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It is the absolute obligation of the holder of the Certificate of Professional Competence to be familiar with and comply with all aspects of the law relating to the Certificate of Professional Competence and in particular the obligation to obtain and maintain the level of training and instruction required for the Certificate of Professional Competence.

The training process has been designed and developed by the Road Safety Authority for the express purpose of facilitating the training of all classes of drivers required to acquire and hold the Certificate of Professional Competence.

The Road Safety Authority does not accept any obligation and/or responsibility arising out of the use of and/or the application of the materials, whether directly and/or indirectly, and the information used in the training of drivers is not intended to replace knowledge of the laws and regulations relating to the Certificate of Professional Competence.

The contents of this manual are expressed in general terms and are not intended to be a detailed analysis of the law. It is based on the assumption that readers are familiar with many of the technical terms used when referring to HGV and PSV vehicles. This guide does not, and is not intended to provide legal advice or to represent a legal interpretation of the law.

It is the primary obligation of the driver to know the laws and regulations relating to their profession.

RSA Head Office

Údarás Um Shábháilteacht Ar Bhóithre
Road Safety Authority

Páirc Ghnó Ghleann na Muaidhe, Cnoc an tSabhaircín, Bóthar Bhaile Átha Cliath, Béal an Átha, Co. Mhaigh Eo.
Moy Valley Business Park, Primrose Hill, Dublin Road, Ballina, Co. Mayo.

email: info@rsa.ie website: www.rsa.ie

For information relating to the tachograph, drivers hours, vehicle standards and CVRT contact the Road Safety Authority, Clonfert House, Bride Street, Loughrea, Co. Galway.
Email: enforcement@rsa.ie

FOREWORD FROM THE RSA DRIVER EDUCATION SECTION

This Driver Certificate of Professional Competence (Driver CPC) syllabus has been developed by the RSA with the assistance of the transport industry and experienced training organisations.

The information contained in this manual (No. 5.3. The Professional Truck Driver) together with the information provided in Manuals 1, 2, 3, 4 and 6 combines to become an excellent resource for use by professional drivers. Drivers are encouraged to keep all of the manuals together in a safe place and to refer to them from time to time whenever they want some clarification or guidance on how to approach a particular issue.

The next few pages set out what the programme has to offer those attending, whether you are already working as a professional truck or bus driver, or you are new to the profession and want to become a qualified driver with a view to working in the transport industry. By following the guidance provided and adhering to 'best practice' outlined in this manual, you will significantly reduce the likelihood of being involved in a serious incident. These incidents could ultimately involve financial penalties, loss of business and a risk of being involved in a serious injury or fatal collision.

The course is broken down into modules covering a wide range of areas outlined in the Driver CPC EU Directive and Irish National legislation, which will be of interest to all professional bus and truck drivers and all good employers. Some areas may be new to you, in other parts it may simply be a case of refreshing your skills or knowledge – in either case we are certain that you will find the programme challenging, yet enjoyable.

Driver CPC covers key aspects such as the Health and Safety of professional drivers as well as the rational use of fuel and important road safety related matters. As such you will possibly have encountered some of these topics before. However, these topics have such a significant impact on the safe movement of passengers and goods that key messages are repeated and/or reinforced.

The Board of the RSA considers Driver CPC to be a key step in our common aim to reduce death and serious injuries on our roads. There will also be benefits to the transport industry through improved safety, enhanced eco-driving, lower insurance costs and a highly trained resource of professional drivers. By participating in Driver CPC training, you will be developing and refreshing the knowledge and skills required for your profession. It will help you to not only keep on top of your profession but also to remain a safe and socially responsible driver.

By taking this training at an RSA approved training centre you can be confident that the provider has met all the quality assurance targets required of an RSA registered training provider and is committed to helping you achieve your own personal objectives from this course.

Please be prepared to ask questions of your trainer and the group and to share your own experiences. By actively joining in with each training session you will be initiating and contributing to debate among your group of peers. Sharing your experiences and listening to others will help to benefit everyone and may in itself make an important contribution to Irish road safety.

Once you have completed any of the training you will be able to view your Driver CPC training record by logging onto the RSA website and visiting 'MY CPC' (see the guide at the back of this manual).

From there you can print off your record and if required, you can provide a copy to your employer to prove your status as a professional driver or use it to support a job application when applying for work as a professional truck or bus driver.

May we take this opportunity to wish you well with the course and we look forward to your contribution in the ever-increasing demand for quality drivers.

Yours sincerely,

The Driver Education Section

IMPORTANT

The RSA endeavours to provide you with the latest information but please be aware that Road Traffic and other applicable legislation is continuously changing. As a consequence the information contained in this manual or provided via any of the related PowerPoint presentations is also subject to change. The RSA will continue to add up-dates or refresh the material from time to time but can in no way guarantee that this version contains the very latest information available. If you have any doubts about the validity of information contained within this manual or any of the presentation slides, please seek clarification from either your trainer, your employer or transport manager (as appropriate).

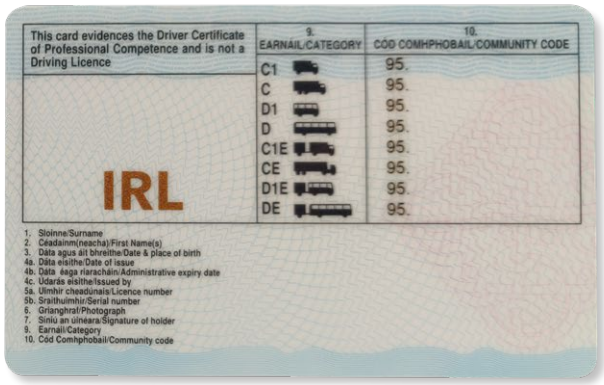
If necessary you may also wish to obtain independent legal opinion.

To ensure you have the latest version of this module, check our website for details, just click on the Driver CPC section of www.rsa.ie.

While every effort is made to ensure that the material in this manual is accurate at the time of going to press, it remains the responsibility of drivers to ensure they are informed of and familiar with all regulations, conditions and requirements relating to all aspects of their profession.

Sample CPC Card

Once you have completed your Initial Driver CPC training you can apply for your Drivers Qualification Card.



When driving a truck or a bus in a professional capacity, a driver must carry a valid

- CPC card for the category
- Driving licence for the category
- Tachograph card or tachograph charts

On the CPC card, the code number '95' is inserted opposite the categories of licence for which CPC training has been completed.

Some EU countries do not issue Driver CPC cards. Instead, they insert the CPC code number '95' on the driving licence opposite the categories for which CPC training has been completed.

INTRODUCTION

The following information is provided for persons who wish to become professional truck or bus drivers, and for those who are already qualified in the profession. It outlines the steps to be taken in order to obtain Initial Qualification and to maintain their CPC entitlement (Periodic Qualification).

Welcome to the Road Safety Authority's Approved Training Programme for the Drivers Certificate of Professional Competence. (CPC).

Driver CPC is a Certificate of Professional Competence issued to drivers who are entitled to hold one. It was first introduced across the EU in 2008 for professional bus drivers and 2009 for professional truck drivers.

