carried out during 2010 – 2012 for the Bridge Strike Prevention Group.	💻 **12**

Key Points	Contents	Ref
Trainer's note	*Below are details of the population of 287 drivers involved in the research.* ***Age** - ages ranged from 21 to over 60, with the most common age group being between the ages of 41 to 50 (36%). 76 % of all respondents were over the age of 41.* ***Gender** - 96% of respondents were male, with the remaining 12 drivers being female, all of whom worked in the passenger carrying vehicle community.* ***Nationality** - 98% of respondents were British, with the remaining 2% being made up of participants from Ireland, Poland and Zambia.* ***Employment Status** - 98% of respondents were full time employees with the other 2% being agency drivers* ***Employed by** - 94% of respondents worked for large companies with 10 or more drivers.* ***Experience** - driver experience ranged from less than 1 year to 50 years experience with the most common experience level being between 6 to 10 years (22%).* ***International experience** - Only 3% of respondents had experience of driving outside of GB in tall vehicles.* ***Distances driven** - drivers covered a range from less than 3000 miles up to 150000 miles per year.*	
Principal cause	State that there may be several contributory causes of bridge strikes, but the principal cause is that the vehicle is higher than the lowest part of the bridge spanning the road.	

Key Points	Contents	Ref
Other causes	Other contributory causes include: • drivers not reading, misreading or not obeying traffic signs; • distractions such as advertising hoardings; • lifting arm or crane in raised position; • incorrect positioning at arch bridges; • blind obedience to 'car' satellite navigation system directions which do not include details of low bridges. Discuss these and other possible causes with the attendees.	💬Group discussion
Trainer's note	*When discussing the causes of bridge strikes, consider how some disasters (air, space, nuclear) have involved highly trained and competent individuals, recognised in their field, making silly mistakes in moments of stress, fatigue, distraction etc.*	
Safeguards	Explain that therefore there are legal requirements which will be covered in the next session and procedures such as route planning at diversions etc which are designed as a safeguard, borne out of recognition that people can make mistakes whilst driving.	

Session 2: The law

Session objectives

At the end of this session, the trainees will understand legal requirements for:

- displaying the vehicle height in the cab;
- equipment alarms for vehicles with high level equipment;
- traffic signs;
- reporting bridge strikes.

Key Points	Contents	Ref
2.1	VEHICLE HEIGHT NOTICE IN CAB	
Regulation	Legal requirements are governed by "The Road Vehicles (Construction & Use) (Amendment) Regulations 1986, under Statutory Instrument No 1078/1986 as amended by "The Road Vehicles (Construction & Use) (Amendment) Regulations 1997, under Statutory Instrument No 530/1997, and "The Road Vehicles (Construction & Use) (Amendment) (No. 3) Regulations 1998, under Statutory Instrument No 1188/1997, in which the following applies: • for most vehicles, the maximum travelling height of the vehicle must be displayed on a notice (in a prominent position) in the driving cab when the overall travelling height of the vehicle, its load or equipment exceeds 3 metres.	💻 **14**
Travelling height	Ask the drivers what they understand by 'travelling height'. The overall travelling height is the overall height from the ground level to the highest part of the vehicle, its load or equipment when the vehicle is in travelling mode.	💬Group discussion

Key Points	Contents	Ref
Notice number size	Point out that: • the notice must show the overall travelling height in feet and inches, or in both feet and inches and in metres; • the numbers used for giving the height in feet and inches must be at least 40mm tall; • the numbers used for giving the height in both feet and inches and metres must not differ by more than 50mm; • the height shown in the notice must be not less than the overall travelling height of the vehicle, its load or equipment, or more than 150mm above that height.	
Includes trailer and load or equipment	Tell the attendees that the requirement to display the height in the cab also applies when trailers are being towed if the overall travelling height, i.e. height of the trailer, its load or equipment, exceeds 3 metres.	
Exceptions	Tell drivers that there are exception to this requirement: 1. If they are carrying sufficient information in documents defining their route which includes information on the height of bridges to allow them to complete their route without risk of colliding with a low bridge, and they travel on the route described. 2. If the driver is unlikely to encounter on the route a bridge or other overhead structure which isn't more than 1 metre higher than the overall travelling height of the vehicle 3. A vehicle not more than 4 metres high if registered in a European State and used in international traffic, i.e. European Union registered vehicles.	
Trainer's note	*Discuss with the group when these exceptions should be applied.*	Group discussion

Key Points	Contents	Ref
2.2	EQUIPMENT ALARM	
Regulation	In addition to the requirements to display the travelling vehicle height in the cab, where high level power operated equipment exceeding 3 metres is fitted to vehicles or trailers, a warning device must be fitted to give a visible warning to the driver if the equipment is raised whilst being driven, unless the equipment can be fixed in position by a locking device.	
What is high level equipment	Ask attendees what they consider to be vehicles that have high level power operated equipment. The answers should include a lorries with a HIAB crane or other type of lifting arm and a tipper lorry which can unload by part of the vehicle being tipped to the rear or sideways.	Group discussion
Definition	High level equipment means equipment that can be raised by a power operated device, and the raising or lowering of the equipment alters the overall travelling height of the vehicle when the vehicle is unladen.	**15**
Daily checks	Stress that these are legal requirements, and the importance of including these items during daily checks to ensure legal compliance.	
Visual warning predetermined height	Tell the attendees that a visual warning is required to be provided if the highest point of the equipment exceeds the overall height or a predetermined height whilst being driven. This predetermined height must not exceed the overall travelling height by more than 1 metre.	
Predetermined height to be displayed in cab	If the predetermined height is used, the height to be displayed on the notice in the cab is the predetermined height.	

Key Points	Contents	Ref
Not applicable if locked	This requirement does not apply if the equipment can be locked in the stowed position, and if this is the case, the equipment is required to be locked in that position whilst being driven. The locking device must also not be able to be interfered with by the person in the driving cab.	
Similar exceptions	Advise the attendees that similar to the requirement for the notice in the cab, a visual warning is also not required if the driver is unlikely to encounter on the route a bridge or other overhead structure which isn't more than 1 metre higher than the overall travelling height of the vehicle. Similarly there is an exemption for European Union registered vehicles not more than 4 metres high.	
Exempt vehicles	There are also several vehicles exempt from this requirement which include: • an agricultural tractor; • a fire engine; • a motor vehicle drawing a car transporter; • a motor vehicle or trailer used by the armed forces.	
2.3	TRAFFIC SIGNS	
Responsibility	The Highway Authority (Road Authority in Scotland) is responsible for provision of signs on approaches to and at a low bridge to indicate the height restriction over the public highway. Bridges with minimum headroom over the road or carriageway of 16 feet 6 inches or less should be signed.	
Network Rail not responsible for signing low bridges	The Rail Authority has no responsibility to provide signs at low bridges.	