The EU requires its member states to provide better training for professional drivers. Many professional drivers in the EU are working without the benefit of training or the opportunity to regularly refresh their skills. As a result, the EU introduced Directive 2003/59/EC, as amended by Directive (EU) 2018/645, which makes it compulsory for member states to have a driver CPC programme in place for professional drivers.

In Ireland, this is given effect by S. I. (Statutory Instrument) 359 of 2008.

This course fulfils part of the requirements for CPC driver training under Directive 2003/59/EC.

For CPC purposes, a professional driver is someone who drives a truck or a bus, whether as self-employed, for a salary, on own account or for hire or reward, and who holds one or more of the following categories of driving licence; C1, C1E, C, CE, (trucks) or D1, D1E, D, DE. (buses). A driver who does not wish to drive a truck or a bus in a professional capacity (and therefore does not need a CPC qualification) must be at least 21 years of age (trucks) and 24 years of age (buses) before they can obtain the relevant licence.

Drivers of vehicles which can be driven by the holder of a Category B licence – cars and light commercial vehicles with a MAM (Maximum Authorised Mass) not exceeding 3,500 kg., and vehicles with passenger accommodation for not more than 8 persons - are not required to undergo CPC training. (The MAM of category B vehicles which are powered by batteries or gas will increase to 4,250 kg from 23 May 2020 to allow solely for the increased weight of those propulsion systems).

IMPORTANT – A Driver CPC Qualification Card is not a driving licence. In order to drive a truck or bus you must:

- be the holder of a current valid driving licence for the category of vehicle you are driving, and
- be the holder of a current valid driver's CPC card for the category of vehicle you are driving professionally.

Once you are fully CPC qualified you can apply for and receive your Drivers CPC card. Both your driving licence and Drivers CPC card must be carried by you whenever you are driving your truck or bus professionally. You must also carry a digital tachograph card if your vehicle is fitted with a digital tachograph. The driver of an eligible vehicle must insert their tachograph card/chart into the vehicle tachograph head/unit and operate it as legislation requires.

Key aims

The key aims of the Driver CPC programme are

- Ensuring all professional bus and truck drivers have high standards of driving and of road safety practices and that those standards are maintained throughout their driving careers
- Ensuring high standards of their personal health and safety
- Ensuring high standards in relation to fuel efficiency and reduced pollution
- Creating a common standard for the training and testing of drivers throughout the EU
- Reducing fatalities and serious injuries on the roads. The RSA's target is for Ireland to have one of the lowest casualty rates in Europe.

The Driver CPC

Professional drivers fall into two categories from a Driver CPC perspective:

- those who were already working as professional drivers when the scheme was put in place, and
- those who are new to the profession.

'Acquired rights' to Driver CPC

Acquired rights to a Drivers CPC qualification applies to those drivers who were already working as professional drivers when the scheme was put in place. If you got your bus licence on or before the 9 September 2008, or your truck licence on or before 9 September 2009, you are automatically entitled to a Driver CPC qualification, known as 'acquired rights'.

To keep your Driver CPC, you must then undergo 35 hours of periodic training over the next five years, and in each subsequent five year period throughout your professional driving career.

Training is on a one-day-per-year basis (minimum of 7 training hours each day).

If you are maintaining both a bus and a truck CPC entitlement you must complete 42 hours of training over each five year period. The RSA strongly recommends that dual licence holders undergo the vehicle specific modules in the same CPC year.

Periodic training is compulsory and is designed to help you be:

- A better safer and socially responsible professional driver
- A more environmentally aware, fuel efficient and cost conscious driver
- Physically healthier

In Ireland CPC Periodic refresher training is only provided by RSA approved trainers at RSA approved training centres. When booking training check to make sure your trainer and centre are approved by the RSA. Unapproved training will not count towards your Drivers CPC.

If you don't qualify for 'acquired rights' for Driver CPC

If you obtain your bus licence on or after 10 September 2008 or your truck licence on or after 10 September 2009 you don't qualify for acquired rights and must obtain your 'Initial CPC' qualification.

There are four steps in this process.

To become a professional bus or truck driver and obtain your 'Initial CPC' qualification you first must pass:

- Step 1 – The new truck, the new bus or the new Combined Truck and Bus theory test as appropriate. (This new theory test also permits successful candidates to apply for their learner permit).
- Step 2 – A two-hour case study theory test
- Step 3 – The standard 90-minute driving test.
- Step 4 – A 30-minute practical knowledge test.

Before applying for a bus or truck learner permit you must hold a Category B licence, and also pass a medical exam.

Please note: If you obtained your bus or truck learner permit before 30th September 2014 you will need to complete the CPC Step 1 theory test (set out at step No 1 above).

In addition, you must then maintain your Driver CPC by completing the Periodic refresher training of at least 35 hours of training over each subsequent five year period as mentioned above. If you are maintaining both a bus and a truck CPC you must complete 42 hours of training over each five year period.

Test locations

The Driver CPC bus/truck test and practical test can be carried out in any existing bus/truck test location, but not every type of vehicle can be tested at all centres. You should enquire beforehand as to which type of vehicle can be tested in each test centre.

Theory tests

The Driver CPC theory tests are part of the Driver CPC process, which is mandatory for all new professional drivers.

- Step 1: Drivers must first pass the relevant theory test and obtain their learner permit
- Step 2: Drivers then must take and pass their CPC Case study theory test/s.

CPC Step 1:

You have a number of options depending on what licences you want to get and what tests you have already completed. Option 1 – applies for either a bus or truck theory test. This test consists of 100 multiple choice questions - you must correctly answer at least 74 of them to pass either the bus or the truck exam. Option 2 – applies for a combined bus and truck theory test. This test consists of 140 multiple choice questions. If you want to drive buses and trucks, you may opt to take the combined bus and truck exam which costs €84. You must correctly answer at least 104 questions to pass this combined bus and truck exam. If you have already passed either one of the new bus or truck theory tests since 30th September 2014 - you may then choose to add the alternate category by passing the bus module or truck module test (as appropriate). The cost of the Module test is €45. These Module tests consist of 40 questions. To pass you must correctly answer at least 30 questions.

CPC Step 2:

Step 2 consists of three case studies which are short scenarios that describe various situations a driver might face in a typical driving day. There are 15 questions in each case study (45 in total). To pass, you must correctly answer 28 of the 45 questions, with a minimum of 5 questions correctly answered on each case study.

To prepare for any of these theory tests

Study material including advice on how to prepare for both the new exams and the CPC case study tests is available from Prometric Ireland. Visit www.theorytest.ie.

CPC Step 3:

The CPC standard driving test

When successfully completed, the standard driving test, which lasts for approx. 90 minutes, entitles a driver to apply for their driving licence in the relevant category

CPC Step 4:

This test is also conducted by the driver tester in the driving test centre and is usually taken directly after the standard driving test and using the same vehicle.