Key Points	Contents	Ref
Metric and imperial dimensions	Road signs specify the maximum permitted vehicle height under a bridge in imperial dimensions and at some bridges additionally in metric dimensions.	
Prohibition and advisory road signs	There are two types of road traffic signs, circular which prohibit, and triangular which are advisory. In general, circular signs are fixed to flat soffit bridges and triangular signs to arch structures, although examples may be found where this convention has not been followed.	💻 **16**
Roundel prohibition	Tell the drivers that if their vehicle is higher than the height shown on a circular traffic sign at or in advance of a bridge, they must not pass the sign but find an alternative route avoiding the low bridge.	
Triangular should not pass	Tell the drivers that similarly if their vehicle is higher than the height shown on a triangular traffic sign at a bridge, they should not pass the sign but find an alternative route avoiding the low bridge.	
Arches	At arch bridges, white lines on the road and 'goal posts' on the bridge may be provided to indicate the extent of the signed limit on vehicle height, normally over a 3 metre width.	
2.4	REPORTING A BRIDGE STRIKE	
Damage to 3rd party to be reported	Remind the drivers that any road traffic collision that causes damage to a 3rd party is required to be reported.	💻 **17**
Bridge owned by 3rd party	Each bridge strike will cause damage to a bridge, and must therefore be reported.	
Railway Authority before police	A Strike at a railway bridge must be reported to the Railway Authority first and then the Police.	
How to later	Tell the attendees how to report a bridge strike will be covered later in the course.	

Session 3: Vehicle height measurement

Session objectives

At the end of this session, the trainees will understand how to measure the overall travelling height of the vehicle and the requirements for displaying the measured height.

Key Points	Contents	Ref
3.1	DRIVER SURVEY – VEHICLE HEIGHT	
Drivers' survey	Point out that the delegates had earlier seen a slide *(Slide 12)* which referred to research carried out for the Bridge Strike Prevention Group. This research included a drivers' survey and one of the questions in the survey asked as to use of devices to measure the vehicle height.	💻 **19**
Nothing used	Point out that nearly ¾ of the sample did not use anything to measure the vehicle height.	
How?	Ask 'how were they able to display the correct travelling height in the cab'?	🗣Group discussion
Quote	Point out the quote. Ask the attendees what they consider to be a 'proper measuring stick', and whether they have one. A' proper measuring stick' is a telescopic measuring pole.	
Legal requirement	Remind the drivers that it is a legal requirement to know the height of the vehicle, and that therefore they must have a facility to measure the height of their vehicle.	

Key Points	Contents	Ref
3.2	OVERALL TRAVELLING HEIGHT	
Travelling height	Ask the attendees what they understand to be the overall travelling height. Tell them that it is the greatest height measured from ground level to the highest part of the vehicle, its load or equipment. If drawing a trailer, overall travelling height means the greatest height of the vehicle and trailer combination including its equipment and load.	Group discussion **20**
How?	Ask the drivers where they would measure the height?	Group discussion
Examples	Ask the drivers to give examples of the highest part of the vehicle or load? Point out that unless an empty flat bed trailer, the trailer is likely to be highest above the coupler. Ask drivers to identify loads which may be the highest part of the vehicle or load. Examples could include: • cars on a car transporter; • an excavator on a flat bed trailer; • containers; • contents of skip vehicles.	Group discussion
3.3	VEHICLE, LOAD AND EQUIPMENT HEIGHT	
Walk round check Use depot fixed measurement device or measurement pole	Remind drivers that they should familiarise themselves with the vehicle before starting the journey, and this includes measuring the height of the vehicle. Some depots have fixed measuring devices which are suitable to obtain the overall travelling height. If there is no depot fixed measuring device, the recommended method to check the overall travelling height is to use a measurement pole, and is essential if the load is not contained within a container, or curtain sided trailer.	

Key Points	Contents	Ref
Procedure to be followed	Tell the drivers that mistakes are more likely if height components are measured individually and added up Advise the attendees that the following procedure should be followed: • couple trailer and tractor units; • set trailer and unit air suspension systems for automatic ride height; • when the suspension has settled: – park on a level area; – check maximum travelling height.	💻 **21**
Check if load changes	Unless the vehicle is self levelling, the height should be checked whenever the load changes, positively or negatively.	
Use measuring pole	Tell attendees that unless the depot has a fixed measuring device, it is recommended to use a height measurement pole: • essential if load is not contained; • hook top of pole over highest part of vehicle, load or equipment.	
Trainer's note	*At this point it is a good idea to show a measuring pole and demonstrate the use of the equipment. If possible, attendees should be asked to measure heights of suitable vehicles in the locality as part of the practical training.*	
3.4	TRAILER COUPLER HEIGHT	
Headboard not legal requirement	Headboard markings are not a legal requirement. There is also no obligation in law to mark the coupler height on the tractor unit, although this is recommended good practice.	
Headboard dimension	The dimension on the headboard should be clearly shown in both imperial and metric dimensions.	💻 **22**

Key Points	Contents	Ref
Coupler heights vary Check measured height and headboard Transport Manager is to be informed of any discrepancy	Warn attendees that coupler heights can vary, and that they should not rely on the overall height shown on the headboard to determine maximum travelling height. Different types of units have different coupler heights, and thus if the measured height is different from that shown it implies that either the headboard marking is incorrect or that the tractor unit is not appropriate for the trailer. Emphasise that if there is a discrepancy between the measure height and that shown on the headboard, the Transport Manager is to be informed as it is essential that this height information is correct.	
3.5	RECORDING AND DISPLAYING THE HEIGHT	
Legal requirement Height not less than overall travelling height Check notice	Remind the drivers that it is a legal requirement to display the maximum travelling vehicle height on a notice in the driving cab, and that the notice must be located in a prominent place in the view of the driver. Remind drivers that the height shown in the notice must be not less than the overall travelling height of the vehicle, its load or equipment, or more than 150mm above that height. The notice is to be set or checked every journey.	💻 **23**

Session 4: Journey planning and routing

Session objectives

At the end of this session, the trainees will understand,

- methods and tools available for route planning to avoid low bridges;
- constraints applicable to use of atlases for route planning;
- benefits of LGV specific satellite navigation systems;
- possible problems with using systems that provide warnings of low bridges.

4.1	DRIVER SURVEY – ROUTE PLANNING	
Only 27% route plan allows for low bridges	Point out that the findings from the the drivers survey in the research carried out for the Bridge Strike Prevention Group for route planning including allowance for low bridges shows that only 27% of drivers normally took account of low bridges when planning routes, and that over half were unaware or did not have access to a copy of the Truckers' Atlas.	💻 **25**
4.2	ROUTE PLANNING	
4.2.1 Routes should eliminate risk Tolls should include low bridge information Use primary routes	Advise attendees that routes should be selected and planned in advance to eliminate the risk of bridge strikes utilising their knowledge of the vehicle height obtained by measurement. Tell the drivers to use route planning tools that include low bridge information, and that this will save them time and money in the long run. Tell the attendees that to minimise the risk of bridge strikes, primary routes should be used wherever possible. This may not avoid the necessity to pass under a low bridge but will nevertheless minimise the number of occasions that this is likely to occur.	💻 **26**

No turning points may cause severe congestion	The drivers should be advised that at some low bridges there are no turning points which will lead to severe congestion if on a busy road, and that at others the detours they have to take could add significant amounts of time to their journey – not just five minutes here and there, but sometimes a significant part of the hour.	
4.2.2 Truckers' Atlas May not be up to date	There are several sources of information that may provide advice as to locations and heights of low bridges: 1. Atlases such as the Truckers' Atlas which show locations of low bridges over roads and indicate the signed height. It should be borne in mind that this information has been collected by the publisher and may not always be up to date.	
Trainer's note	*If available a copy of the Truckers' Atlas should be passed around the class. Driver's should be asked to consider the limitations of atlases as these documents show low bridges on A and B roads only and are of very limited use as a route planning tool to minimise bridge strike risk if other classes of road are to be used.*	
LGV specific satellite navigation systems Systems with add on databases not suitable for route planning	2. LGV specific satellite navigation systems which include location of low bridges and the signed height. State that the next slide gives more guidance on use of these systems. Emphasis the differences between satellite navigation systems that will plan the route to avoid bridges and systems with the add-on databases that will lead the driver along any route and give a warning about the bridge. The latter are not suitable route planning systems – they are only bridge warning systems and using these alone can cost time and money as the driver may nevertheless have to retrace their route to avoid a low bridge.	

Highway (Road) Authorities Councils Plan in advance	3. Local Highway Authorities (Road Authorities in Scotland) - can also provide advice as to restrictions due to low bridges. Some authorities publish restrictions such as low bridges, narrow roads, load restrictions on their web sites. Advise the attendees that generally these authorities are the highways or roads departments of county councils or metropolitan borough councils. Remember: plan your journey in advance so that you can avoid the low bridges in the first place!	
4.3	SATELLITE NAVIGATION SYSTEMS	
Valid reason? Who uses a satellite navigation system Do not ignore traffic signs	Ask the drivers if following directions from a satellite navigation system is a valid reason for colliding with a bridge. Ask the drivers how many use a satellite navigation system. Ask those who say yes, whether the system includes bridge heights. Suggest that any who have a system without bridge heights that they should consider changing their system or at least obtain this data for their satellite navigation system remembering however that by adding a database only provides a warning system, not a route planning tool. Remind the drivers that although satellite navigations systems can be useful, they should not rely on such equipment totally. They are particularly useful to find the delivery point in a town or city not driven in previously, but nevertheless a driver should not ignore signs for low bridges if the satellite navigation equipment gives instructions to travel along a road with a low bridge. Use observation and common sense, whatever the guidance from the satellite navigation system.	Group discussion **27**

Use LGV specific satellite navigation systems Car systems not suitable Updates	Reinforce the message that only LGV specific satellite navigation systems which include location of low bridges and the signed height should be used for route planning. Off the shelf systems suitable for use in cars are not suitable as these will lead a driver down roads suitable for cars which may not due to width or low bridges not be suitable for an LGV. Drivers should also be reminded that updates to these only LGV specific satellite navigation systems should be obtained and uploaded as changes do occur in the signed heights. Reasons for these changes could include: • bridge reconstruction; • following a review of the signed heights – all highway and road authorities were recommended in 2011 to carry out a review of signed heights at low bridges by the UK Bridges Board; • resurfacing under the bridge.	

Session 5: Traffic signs and road markings

Session objectives

At the end of this session, the trainees will understand:

- why this section is included;
- the type of signs provided and their meaning at and in advance of flat soffit bridges;
- the type of signs provided and their meaning at and in advance of arch bridges.

Key Points	Contents	Ref
5.1	DRIVER SURVEY – ROAD TRAFFIC SIGNS	
Recent research included understanding of traffic signs	Tell the attendees that as new drivers they would have learnt the meaning of specific signs applicable to large goods vehicles, but that nevertheless the recent driver's survey in the research carried out for the Bridge Strike Prevention Group included ascertaining drivers understanding of traffic signs.	
Refresher	The research found that three quarters of drivers were unaware of the height of an unsigned bridge. Therefore this course includes a refresher of the meaning of traffic signs Ask the attendees the questions on the slide.	💻 **29**
Maximum vehicle height under an unsigned bridge	Tell them that the maximum height of a vehicle/load combination that can safely be taken under an unsigned bridge is 16'-3" (4.95m) high allowing for the minimum safety margin.	
Headroom below unsigned limit	Advise them that a bridge with headroom just below this limit will be signed at 16' 0'' (4.9m).	
Safety margin	Tell the attendees that this difference does not mean that there is a safety margin on all bridge heights of 6 inches, although they may think as such.	