A vehicle must be available for the test, which is a practical knowledge test lasting approx. 30 minutes. It covers areas such as

- safety
- passenger comfort
- legal matters relating to driving
- vehicle loading and stability
- ability to deal with an emergency
- physical risks involved in driving

Booking a test

Driver CPC theory test: Lo-call: 1890 60 61 06 or go to www.theorytest.ie.

Driver CPC standard driving and practical knowledge test: Lo-call: 1890 50 60 80 or go the RSA's online booking facility. If you wish, you can attend training in RSA-approved training centres to help you prepare for your Driver CPC examination.

Proof of certification

Drivers with acquired rights – applying for a CPC Qualification Card

For drivers who held 'acquired rights' - your licence will have an issue date before the September deadlines in the relevant category as proof of your acquired rights. When you complete your periodic training and apply for one, you will be issued with your CPC qualification card. Check this carefully as if you did not already hold a licence before the start dates you do not hold a drivers CPC qualification and any periodic refresher training completed will not count – you must obtain the correct Drivers CPC first.

New drivers – applying for a CPC Qualification Card

When you have passed your Driver theory test, the case study tests and the two driving tests, you will be issued with an application form by your driver tester. Complete and return the form to the Driver Education Section, RSA, Primrose Hill, Ballina, Co Mayo. You can generally expect to receive your card within 10 working days.

Exemptions

Driver CPC certification is not required for drivers of vehicles used:

For non-commercial purposes, e.g., driving as a volunteer; drivers of emergency or rescue vehicles e.g., Gardai, Defence forces, Ambulance and Irish Prison service.

For registered RSA approved Driving Instructors who are giving driving instruction.

In the course of someone's work, provided that driving the vehicle is not the driver's principal occupation, e.g., a plumber using a light truck to transport their plumbing materials.

Vehicles with a maximum speed not exceeding 45 km/h

See Appendix 12 for the complete list of exemptions.

There is no exemption to the requirement for a CPC qualification for drivers wishing to take out a learner permit/ full licence for category C or CE when under the age of 21, or for category D or DE when under the age of 24.

If you have any queries about whether your driving duties require you to hold a drivers CPC card check with your Transport Manager, with your legal advisor, with your Insurance Company, or consult the RSA. Where a doubt exists, the RSA recommends that you undergo the CPC training. However, clarification may ultimately be decided by the Courts.

More information on Driver CPC is available from:

Driver Education Section

Road Safety Authority
Moy Valley Business Park
Primrose Hill
Ballina
Co Mayo
Email: cpc@rsa.ie

It is recognised that many people who will participate in this training may be owner/operators, while others will work for transport organisations. Please note, any time the text mentions 'company' or 'your employer', those who are owner/operators should consider this to refer to them. This training material will contain references to best practice in relation to specific areas which all professional drivers should follow. Local arrangements or manufacturers guidelines for your vehicle may differ, and should be followed. In areas where the term 'must' refers to legislation, this should be read as absolute.

Penalties for non-compliance with Driver CPC Regulations.

Possible Fines for the Driver	Euro
Driving while not the holder of a valid CPC Card	€2,000
Driving while not carrying a valid CPC Card	€1,000
Failing to produce a valid CPC Card to a Garda or an RSA Transport Officer	€1,000
Driving with fraudulent documentation	€5,000
Possible Fines for the Employer/Operator	
Allowing a non-compliant person to drive a vehicle	€5,000

OVERALL OBJECTIVES OF THE DRIVER CPC PROGRAMME

The purpose of the CPC training programme is to confirm and expand on the existing knowledge and skills of each driver, ensuring professional drivers continue to be safe, courteous and fuel-efficient drivers who drive from a road-sharing perspective.

It is intended that the development of a defensive driving style - anticipating danger, making allowance for other road users – together with rational fuel consumption, will have a positive impact both on society and on the road transport sector itself.

In particular, it is designed to ensure that drivers know

- the characteristics of the transmission system in order to make the best possible use of it
- the technical characteristics and operation of the safety controls in order to control the vehicle, minimize wear and tear and prevent disfunctioning
- how to load the vehicle (goods) with due regard for safety rules and proper vehicle use
- how to load the vehicle (passenger) with due regard for safety rules and proper vehicle use
- how to ensure passenger comfort and safety
- the regulations governing the carriage of goods
- the social environment of road transport and the rules governing it
- the regulations governing the carriage of passengers
- the risks of the road and of accidents at work
- how to prevent criminality and trafficking in illegal immigrants
- how to prevent physical risks
- their responsibility as a driver for managing their own health and only to drive when medically fit to do so
- the importance of physical and mental ability
- how to assess emergency situations
- how to adopt behaviour to help enhance the image of the company
- the economic environment of road haulage and the organisation of the market
- the economic environment of the carriage of passengers by road and the organisation of the market
- how to optimise fuel consumption

Typical Driver CPC Training Arrangements

The RSA sets down standards for the CPC Training Organisations to follow. If you are not satisfied with any of the training room arrangements, please raise the matter with your CPC Trainer in the first instance. If it is not possible to resolve the issue, please refer to the CPC Training organisation. Finally, if you remain dissatisfied, please bring the matter to the attention of The Manager, Driver Education Section, RSA, by emailing cpc@rsa.ie

GROUP GROUND RULES

The course trainer will facilitate a discussion aimed at agreeing a set of `Ground Rules` by which the class agrees to abide.

By abiding by these rules the class will;

- Cover the required material
- Finish on time
- Not have people disrupting the training
- Be able to concentrate
- Not be distracting each other

By agreeing a set of rules together we all have an opportunity to clearly understand what is expected of ourselves and others.

By obeying your agreed rules, drivers can be confident that they will be able to avoid issues like those listed above. The day will be more enjoyable and easier to follow if we all observe the set of agreed ground rules.

Please consider what sort of things can or should be included and contribute to the discussion.

You may wish to note what has been agreed by the group in the box below.

Agreed Ground Rules

Outline of a typical training day.

The trainer will firstly carry out a registration session, gathering each participants details, including name, driver number and PPS Number. Drivers should produce their Driving Licence to the trainer.

If a driver should inadvertently attend the wrong training module, additional significant costs will be incurred by him or her to complete a further training day to correct the error.

The trainer will then carry out a short briefing session outlining the days agenda and informing drivers on typical housekeeping arrangements such as break times, emergency procedures, no smoking rules, no phone calls, etc.

The trainer will then carry out introductions during which he/she and all course participants will give a short introduction of themselves and a brief description of their driving career to date. These introductions will help the trainer to plan the delivery of the days training. During the course, the trainer will seek to engage each participant and draw on their driving experiences to date, good or bad.

The table below sets out the training aims for this CPC Module 5.3 along with an indication of the EU Directive requirements being covered.

MODULE $5._3$ OBJECTIVES

Directive text

1.3. Ability to optimise fuel consumption.

Importance of anticipating traffic flow, appropriate distance to other vehicles, use of the vehicles momentum, steady speed, smooth driving style, appropriate tyre pressures, familiarity with intelligent transport systems that improve driving efficiency and assist in route planning.

1.4. Ability to load the vehicle with due regard for safety rules and proper vehicle use.

Forces affecting vehicles in motion, use of gearbox ratios according to vehicle load and road profile, use of automatic transmission systems, calculation of payload of vehicle or assembly, calculation of total volume, load distribution, consequences of overloading the axle, vehicle stability and centre of gravity, types of packaging and pallets, main categories of goods needing securing, clamping and securing techniques, use of securing straps, checking of securing devices, use of handling equipment, placing and removal of tarpaulins.

2.2. To know the regulations governing the carriage of goods.

Transport operating licences, documents to be carried in the vehicle, bans on using certain roads, road-use fees, obligations under standard contracts for the carriage of goods, drafting of documents which form the transport contract, international transport permits, obligations under the Convention on the Contract for the International Carriage of Goods by Road, drafting of the international consignment note, crossing borders, freight forwarders, special documents accompanying goods.

3.2. Ability to prevent criminality and trafficking in illegal immigrants.

General information, implications for drivers, preventive measures, check list, legislation on transport operator liability.

3.6. Ability to adopt behaviour to help enhance the image of the company.

Behaviour of the driver and company image, importance for the company of the standard of the service provided by the driver, the roles of the driver, people with whom the driver will be dealing, vehicle maintenance, work organisation, commercial and financial effects of a dispute.

3.7. To know the economic environment of road haulage and the organisation of the market.

Road transport in relation to other modes of transport (competition, shippers), different road transport activities (transport for hire or reward, own account, auxiliary transport activities), organisation of the main types of transport company and auxiliary transport activities, different transport specialisations (road tanker, controlled temperature, dangerous goods, animal transport, etc.) changes in the industry (diversification of services provided, rail-road, subcontracting etc.)

Driver CPC Module Number

5.3

Driver Certificate of Professional Competence (CPC)

THE PROFESSIONAL TRUCK DRIVER

Session 1

CONTENTS – SESSION 1

SECTION A – ROAD SAFETY QUESTIONNAIRE

The following questions are based on road safety issues. Please tick the box opposite whatever answer you think is correct.

1. When travelling at a speed of over 50 km/h what is the recommended minimum clearance that a truck driver should give to a cyclist?

a)	0.5 Metre	
b)	1.0 Metre	
c)	1.5 Metre	

2. On a right-hand bend, with an adverse camber the road would

a)	Remain Level	
b)	Dip to the right	
c)	Dip to the left	

3. A driver must not park within what distance of a junction?

a)	3 Meters	
b)	5 Meters	
c)	10 Meters	

4. What is the maximum authorised mass (MAM) of a trailer that the holder of a Category 'C' licence can legally tow?

a)	750 kg	
b)	1,500 kg	
c)	3,500 kg	

5. Driving a vehicle (subject to an ordinary speed limit of 90 km/h or less) on the outside lane on a motorway incurs how many penalty points on conviction

a)	2	
b)	3	
c)	4	

6. What is the maximum permitted speed limit for HGV's on a motorway (where no lower speed limit is in place)

a)	80km/h	
b)	90km/h.	
c)	100km/h.	

7. Your truck uses 1 litre of fuel to cover 3 km. By using 1 litre to cover 4 km the saving over 100,000 km is

a)	2,500 litres.	
b)	5,000 litres.	
c)	8,250 litres.	

8. If you are taking medication, are you required to report it to your employer?

a)	Yes, but only if it affects your driving.	
b)	No, because under GDPR it is personal information.	
c)	Yes, in all circumstances.	

9. In dry weather how might a driver judge what is a safe following distance to the vehicle in front?

a)	By allowing at least two vehicle lengths between the vehicles.	
b)	By allowing at least two seconds to elapse between the vehicle in front and the driver's own vehicle passing a fixed point.	
c)	By driving at the same speed as the vehicle in front.	

10. On average, how many pedestrians would be killed if hit by a car at 50 km/h?

a)	1 out of 10	
b)	5 out of 10	
c)	8 out of 10	

11. How many penalty points will be incurred on conviction for holding a mobile phone while driving?

a)	3	
b)	5	
c)	7	

12. When meeting a smaller vehicle on a narrow road, you should

a)	Be aware that the larger vehicle has the right of way.	
b)	Drive along the centre of the road to make the other driver pull in.	
c)	Reduce speed and pull in and stop if necessary.	

13. The driver of a heavy goods vehicle will incur how many penalty points on conviction for not wearing a seat belt

a)	3	
b)	4	
c)	5	

14. What is the maximum speed limit on a dual carriageway for a goods vehicle with a maximum authorised mass/design gross vehicle weight (DGVW) of more than 3,500 kg?

a)	100 km/h	
b)	90km/h	
c)	80km/h	

15. A drivers reaction time is made up from

a)	Time taken to lift the foot off the accelerator.	
b)	Time taken whilst the brake pedal is depressed before the vehicle is stopped.	
c)	Time taken to move the foot from the accelerator to the brake pedal.	

16. A driver must not park within how many metres before a pedestrian crossing or a set of traffic lights.

a)	15 metres.	
b)	10 metres.	
c)	5 metres.	

17. What should drivers do if they become drowsy while driving?

a)	Stop and take a break, including a short walk if possible	
b)	Turn up the cab temperature with the heater.	
c)	Increase speed to reduce the journey time.	

18. Fuel economy is achieved by

a)	Smooth acceleration and timely gear changes	
b)	Hard acceleration up through the gears	
c)	Keeping the tachometer needle above the green zone	

19. Failure by a driver of a vehicle to obey traffic rules at a railway level crossing, swing bridge, or lifting bridge will incur how many penalty points on conviction

a)	3	
b)	4	
c)	5	

20. Where a learner/novice/professional drivers BAC is between 20mg and 80mg of alcohol per 100 ml of blood which of the following will be incurred by the driver?

a)	A maximum of 3 penalty points	
b)	A maximum of 5 penalty points	
c)	Automatic disqualification	

SECTION B – FORCES AFFECTING VEHICLES IN MOTION

As a professional driver it is your responsibility to ensure the safety of any loads which are on your vehicles, taking into account your own acceleration, braking and cornering. When a vehicle is moving or changes direction – cornering, on roundabouts, overtaking, changing lanes, etc., forces come into play which affect the stability of the vehicle and any load which it is carrying.

Friction and Weight

Friction or weight is not enough to stop unsecured cargo from sliding off in a different direction to that in which you are travelling. It is wrong to assume that the weight of the load itself will keep it securely in position. Under heavy braking the weight acting in a forward direction can be equal to that acting down on the vehicle. Therefore, a load that is not restrained by some form of device will not be secure, no matter how heavy it is.

You must also consider the safety of yourself, of your vehicle, and make allowance for other road users.

The forces acting on the load during braking increase with the rate of deceleration and the weight of the load. So, when the vehicle is braked, the load will want to continue to move in its original direction. The harder you brake, the more the load will try to move. It requires much more force to stop a load that has started to move than it does to prevent movement in the first place. This "battering ram" effect increases rapidly with the increase in distance through which the load moves relative to the vehicle. It is essential therefore that the load is restrained in such a way that any movement of the load on the vehicle is prevented.