Key Points	Contents	Ref
Not to rely on safety margin	Point out that the safety margin is variable, and due to measurement errors or subsequent road resurfacing there may be a reduced or no safety margin at some bridges, so drivers must not rely on it.	
Question	Ask the attendees to tell you the meaning of the two signs on the right of the slide.	
5.2	FLAT SOFFIT BRIDGES	
Answer	These show that vehicles higher than 14' 6'' or 4.4 metres are prohibited from passing under the bridge. This sign is likely to be erected on or immediately adjacent to a bridge with this limiting headroom. Tell them that in some cases roundel signs may be erected on posts in advance of a low bridge.	💻 **30**
Roundel prohibits	Wherever a roundel prohibition traffic sign is located, a vehicle higher than the dimension shown on the sign is not permitted to pass the sign. If a driver passes these signs in a vehicle higher than the dimension shown, a traffic offence has been committed.	
Don't pass if higher than the limit	Reinforce and emphasise the message - Don't pass if you exceed the signed height	
Black and yellow hazard markings	Inform attendees that these signs are likely to be used in conjunction with black and yellow hazard markings on the external face of the bridge. These should slope towards a 'V' in the centre of the road.	
Metric and imperial dimensions not equivalents	Point out that the imperial and metric dimensions are not equivalents, and that these are determined using different methods. State that it is possible for the metric dimension shown with an imperial dimension on different bridges to vary by 0.1 m. Similarly for the same metric dimension on different bridges, the imperial dimension may differ by 3''.	

Key Points	Contents	Ref
5.3	ADVANCE TRAFFIC SIGNS FLAT SOFFIT BRIDGES	
Advance signs showing prohibition Route to be followed if vehicle higher Destination before bridge	Signs may be erected in advance of the bridge showing that a height prohibition either a distance from the sign or at the location named. There are several forms. Point out that some indicate alternative routes avoiding the restriction, such routes should be followed if the vehicle being driven is higher than the restriction shown. Tell attendees that they may travel towards the restriction if their destination is before the bridge.	💻 **31**
5.4	ARCH BRIDGES	
Triangular signs warn Signs should not be passed if the vehicle is higher Three options	Tell the attendees that similar to the roundels triangular signs warn of a vehicle limit under a bridge. Reiterate that these signs should not be passed if their vehicle is higher than the dimension shown. Tell the drivers that should they strike a bridge after passing these signs, it is likely that they will be charged with 'driving without due care and attention' for which the possible fine is significantly greater than the traffic 'ticket' fine for passing a roundel. Tell attendees that there are three possible arrangements. A bridge may be signed with: 1. a sign showing imperial dimensions only; 2. a pair of signs showing both imperial and metric dimensions with the metric sign on adjacent to and on the right of an imperial sign; 3. a single sign showing both imperial and metric dimensions.	💻 **32**

Key Points	Contents	Ref
Dual dimension triangular warning sign	Advise attendees that the Regulations were amended in 2011 and the use of the dual dimension triangular sign was authorised. These new dual dimension triangular signs are larger so that the text is the same size as that on single dimension signs. It is likely that in time attendees will see more of these signs compared to the pair of imperial and metric signs or a single imperial sign.	
5.5	ARCHES BRIDGE AND ROAD MARKINGS	
Chord marking (goal posts) 3 metres apart 2nd set of 'goal posts' Headroom exceeds 16' 6''. Black and yellow hazard marking	At an arch the headroom varies across the road, and so the signs indicate the height over the centre part of the arch. This area is defined by white strip markings on the face of the bridge referred to as "goalposts" because of their shape, but the correct term is "chord markings". Point out the chord markings which look like 'goal posts. Advise the drivers that there will be markings on the road to correspond to the chord limits. Advise the delegates that a second set of "goalposts" may be provided to indicate the clearance at the kerb Advise the delegates that a set of chord markings may be provided at the kerb edge only, and none over the centre of the arch. In such cases the available headroom under the centre part of the arch exceeds 16' 6''. Indicate to the trainees the black and yellow hazard makings provided to improve visibility of the arch.	💻 **33**

Key Points	Contents	Ref
5.6	ADVANCE TRAFFIC SIGNS ARCH BRIDGES	
Triangular signs with the arch shape Dimension Advance triangular warning signs	Point out the triangular signs with the arch shape – these are only provided when the bridge is an arch. These signs will only show either the limit in imperial units or in metric units. A metric sign will not be used on its own but in conjunction with imperial dimensioned sign above it. An imperial sign may be used without a metric sign. Similar to those for mandatory roundels there are also several versions of advance triangular warning signs that may be used for an arch. These could indicate an alternative route, distance to the restriction or the location of the restriction.	💻 **34**

BREAK

It is recommended that this is a suitable opportunity for the delegates to take personal needs break.

Session 6: On the road

Session objectives

At the end of this session, the trainees will understand:

- requirements for checks before commencing a journey;
- the necessity to obey traffic signs;
- the action to be taken if diverted of the planned route;
- potential problems with road traffic signs;
- how to pass under an arch safely.

Key Points	Contents	Ref
6.1	STARTING YOUR JOURNEY	
Vehicle height displayed in cab Traffic offence	Remind attendees that they should be ready to start their journey when all checks have been completed, the vehicle height has been measured and displayed in the cab, and the route planned avoiding bridges lower than the overall travelling height. Remind the drivers that they commit an offence if the overall travelling height of their vehicle is over 3 metres and the correct maximum height is not displayed in the cab.	💻 **37**
Trainer's note	*This may be an opportunity to have a group discussion to remind the attendees as to what should be included in a walk round check.*	🗣Group discussion
6.2	ON THE ROAD	
Follow planned route Obey all traffic signs Reminder for satellite navigation systems	When on route, it is essential that the planned route is followed. Tell attendees that they must obey all traffic signs on the route. Drivers should stop if in doubt, and if not sure that it is safe take another route. Remind attendees to use satellite navigation systems with bridge height information, and to use it with care, not to follow it blindly but take heed of traffic signs.	💻 **38**

Key Points	Contents	Ref
Avoid short cuts	Apparent short cuts shown, whether indicated on satellite navigation systems or not, may not be as friendly as first appears, and are likely not to be suitable for a large goods vehicle. It is possible that the driver who chooses a short cut often finds a low bridge, narrow road, sharp bend or parked cars which prevent further movement forward. Turning back in such cases is not a simple manoeuvre.	
Diverted off route	There is a possibility that a driver may be diverted from the planned route (traffic jams, road traffic collisions or other incidents). In such cases there is a need to plan an alternative route, and if necessary the Transport Manager should be consulted for advice.	
Take route planning tools	Although a driver may set off with a plan, if diverted having a route planning facility (map, satellite navigation system etc) available in the cab may save them time and prevent a bridge strike.	
Endorseable offence to use a hand held mobile phone	Remind the drivers that it is an endorseable offence to use a hand held mobile phone or similar device whist driving.	
If diverted be vigilant	Tell the attendees that police will not be concerned whether or not the road on which a driver may be diverted has a low bridge or not. There concern is with the immediate cause of the diversion. Accordingly if diverted a driver should be vigilant and look out for traffic signs indicating a low bridge ahead, and if necessary change the route again.	