The basic principle is that the combined strength and suitability of the load restraint system must be sufficient to withstand a force of not less than the total weight of the load moving forward, so as to prevent the load moving under severe braking, and half the weight of the load moving backwards or sideways.

Note; Load restraint systems are discussed in more detail in Section D.

Vertical movement may occur but this should be overcome if the above conditions are met.

This applies to all vehicles no matter what their size, from small vans to the largest goods vehicles. These principles are based on the maximum forces that are likely to be experienced during normal road use and not if the load is subject to the excessive forces that may be encountered if the vehicle swerves violently, or is involved in an emergency braking incident, or an accident. They should therefore be regarded as minimum requirements.

Centrifugal force

This is the force that pulls outward from the centre of rotation. When a vehicle takes a turn through a curve, centrifugal force acts to pull your vehicle, and its load, away from the direction in which you are turning.

When the vehicle takes a curved path at a bend, the forces acting upon it tend to cause it to continue on the original straight course. At normal speeds this is overcome by the grip between the tyres and the road surface. If a truck takes a bend too fast, centrifugal force will cause the vehicle and any load to be thrown towards the outside of the bend.

It should be remembered that when a vehicle is carried on a ship, as in roll-on, roll-off ferry operations, the vehicle and its load will be subject to different forces due to the rolling and pitching motions of the vessel. Therefore a restraint system that is suitable for road use may not be adequate at sea.

Example of centrifugal force

Inertia and momentum

A stationary truck may weigh more than 40 tonnes when fully loaded. It requires a great deal of energy to make it begin to move, even on a level surface, but it takes relatively little power to keep it rolling at a constant speed once it has started to move. Resistance to movement is called inertia and the force that keeps the vehicle rolling is called momentum. Modern trucks have engines with a high power output to:

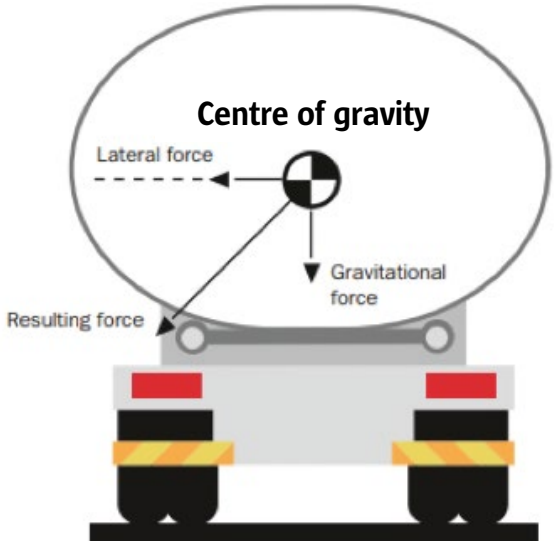
- Give good acceleration;
- Overcome inertia.

Loads are also affected by these forces. Load inertia has to be overcome in much the same way as the vehicle's. Acceleration will tend to push the load backwards, while braking will tend to move it forward, due to momentum.

All acceleration and braking should be smooth, controlled and as progressive as possible.

Gravity

When a vehicle is stationary on level ground the only force acting upon it is the downward pull of gravity.



Centre of gravity: The vehicle's centre of gravity is the point around which all its weight is balanced. Steering, acceleration or braking moves the centre of gravity and puts stress on the vehicle's tyres and suspension as well as on the load.

On an uphill gradient the effect of gravity will be much greater so that:

- Much more power is needed from the engine to move the vehicle forward and upward;
- Less braking effort is needed and the vehicle will pull up in a shorter distance.

On a downhill gradient the effects of gravity will tend to:

- Increase the vehicle's speed;
- Require more braking effort;
- Increase stopping distances.

Overturning

One of the factors that may cause a vehicle to overturn is the height of the centre of gravity. Overturning occurs when a vehicle's centre of gravity moves outside its track. The risks are increased by the speed of travel, angle of the bend, steepness of the slope, height and stability of the load, increased load on tyres, wind, and weight distribution.

Tipping Edge

This is the point at which the vehicle will try to overturn as a result of a change to the location of its centre of gravity. The point at which a vehicle will reach the actual rollover threshold will be determined by:

- Vehicle design characteristics;
- Load weight and distribution
- Roadway design characteristics;
- Driver handling of the vehicle
- Weather conditions
- Height of the load
- Downhill stretches leading to sharp bends
- Bends with a negative camber
- Poor suspension
- Uneven or incorrect tyre pressures.

Heavy braking while cornering can bring components very close to their design limits.

Where these limits are exceeded, a driver can lose control and the vehicle can overturn.

What affects the stability of a truck?

Under normal operating conditions, a variety of factors act on the moving vehicle and can contribute to the development of forces which affect its stability;.

- lateral (side) wind gusts,
- load changes,
- sharp accelerations and decelerations,
- sudden steering and braking applications
- road camber,
- incorrect tyre pressures
- defective or incorrectly set levelling valve

High winds in particular can be problematic for drivers of high-side vehicles, especially on elevated or exposed stretches of road. Vehicle stability can be affected and vehicles may even overturn. Other road users may be blown into your path. Bridges may be closed or restricted to cars only, and ferry sailings may be affected. You should listen for weather warnings and plan your journey accordingly.

Other factors that contribute to a vehicle's stability are the vehicle's wheelbase, track, and height and the vehicles weight distribution.

A vehicle's "track" is the distance between the wheels on the same axle of the truck.

The vehicle's wheelbase is the distance between the centreline of the vehicles front and rear wheels.

Road camber refers to the slope of the road surface.

Front overhang – FOH

The front overhang is the overall distance between the centre line of the front axle of the truck and the front edge of the truck.

Rear overhang – ROH

The rear overhang is the distance between the centre line of the rear axle and the rear end of the truck or the truck's load, whichever is greater. If a truck with a long rear overhang is loaded with lengthy or heavy cargo, then the load on the rear axle will become excessive. This can cause the front tyres to lose their grip on the road and make the steering difficult to control.

Drivers should be particularly alert to the danger of tail swing with a vehicle that has a long rear overhang

Lateral stability

Factors that affect the vehicle's lateral stability include the load placement on the truck, the height of the load above the surface on which the vehicle is operating, and the degree at which the vehicle is leaning.

Dynamic stability

Drivers should also be aware of the dynamic forces that result when the vehicle and load are put into motion. The weight's transfer and the resultant shift in the centre of gravity due to the dynamic forces created when the vehicle is moving, braking, cornering, tilting, etc., are important stability considerations. When determining how a vehicle should be safely handled, the driver should exercise extra caution when dealing with loads that cause the vehicle to approach its maximum design characteristics.

Kinetic energy

This is the energy that is stored up in the truck when it is travelling along. Efficient use of this energy can be used to reduce fuel consumption, by easing off the accelerator in good time when approaching a bend, roundabout, or other road feature such as traffic lights or a pedestrian crossing. This allows the truck to reduce speed gradually and avoid the need for harsh braking. It can also avoid the need to engage lower gears and harder acceleration in order to resume normal speeds.