Key Points	Contents	Ref
Result of police diversion	Tell the attendees that when a fire occurred in Manchester adjacent to a motorway, the police closed the motorway because smoke was reducing visibility, and traffic was diverted off the motorway at the nearest junctions. As a result of this there were 5 bridge strikes reported at the same bridge in two hours. Network Rail positioned a member of staff at the bridge to endeavour to halt vehicles that appeared higher than the bridge to prevent further strikes occurring. All of the drivers involved in the strikes considered incorrectly that as they had been diverted by the police the diversion was suitable for their vehicle.	
6.3	PROBLEMS WITH TRAFFIC SIGNS	
Obscured by vegetation, dirty, damaged or missing Only sign at bridge Do not try to creep under Report defective signs	The drivers should be made aware that although they have been given information earlier in the course of the traffic signs applicable to low bridges, it is possible that these signs could be obscured by vegetation or are dirty, damaged or missing. It is possible that the only sign seen by the driver is one on or at a low bridge. This may be because the driver has not observed a sign in advance of the bridge due to it condition, sign clutter or distractions in the environment. It may also be because, no approach signs have been provided. Tell attendees that in such cases they should not try to creep under the bridge as they will collide with it, but to try to turn the vehicle and take another route. Seek assistance if necessary. Tell attendees that if they see a sign which is not able to be read or a sign is missing that they should report the condition of the sign to the local Highway/Road Authority.	💻 **39**

Key Points	Contents	Ref
White lines in centre of arch	There are several examples where continuous white lines pass under an arch. In such cases the driver of a high vehicle is caught between a rock and a hard place. If the driver does not cross the white line, the bridge will be struck. If the white line is crossed, not only is this a traffic offence, but there is a risk of being involved in a collision with an approaching vehicle. In such cases, seek assistance including that of the police.	
6.4	ARCH BRIDGES	
Pass under 'goal posts' Move to centre of road Slow down, warn of presence If in doubt Passing under the bridge Do not assume priority	At arch bridges drivers of high vehicles must ensure their vehicle passes between the goal posts. Tell the drivers that to pass safely under an arch, they will have to move towards the centre of the road. Signs and road makings indicating where this manoeuvre is to be carried out should be provided. Tell the drivers to slow down as they approach the bridge and only move to the centre of the road when it is safe to do so. If necessary sound their horn or use dipped headlights to warn of their presence. Tell the drivers that they should have a good view forward to allow visibility of approaching traffic. If in doubt WAIT! Advise the drivers that only when and only when the road ahead is clear and safe should they proceed. They should allow enough room to gain their road position, pass below the bridge, and then regain the correct side of the road without causing other vehicles to swerve, brake or otherwise alter course. Emphasise to that drivers should never force their way through or assume that the height or size of their vehicle gives them priority.	💻 **40**

Key Points	Contents	Ref
Do not swerve to avoid approaching vehicle	Warn the drivers that if an approaching car or other vehicle does not slow down to let them through as that driver has not seen their vehicle in the middle of the road, they should not swerve to avoid the other vehicle. They are likely to hit the arch soffit and damage their vehicle. In such circumstances they should slow down and give warnings to the approaching vehicle driver. Come to a stop if necessary.	
Wide loads	Drivers of vehicles with wide loads over 3m (9´ 10˝) need to take extra care at arch bridges as the maximum height available will be less than the signed limit.	

Session 7: Reporting a bridge strike

Session objectives

At the end of this session, the trainees will understand:

- how to report a bridge strike;
- the information to be provided when reporting a bridge strike;
- the action taken by the rail authority when responding to a reported bridge strike.

Key Points	Contents	Ref
7.1	DRIVER SURVEY – REPORTING A BRIDGE STRIKE AT A RAILWAY BRIDGE	
Drivers' survey	The drivers' survey included in the research for the Bridge Strike Prevention Group referred to earlier included a question which asked what action would the respondents take if involved in a bridge strike.	💻 **42**
One third correct	Point out that only just over one third would take the correct action and inform the Rail Authority.	
Reason to inform Rail Authority	The Rail Authority needs to take action to maintain the safety of the railway. Inform attendees that this applies even if it appears that: • no damage has been caused to the bridge; • only a collision protection beam has been struck; • no one has been hurt; • trains have passed over the bridge since the bridge was struck.	
Inform Rail Authority before company	Tell the attendees that, although they must obey instructions to inform their company of any incidents such as bridge strikes, this must not be done before the Rail Authority is informed. Any delay may affect the safety of the railway.	

Key Points	Contents	Ref
7.2	REPORTING A BRIDGE STRIKE AT A RAILWAY BRIDGE	
Trainer's note	*Take the attendees though the 4 steps to report a bridge strike.*	
7.2.1 Use number on identification plate If no plate, dial 999	Point out that the telephone number on the photograph shown will apply only for the bridges in Scotland. At any other bridge the number to be used is that on the plate at the bridge. If no plate is present or it is vandalised such that the number can not be read, the police should be contacted using 999. Ask the police to inform the Rail Authority.	💻 **43**
7.2.2 Report strike to Rail Authority immediately Before returning to depot 999 Bridge strikes must be reported Tell employer Don't move vehicle	**Step 1** Report the bridge strike to the Rail Authority immediately so that trains may be stopped from crossing the bridge. Telephone the number shown on the identification plate on the bridge. Remind the attendees that they should not wait until they return to the depot before reporting the bridge strike. **Step 2** Advise the police using the 999 system. Remind the attendees that any road traffic collision that causes damage to a 3rd party must be reported. Each bridge strike causes damage to a bridge, and must therefore be reported. **Step 3** Report the bridge strike to your employer. **Step 4** Keep the public away and do not move your vehicle.	

Key Points	Contents	Ref
7.2.3 Railway over road or road over railway No plate, not railway bridge?	Advise attendees that these actions should be followed for any strike at a bridge carrying the railway over a road, or a bridge carrying a road over the railway. Point out that if there is no plate at the bridge - the bridge involved may not be not a railway bridge, for example if it is a footbridge over a road or a bridge carrying a canal, then the police are to be called using 999.	
7.3	INFORMATION TO BE PROVIDED	
Trainer's note	*Before showing slide 44, it is suggested that the delegates are asked to state what information the Rail Authority will need.*	Group discussion
Reporter's contact details Bridge identification Bridge names Identification plate When trains are stopped	The contact details of the person reporting the strike are required so that they may be called back if necessary. The bridge identification is generally in the form ABC/123 although there are variations to this according to the bridge location. Bridge names may be a road name different from that used today. The name used by the Railway Authority will be that in use when the railway was constructed. The bridge identification, name and location should be as shown on the bridge identification plate. If the vehicle is wedged and persons are or may be trapped the Rail Authority will stop train movements across the bridge until it is confirmed that nobody is trapped. Similarly train movements will be stopped if the vehicle is carrying dangerous goods as there may be a risk of fire.	**44**

Key Points	Contents	Ref
7.4	ACTION TAKEN BY THE RAIL AUTHORITY	
Why inform Rail Authority	State that the information shown on slide 45 is to help the attendees to understand why it is necessary to inform the Rail Authority	💻 **45**
Action by Signaller	Network Rail Control office will tell the Signaller who controls train movements over the bridge of the reported bridge strike. The Signaller will take action to stop train services until the bridge is examined by a bridge examiner, or alternatively may in accordance with an instruction for the bridge authorise train movements over the bridge at a reduced speed or normal speed.	
Why trains are stopped	Trains are stopped when it is considered likely that the bridge could be significantly damaged in a bridge strike such that the capability of the bridge to carry trains safely may be affected. In such cases there could be a risk of a derailment.	
Examination of the bridge	Arrangements will be made for the bridge to be examined, and if the damage to the bridge caused by the strike has not affected the capability of the bridge to carry trains, train movements over the bridge will be restored.	
Police and other emergency services informed	The police, other emergency services and Highway/Road Authority will also be informed. The Highway/Road Authority will need to take action if the traffic signs on the bridge have been damaged.	

Session 8: Consequences of a bridge strike

Session objectives

At the end of this session, the trainees will understand the possible consequences of a bridge strike on:

- the railway;
- the Highway or Road Authority;
- other road users;
- the vehicle operator;
- the driver.

Key Points	Contents	Ref
8.1	DANGEROUS AND EXPENSIVE	
Dangerous and expensive	State that bridge strikes can be dangerous and will be expensive.	💻 **47**
Safety affected	Bridge strikes affect the safety of: • trains and the travelling public; • vehicle drivers; • members of the public.	
	Emphasise that bridge strikes not only will cause damage to the vehicle involved but also have the potential to cause a train derailment.	
Loss of life	Any train derailment has the potential to cause catastrophic loss of life.	
Track distortion	There have been several strikes in which the track has moved or significant damage has been caused to the bridge.	
Derailment avoided	Point out in the upper image, the distorted track and the bridge debris on the track. A derailment as a result of this strike was only avoided by the driver of a train on the other line (on right approaching the camera) using his cab radio to advise the driver of a train on the other line approaching the bridge so that the train could stop before the bridge.	

Key Points	Contents	Ref
Costs Driver and members of public at risk Rail Authorities recover costs	Emphasis that in addition to the costs to the Rail Authority, bridge strikes will result in costs for: • vehicle owners • vehicle drivers • the community The vehicle driver is at risk, as also are members of the public in vehicles travelling in the opposite direction, or in some cases following the vehicle that strikes the bridge. Rail Authorities will seek to recover their costs from the vehicle owner. A driver involved in a strike will however also find the strike expensive. The local community will also suffer a loss whether it be due to congestion on the road network, loss of the load or injuries of the driver and other road users.	
8.2	SKEW BRIDGES	
Review risk Overturns if travelling at speed Driver and other drivers at risk of serious injury Road closed for vehicle recovery	We mentioned earlier that skew bridges can be a particular risk to the driver. Lorries involved in a bridge strike at a skew bridge if travelling at speed could overturn. Point out that the angle of the skew does not have to be particularly large to turn a vehicle over. If the vehicle overturns on to the opposite carriageway, both the driver and occupants of approaching vehicles are at risk of serious injury. If the skew is in the other direction the vehicle may hit the bridge abutment and the driver could be injured by the impact. All such bridge strikes result in the road being closed for recovery of the vehicle and its load. Train services may continue as the bridge will not be significantly affected, but the road is likely to be closed for several hours whilst the driver is rescued from the driving cab, and for recovery of the vehicle and the load.	💻 **48**

Key Points	Contents	Ref
8.3	BRIDGES WITH VARIABLE HEADROOM	
Diminishing headroom Suspension collapsed Cracks in arch barrel Strayed outside road markings	Slide 49 shows an example of an incident in which a vehicle has passed under the bridge but which because the road is on a hill, the headroom decreases along the road, and the lorry has struck the underside of the arch. In this particular case the lorry with its container were travelling at a significant speed and the when it struck the underside of the arch, it caused the suspension of the lorry to collapse and for the under frame to gouge the road surface. The momentum of the vehicle also caused significant cracks to the arch barrel and walls which had to be repaired before train services could be restored. This strike also shows the consequence of straying outside the lines marked on the road indicating the extent of the signed limit on vehicle height. In this particular case the vehicle should have been able to pass safely under the bridge if it had remained between these lines. It however was driven about a foot outside the marked limit and struck the edge of the arch. It became so well wedged, two recovery vehicles were needed to pull it back from under the arch.	💻 **49**
8.4	WEDGED VEHICLES	
Previous strike Bridge not damaged	Tell the attendees that the previous strike under the arch was one consequence of a vehicle becoming wedged under a bridge. The strikes shown on slide 50 are further examples of what can happen. In the three strikes, the bridge was not severely damaged, but the consequences for the vehicle and local community were significant with the roads closed for a considerable part of the day to allow recovery of the wedged vehicles.	💻 **50**