Kinetic energy is converted into heat at the brake shoes and drums, and is wasted when braking occurs.

Bulk Liquid Loads

When carrying bulk liquid, driving at speed on bends can cause rollovers. Roundabouts are a typical S-bend that can cause rollovers. If the liquid is on one side during the first curve left onto the roundabout, then shifts to the other side during the next curve, the fluid is positioned to shift back to the first side with four times the centrifugal force it had during the initial curve.

Control of the vehicle speed and proper planning to make the manoeuvre safe is crucial in preventing this. Harsh acceleration, sharp steering or heavy braking causes a fluid surge (either forward, backward or sideways) inside a tank compartment. This surge of liquid may exert a force, which, if not taken into account by the driver, may be the cause of a rollover.

Hanging Loads

Hanging loads such as carcasses or garments should be properly secured to minimise swinging or sliding inside the vehicle. When this movement occurs, the load and centre of gravity moves, and is likely to affect the driving dynamics of the vehicle. Hanging loads will start to swing longitudinally as a result of the vehicle accelerating or decelerating. When the vehicle changes direction, the hanging load will swing sideways. This could make the vehicle more difficult to control.

Where possible when loading the vehicle, the load should be distributed evenly. However due to the nature of the load and particular customer requirements, this may not always be possible. In such cases the driver should be made aware of how the vehicle is loaded, and the placement or location of the different consignments on the truck/trailer.

Equally, when partial delivery has taken place the driver should endeavour to ensure the remaining load is as stable as possible. In all cases as many `stops` as possible should be applied on the support railings to restrict movement of the load.

While it is not possible to eliminate blood, fat and meat debris from the trailer floor, every effort should made to reduce the risk of people slipping while in the trailer, when unloading or securing the load.

Example of hanging load

SELF-ASSESSMENT OF KNOWLEDGE

Please complete the following questions to help assess your understanding of the session so far:

Q1. When a vehicle changes direction at speed, is weight enough to stop unsecured cargo from sliding off?

Your Response

Q2. Under heavy braking what is the weight acting in a forward direction equal to?

Your Response

Q3. What is centrifugal force?

Your Response

Q4. What is vehicle momentum?

Your Response

Q5. What does road camber refer to?

Your Response

Q6. Define the centre of gravity of a vehicle

Your Response

Q7. What is the tipping edge of a vehicle?

Your Response

Q8. What problems do liquid loads produce in comparison to solid loads?

Your Response

Q9. What is kinetic energy?

Your Response

Q10. What precautions should be taken when transporting hanging loads?

Your Response

SECTION C – CALCULATION OF PAYLOAD

Maximum legal weights are determined by a number of factors, including the spacing between the axles, the outer axle and bogie spread, the number of tyres on each axle, and the type of suspension fitted. Vehicles with Road Friendly Suspension (RFS) and twin tyres on the drive axle are permitted to carry higher weights than those without. The majority of vehicles with RFS operate on air suspension, but some rubber, hydraulic and steel suspension may also count as road friendly. See the vehicles weight plate for information on maximum permitted weights. The weight plate is usually located in the footwell of the nearside front door.

Who is legally responsible for the vehicle –the owner, the driver, or both?

In accordance with road traffic legislation, and depending on the offence involved, the driver and/ or the owner of the vehicle may be guilty of an offence if a vehicle is not compliant with the applicable legal requirements.

The Road Traffic (Construction, Equipment and Use of Vehicles) Regulations 1963, as amended, set out specific requirements regarding the use of vehicles on public roads and the Road Traffic (Construction and Use of Vehicles) Regulations 2003 contain the provisions in relation to maximum weights. Both of these statutory instruments have been substantially amended since drafting, and a full list of amendments to each is available on the RSA website www.rsa.ie

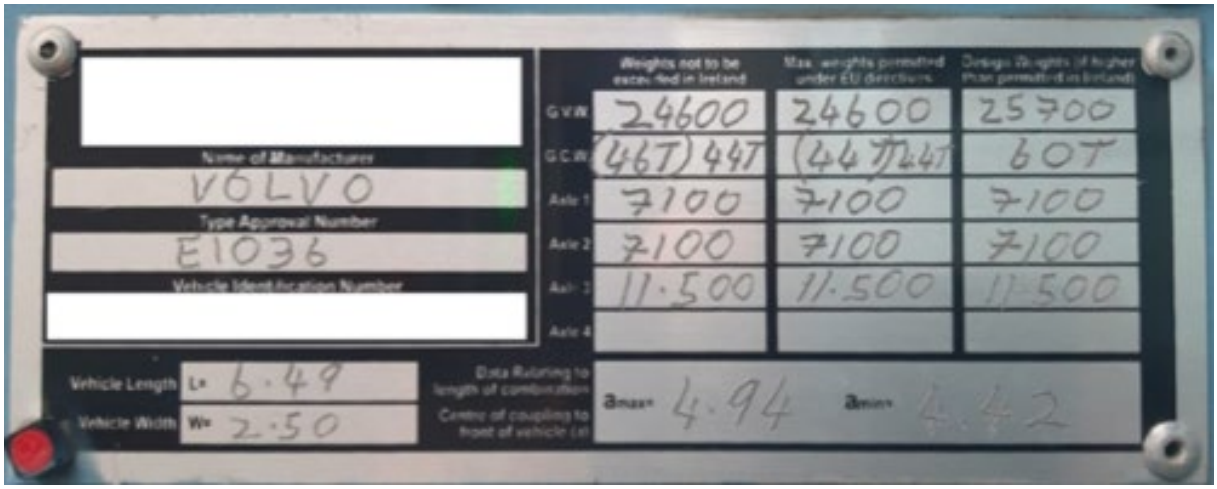
Plated Weights

The following vehicle types must be fitted with a weights and dimensions plate at an NSAI (National Standards Authority of Ireland) approved plating centre:

- Goods vehicles (including their trailers and semi-trailers) with a design gross vehicle weight exceeding 3,500kg and,
- Buses/coaches with more than 8 passenger seats and a design gross vehicle weight exceeding 5,000kg.

A check for the presence of an appropriate weights and dimensions plate is part of the roadworthiness test carried out at an approved CVRT (Commercial Vehicle Roadworthiness Test) centre. The only plates acceptable are those fitted by the vehicle/trailer manufacturer (provided it contains the necessary information), or a plate fitted by an Authorised Person appointed by NSAI. Where a vehicle or trailer has been plated by the manufacturer a combination of two plates is acceptable.

Example of weight plate.
Note the red seal which breaks if the plate is interfered with



Permits for Abnormal Loads

In exceptional circumstances, for example the carriage of abnormal and indivisible loads (AILs), the legal limits on weights and dimensions stipulated in the Construction & Use Regulations may be exceeded. Where it is proposed to carry a load which is such that the gross vehicle weight or axle weights are in excess of the legal limits or the dimensional or projecting limits are breached, a permit must be obtained from the relevant Local Authority or Authorities through whose functional area(s) the load will be carried. An Garda Síochána also operate a streamlined permit system for the movement of wide and long loads on main routes. See page 86, Appendix 1, for further information.