Key Points	Contents	Ref
High level equipment recovery vehicle gouged road Police require vehicle to be cut up Following satellite navigation instructions Let air from tyres	In the strike involving the lorry with the raised high level equipment, the bridge was struck so hard that when the recovery vehicle attempted to pull the lorry back out from under the bridge, the recovery lorry moved towards the wedged lorry, and the supporting feet of the vehicle dug into and grooved the road surface. Two recovery vehicles were needed to extract the wedged lorry from under the bridge. If the road is normally busy, it is not unknown for the police to arrange for the offending vehicle to be cut up to enable it to be moved and the road opened. In the case of the waste skip, it is the vehicle owners who are taking this drastic action. The photograph on the left shows a wedged curtain sided lorry resulting from the driver slavishly following instructions from a satellite navigation system inappropriate for use by large goods vehicles, and not observing the traffic signs on and in advance of the bridge. The road is narrow and the height restriction is bridge is clearly signed. One method to release wedged vehicles is to let out air from the tyres, but this will not always work with a curtain sided lorry and the frame can distort on impact and lowering of the wheels only lessens the distortion.	
8.5	CONSEQUENCES ON THE RAILWAY	
Safety of railway Potential for derailment	Reiterate that all bridge strikes at railway bridges put the safety of the train crew and travelling public at risk. Remind the attendees that although there has been no derailment since 1978, there is always the potentially for a strike to cause a derailment with consequential catastrophic loss of life. State that the next two slides are examples of bridge strikes where a derailment was avoided by luck.	💻 **51**

Key Points	Contents	Ref
Delay to railway and road	Reiterate that a strike will nevertheless cause delay to the railway until the bridge is examined and normal services can be resumed. It can also cause delay and congestion to the road network particularly if the vehicle overturns or is wedged under the bridge.	
Bridge will be damaged	The bridge involved in a strike will suffer damage. The type of and severity of the damage will depend many factors including the form of construction and robustness of the bridge, the vehicle type and speed at impact.	
Bridge to be examined	As damage can be caused, the Rail Authority will examine a bridge following every reported bridge strike.	
8.6	POTENTIAL FOR DERAILMENT	
Unreported strike	We have seen earlier the consequences from track being distorted due to a bridge strike with a derailment resulting. This is an example of an unreported strike which could have had similar consequences but due to the particular circumstances and location, no derailment occurred.	💻 **52**
Freight line	The line is a freight only line near Buxton, Derbyshire, and at that time there was one freight train per week.	
Track inspection discovered bridge had moved	Before the train runs, the track is inspected. The track inspectors discovered the track misalignment in the photograph on the left. The bridge had been struck and moved about 9 inches at one end, and 6 inches at the other.	
Robust structure	Although now carrying a single line, this bridge was originally constructed to carry two lines with ballasted track and is a robust structure. A 500 T was needed to lift the bridge back to its correct position.	

Key Points	Contents	Ref
Consequence for passenger trains?	Point out that if a similar strike had occurred on a bridge carrying passenger trains that the consequences could have been a derailment with associated loss of life and injuries.	
8.7	FENNY COMPTON 15TH FEBRUARY 2011	
Bridge dislodged on vehicle Redundant track Single lane road Crane arranged to remove bridge Road closed nearly 24 hours	State that this bridge strike is another example of a strike which due to the particular circumstance loss of life and serious injuries were avoided. The strike occurred at a bridge which was carrying a redundant track. The bridge was dislodged by the load (an access platform) onto the vehicle. That there were no serious injuries was due to the: • track on the bridge being redundant; • road was a single lane and no vehicle was passing in the opposite direction. Explain that a road crane was arranged to clear the bridge debris. The damaged bridge was removed 14 hours after the strike. Other debris was removed and fencing erected to make the redundant siding safe. The strike also caused significant delay and disruption to the local community as the road was closed by the police and it was not reopened for nearly 24 hours.	💻 **53**
8.8	BRIDGES OVER THE RAILWAY	
Oxshott bridge strike by concrete mixer	Tell drivers that the examples seen up to now have been of bridge strikes at bridges over roads. Ask the attendees if they remember the incident when a concrete mixer went through a masonry parapet and landed on to a train at Oxshott.	💻 **54**

Key Points	Contents	Ref
Report strike	This event caused serious injury to a train passenger and the lorry driver. Tell attendees that if they strike a parapet to a bridge over the railway, that they must report the strike so that action may be taken to maintain the safety of the railway.	
Trainer's note	*Not as many road over rail bridges have been provided with identification plates giving a telephone number to report a strike to the Railway Authority as have rail over road bridges. Accordingly 999 may need to be used.*	
Masonry parapet unsafe	If the parapet is constructed of brickwork or stone it is likely to be damaged by the strike and if not dislodged it may nevertheless be made unsafe by the large goods vehicle hitting the parapet. It may be necessary to close the road or erect a temporary parapet to enable the parapet to be repaired.	
8.9	BRIDGE AT HOWDEN, HUMBERSIDE	
Concrete parapets demolished Haul route 5 day line closure Costs recovered	This is an example of a strike at a road bridge over the railway. Explain that these two articulated lorries collided over a road too narrow for both of them to pass. The collision resulted in the bridge parapets – point out that these were reinforced concrete parapets – being demolished and falling ion to the tracks below. The vehicles were left in a precarious position, and the only method to recover the vehicles to enable the parapets to be reconstructed and both road and railway to be reopened was to construct a haul route along the track from the nearest access point. As a result the line was closed for 5 days and Network Rail incurred significant costs as on the slide. Network Rail sought and obtained the costs shown from the vehicle insurers.	💻 **55**

Key Points	Contents	Ref
8.10	CONSEQUENCES ON OTHER ROAD USERS	
Death and serious injury Driver at risk Other drivers Road closure	Bridge strikes have resulted in the death and serious injury of the vehicle driver and also other road users. A driver of a large goods vehicle is at risk if the vehicle overturns, such as at a skew bridge. Drivers of other vehicles have been crushed under large goods vehicles, or their vehicle has been hit by loads falling of the back of the lorry. Whenever the vehicle involved overturns or the load is spilt on the road, the police will close the road until the vehicle and load have been recovered. This closure will cause congestion and disruption to the local community, and the costs of such recovery and replacement load will be borne by the vehicle operator.	💻 **56**
8.11	COSTS TO VEHICLE OPERATOR	
	State that a vehicle operator will be liable for all the following costs arising from a bridge strike:	
List of costs (Part 1)	• bridge examination; • repair of bridge damage; • train delays which depending on location and length of disruption could exceed all other costs; • inspection of road infrastructure; • repair of road surfacing and/ or replacement of any damaged road signs; • vehicle recovery; • damage to their vehicle and other road users' vehicles;	💻 **57**

Key Points	Contents	Ref
List of costs (Part 2)	• business loss due to: – the vehicle and driver being off the road; – loss of operator's licence; • increased insurance premiums; • direct compensation and personal injury claims; • legal fees and other associated costs.	
Railway Authorities costs	Railway Authorities will seek recompense for costs of examination, repair of any damage and also any delays to train services.	
Examination costs	Examination costs are of the order of £500 per strike. The cost of repair of damage can however vary from a small amount to the cost of reconstruction of a bridge.	
Delay costs	Point out that depending on the location and severity of the strike, delay costs may far exceed all other costs.	
Trainer's note	*Slide 59 illustrates how delay costs can far exceed all other costs.*	
Road costs	Highway and Road Authorities may similarly claim for their costs for inspection and repair of road signs, surfacing etc.	
8.12	DAMAGED VEHICLE AND LOAD	
Train services restored, road closed	State that the photographs in slide 58 show the extent of possible damage to vehicles and their loads. Curtain sided vehicles are at particular risk of damage and loss of loads. In all these cases the train services were able to be restored after the bridge had been examined, but the road was closed for a significant period to recover both the load and the errant vehicle.	💻 **58**
Costs	Remind the attendees that the cost of the vehicle and load recovery is borne by the vehicle owner.	

Key Points	Contents	Ref
8.13	LEVEL CROSSING WITH OVERHEAD LINES	
8.13.1 Other situations Level crossings Radio aerial to be taken down Restricted headroom	We spoke earlier about other situations where a driver should be aware of the height of the vehicle. Remind drivers that one of the locations where the height of the vehicle is required to be known is when passing under electrified overhead lines on a level crossing. Emphasise that when crossing a level crossing with electrified overhead lines that any radio aerials should be taken down to avoid the electricity running to earth through their vehicle. Remind drivers that some crossings may be signed similarly to a low bridge with the headroom under the electrified overhead lines signed at 16’ 6’’ or less.	💻 **59**
8.13.2 Bathey Lane Traffic signs Damage cost small	Bathley Lane crossing is about 3 miles north of Newark North Gate station on the line from London Kings Cross to York, Newcastle and Edinburgh. Traffic signs in advance of the level crossing show the safe height to be 13’ 9’’ (4.1m)load gauge and there are warning bells hung over the approach road. In the incident, the damage caused to the overhead electrified line was small but the delay costs due to the 6 hour unplanned closure of the East Coast Main Line was over £1million.	
8.13.3 Network Rail sought to recover costs including train delay costs	Network Rail sought to recover damages including those for train delay in conjunction with damages from the strike at the overline bridge at Howden, Humberside (Refer to 8.9). The same motor insurer was involved.	

Key Points	Contents	Ref
High Court Court of Appeal judgement	Liability for the damage was not in dispute, but the recoverability of train delay costs was disputed to both cases. Both cases were heard by the High Court 2010 which found in favour of Network Rail but granted the defendants leave to appeal. In the Court of Appeal judgment in May 2011 each of the three Court of Appeal Judges dismissed the appeal and refused leave to appeal to the Supreme Court. This Court of Appeal judgment binding on all lower courts in England & Wales.	
8.13.4 Recovery of delay costs Increased insurance premiums	Network Rail is thus able to and will seek to recover damages for delay as well as the other costs for examination and bridge damage resulting from a bridge strike. As motor insurers have been confirmed as liable for train delay costs, a further consequence is that this case will impact on insurance premiums in a hardening insurance market leading to increased insurance premiums, and the possibility that cover limits may be insufficient.	
8.14	CONSEQUENCES ON THE DRIVER	
Reminder drivers at risk Dismissal risk Fines, endorsement or imprisonment	We have already said that drivers are at significant risk of being killed or seriously injured particularly at bridges which are at a skew angle across the road. Depending on the company's policy drivers may also be at risk of dismissal. Drivers will also be liable for any fines levied by the courts as a result of the strike, and for a strike with serious consequences, imprisonment or loss of the driver's licence is a real possibility. As a minimum the driver's licence will be endorsed with penalty points.	💻 **60**

Key Points	Contents	Ref
Penalty points	Penalty points may be imposed on a driver for failure to obey roads traffic sign although when a bridge is struck, this is likely to not be the only offence.	
Possible offences	Police charge drivers with approximately 67% of offences. There are a number of offences with which a driver who strikes a bridge could be charged, typically: • manslaughter by gross negligence; • dangerous driving; • careless driving; • impairment; • construction and use etc.	
Evidence considered	A Prosecutor would consider the range and the proportionality of the offence in deciding the offence with which a driver would be charged. In deciding the offences to charge a driver a Prosecutor would be interested in: • presence or absence in cab height display and what the indicator read; • presence, absence and functioning of in cab of lifting arm warning alarm; • vehicle speed; • background and knowledge of driver obtained by police. It is also not unknown for the company involved in a bridge strike to be visited by the Police Commercial Vehicle Unit.	
Personal car insurance	A driver involved in a bridge strike is also required to inform the insurance company who provides insurance for the driver's car. Thus there is a risk that any no claims bonus will be lost, and that the driver's insurance premium will increase.	

Guidance for Professional Drivers

At the end of this course, each trainee should be provided with a copy of the guide for professional drivers.

As the guides are handed out, tell the recipients that the guide gives guidance to professional drivers so that bridge strikes can be prevented and to provide advice on the risks and consequences of bridge strikes. It summarises what they have been informed on the course.

The drivers should be reminded that their responsibilities are to:

- know their vehicle height and width
- know their route
- obey traffic signs

Copies of the guide are available from your company in hard copy or may be downloaded from www.networkrail.co.uk/bridgestrikes

Records

Progress Record

This sheet should be copied at the beginning of each course and ticked by the trainer as it progresses. This forms a record that confirms every Session has been covered, and also helps in the event that a change of trainer is required elsewhere in mid course.

Name of Trainer: Date:

Session	Description	Completed	Trainer
1	Introduction and background to the course		
2	The Law		
3	Vehicle height measurement		
4	Journey planning and routing		
5	Traffic signs and road markings		
6	On the road		
7	Reporting a bridge strike		
8	Consequences of a bridge strike		

Notes:

Attendance Record

Date ……

Delegate Name	Company

Notes