Penalties for breach of the legislation

It should be noted that many vehicles are intended by design to operate at maximum weights which are less than the weights set out in the Construction & Use Regulations. Owners and drivers should familiarise themselves with the maximum weight that applies to their vehicle, or combination of vehicles. This is the lesser of the manufacturer's design weights or the plated weights for the vehicle or combination as outlined.

It is an offence to carry a load on a vehicle which would cause the manufacturer's design weights or the limits specified in the national legislation (i.e. the plated weights) to be exceeded. On conviction, courts can impose a class C fine (up to €2,500), a prison sentence or both, on both the person who commits the offence - the driver - and on the owner of the vehicle.

Where a vehicle owner is convicted of such an offence, further penalties are payable to the Local Authority (for vehicles with a laden weight exceeding 17 tonnes) with responsibility for the maintenance of the road on which the offence was committed.

A summary of the penalties payable are as follows:

- Where the excess weight is between 1,000kg & 2,000kg the fine payable is €500
- Where the excess weight is between 2,000kg & 3,000kg the fine payable is €1,000
- Where the excess weight is between 3,000kg & 4,000kg the fine payable is €1,500
- Where the excess weight is between 4,000kg & 5,000kg the fine payable is €3,000
- Where the excess weight is more than 5,000kg the fine payable is €5,000.

Since 3rd August 2012 the list of offences that attract penalty points now includes offences for breach of the legislation on vehicle weights, resulting in one penalty point on payment of a €200 fixed charge within 28 days of the date of the fixed charge notice (increasing to €300 in subsequent 28 day period) or three penalty points on conviction in court. Where a member of An Garda Síochána reasonably believes that a fixed charge offence has been or is being committed by a person, the member can serve a fixed charge notice on such person. Where the Garda cannot identify the person responsible for the breach of the legislation, he or she may serve the fixed charge notice on the registered owner of the vehicle and the registered owner has 28 days in which to give to An Garda Síochána the name and address of the person who was driving the vehicle at the time of the offence or else make the payment specified in the fixed charge notice.

Court prosecutions should not take place unless a fixed charge notice has been issued and subsequently not been paid.

How do you know the weight that your vehicle is allowed to carry?

- Find the maximum permitted axle weight and Gross Vehicle Weight (GVW/MAM – Maximum Authorised Mass) on plates that must be fitted to all vehicles and certain trailers. This could be a manufacturer's plate, which is usually located in the vehicle cabin, under the bonnet or on the chassis of trailers. This information is also available in the vehicle documentation supplied by the manufacturer.
- Do not confuse the Gross Vehicle Weight (GVW/MAM) with the Gross Train Weight (GTW), or the Gross Combination Weight (GCW). The GVW is the maximum permitted weight of the vehicle including any load it is designed to carry. The GTW is the maximum permitted weight of the vehicle plus any trailer being towed, including any load being carried on the vehicle and trailer.
- Remember that the GVW/MAM includes the weight of the vehicle, the load, the driver and any passengers. Also allow for the weights of any pallets or packing cases.
- Remember that weights are given in metric units of kilograms.
- Look at regulations governing vehicle weights.
- **To ensure that your vehicle is never overloaded you should know the maximum permitted weights of the vehicles you are driving. This should be determined when the vehicle is unladen so that you can calculate the load that can be carried. Also, weigh the vehicle to establish individual axle weights.**

Load Distribution

Two essential requirements must be satisfied when loading vehicles.

These are that the load must be distributed so that:

a. The maximum permitted gross vehicle weight and individual axle weights are not exceeded;

b. The load centre of gravity is kept as low as possible to achieve maximum stability when the vehicle is braked, accelerated or changes direction.

For maximum stability, the items comprising of the total load should be evenly spread to achieve minimum height and be arranged to form a uniform whole so that no excessive stress is applied to whatever restraining devices are used. Where a part of the load is to be picked up or removed during the course of a journey, the effect on gross vehicle weight, individual axle weights and on the securing and stability of the load then being carried must be considered during the initial loading and subsequent unloading. For example, removing a part of the load from behind the rear axle of a vehicle or trailer will reduce the gross vehicle weight, but it may increase the weight on the front axles and may cause individual axles to exceed their permitted weights.

- Drivers should be aware of the handling characteristics of a vehicle with a lifting rear axle and also of a vehicle with a rear steering axle.
- Do not automatically trust declared weights, invoices or delivery notes given to you by customers. Remember that you hold the responsibility for not overloading, not the customer.

Axle weights

The relationship between the vehicle's wheelbase, body length and body overhang should be carefully considered in relation to the composition of the loads to be carried, especially if full use is to be made of permitted maximum axle loads. Problems with axle weights can often occur when vehicles travel up and down steep gradients. In particular bulk or loose loads can easily transfer from one end of the container to the other so loads should frequently be checked when operating in this type of environment and if necessary redistributed.

Loads can shift due to negotiating long steep inclines or steep cambers.

When loading your vehicle you must also be aware of the height of the load if driving an open-top vehicle and ensure that you do not load too high, causing materials to fall off the vehicle or causing obstruction when travelling under bridges etc.

Remember no matter what type of truck you are driving you must know your height restrictions as well as your GVW/MAM, to ensure that you do not take a route with areas of limited height such as low bridges.

Consequences of overloading the axle

An overloaded axle may not only cause damage to the road and to your vehicle, but may also put drivers and other road users at risk.

What will happen if a vehicle is overloaded or incorrectly loaded?

Overloading a vehicle:

- Can make the vehicle less stable, difficult to steer and take longer to stop. Vehicles react differently when the maximum weights that they are designed to carry are exceeded. The consequences can be fatal;
- Overloading can cause the tyres to overheat and wear rapidly, which increases the chance of premature, dangerous and expensive failure (such as blow-outs);
- May mean your insurance cover could be affected;
- Can cause wear and damage to roads, bridges and pavements;
- Is unfair on other operators. Exceeding weight limits is unfair competition;
- May increase fuel consumption, which will increase your running costs.

Make sure

- DO check the weight of the load to be carried.
- DO make sure that the vehicle is capable of carrying the size and type of load.
- DO remember that the size, type and weight of the load will affect the handling of the vehicle.
- DO check the load before moving off and whenever items are added or removed.
- DO remember that loads can settle and shift during a journey causing lashings to slacken.
- DO check the load at regular intervals and after heavy braking or sudden changes of direction.
- DO make sure safe systems of work are devised and followed when loading and unloading vehicles.
- When collecting lift-on/lift-off containers, try to establish the weight and contents of the container.
- Do check the maximum permitted weights and dimensions of any country you are visiting or passing through, including the UK.

Don't

- DON'T overload the vehicle or the axles.
- DON'T load the vehicle too high – the maximum permitted height of a vehicle and its load is 4.65 metres.
- DON'T reduce the load on the steering axle by positioning the load too far back.
- DON'T move the vehicle with any part of the load not restrained.
- DON'T climb onto the vehicle or its load unless it's essential and there is a safe means of access.
- DON'T take any chances-do not risk having an accident!

Remember also that overloading offences can incur Penalty Points on your driving licence.

Calculation of load volume

The volume of any load - solid, liquid, or gas is how much 3-dimensional space it occupies. Volume is measured in e.g. cubic centimetres, cubic metres, etc. The volume of a box is its length x width x height.

There are 3 dimensions involved, hence the units end up cubed to the power of 3. The volume of a cylinder, barrel or round bale is its base area multiplied by its height.

The volume of a closed trailer or box body is its length multiplied by its width multiplied by its height.

Drivers responsibilities - loading

- Report to a person in authority
- Ensure correct load is collected
- Ensure cargo is in good condition to transport
- Ensure correct quantities are loaded
- Ensure cargo is loaded in correct order
- Ensure load is secure to travel
- Check that documentation is correct

Adhere to any special agreements/instructions

Drivers responsibilities – unloading

- Report to a person in authority
- Be courteous, polite and obey on-site rules
- Get seals checked and/or provide samples
- Follow unloading instructions exactly
- Ensure correct quantities are delivered
- Check that documentation is correct
- Ensure remaining load is secure to travel
- Do not leave premises without a clear signature.

Road restrictions

In addition to weight restrictions on your vehicle and its axles, some roads and bridges may also have weight limits imposed on them. Watch for signs and/or road markings which warn of maximum permitted weights ahead.

Maximum gross weight

Maximum axle weight

For information on legally permissible Maximum Weights and Dimensions of Mechanically Propelled Vehicles and Trailers, including Manoeuvrability Criteria, in Ireland, see Appendix 1 at the end of this manual. Additional information and guidelines on vehicle weights is available at www.rsa.ie

SELF-ASSESSMENT OF KNOWLEDGE

Please complete the following questions to help assess your understanding of the module so far:

Q1. What may an overloaded vehicle cause damage to?

Your Response

Q2. How should a load be distributed on a vehicle?

Your Response

Q3. What does the red seal on a weight plate signify?

Your Response

Q4. How could a heavy load behind the rear axle affect a trucks steering ability?

Your Response

Q5. How can travelling up and down steep hills affect axle weights?

Your Response

Q6. What vehicles must be fitted with a weight and dimensions plate?

Your Response

Q7. Who is responsible for the vehicle when being used on a public road?

Your Response

Q8. How do you know the weight that your vehicle is allowed to carry.

Your Response

Q9. What effect can overloading have on your driving licence?

Your Response

Q10. Explain the meaning of the acronym MAM.

Your Response

SECTION D – METHODS OF SECURING GOODS

In order to ensure that all goods are secure while in transit, a proper system of restraining and containment must be in place.

It is both a legal requirement and common sense to make sure that all loads carried on vehicles are adequately secured, no matter how short the journey is. This will ensure workers are safe during unloading and that there is no likelihood of the load moving or falling off during transit, with a very real possibility of danger to the driver and other road users. This applies to all vehicles and to all types of load.

Load restraint/containment

Drivers do not always realise that when travelling along an elevated section of road, the wind speed is greater than on a normal section and the likelihood of parts of a load falling or blowing off and causing a serious incident is increased. Loose objects or materials falling or blowing off open vehicles are at best a nuisance and at worst fatal.

In view of the wide diversity of general loads it is not possible to suggest securing methods for all the types of consignment likely to be encountered. However, the basic precautions outlined will always be applicable. Vehicles equipped with headboards, tailboards, or sideboards, or van bodies will provide some restraint. Additional load restraints must be used in order to prevent loads from moving under any of the following conditions:

a. If there is a risk of the load breaking through the walls, sideboards or tailboard of the vehicle;

b. If the load is liable to be damaged should it move during transit;

c. If there is a risk of the load being blown off, or bouncing out of the vehicle.

The design and construction of the vehicle and its bodywork should be suitable for the loads that it is likely to carry, particularly in terms of the characteristics and strengths of the materials used.

When securing a load you need to take into account:

1. The suitability of the vehicle;
2. The stability of the load;
3. The type of restraint;
4. The condition of the restraint (i.e. wear and tear);
5. Protection from the weather;
6. Prevention of theft;
7. Ease of delivery.
8. Avoiding breakages

When restraining any type of load you also need to be aware of the centre of gravity. If movement of the load occurs during transit it will affect the way the vehicle responds. Therefore the object of the restraint is to make sure that the load you are carrying will be secure when:

- Braking
- Steering
- Accelerating
- Cornering

Pallets

The safe carriage of pallets presents two main problems to consider: firstly, the stability of the items stacked on the pallet and, secondly, the restraint of the pallet and its cargo to the vehicle. In the case of small containers and cased machinery, usually only the second factor needs be considered. When banding or other similar means are used to unitise a pallet and its cargo, it is most important to appreciate that the banding etc. is intended only to keep the pallet and cargo together.

Securing the product to the pallet alone is not sufficient, therefore it will be necessary to secure the entire unit to the vehicle.

There are two basic types of pallet: those which have a number of horizontal bottom members in contact with the vehicle platform and those supported by corner legs and feet. Pallets themselves serve a double purpose in that they enable goods of similar nature and size to be made up into unit loads and also palletised loads can be

more easily handled mechanically, which reduces the effort required to handle and transport them.

Because of the wide variation in the weight and sizes of pallets, situations will arise when the vehicle load space cannot be fully utilised without either exceeding the permitted gross weight or the axle weights. This free load space will increase the likelihood of pallets, which are not properly restrained, moving when the vehicle is braking or cornering. Before loading, the pallets should be examined for damage or other obvious signs of weakness. If there is reason to suspect that the pallets are not of sufficient strength to withstand the load carried on them they should not be accepted for loading. Where pallets are carried on vehicles with van bodies, lashings will be required to restrain the pallets if there are spaces between them or between the pallets and the vehicle sides or headboard. This is because, if there is space for the pallet to move, they could develop sufficient momentum to break through the side curtains or headboard when the vehicle is braking or cornering. Where, for practical reasons, lashings cannot be used then the spaces must be filled with suitable dunnage or packaging, to prevent movement of the pallets.

In order to utilise the full payload capacity of the vehicle it may be feasible to stack palletised loads. However the upper layers of pallets must be positioned so that they are stable and adequately secured to prevent them falling from the vehicle. Unless the upper pallet is directly supported by the lower one, the cargo on the lower pallets must be of sufficient structural strength, or the cargo banded with sheet material such as ply-wood, to withstand the weight of the upper pallet without becoming distorted. Individual items in the load must be firmly secured to the pallet if they are not to be dislodged when the vehicle is in motion.

Movement of the cargo on the pallet may lead to a failure of the restraint system attached to that pallet and those adjacent to it. Bagged items tend to settle under vibration to fill air spaces between the bags, thus loosening any strapping.

The following provisions apply to the movement of all types of palletised loads:

1. The arrangement of the pallets on the vehicle must be such that the maximum permitted gross vehicle weight and axle weights are not exceeded.
2. Unless the pallets are adequately constrained by the body or sideboards and headboard of the vehicle, additional means of restraining the horizontal and vertical movement of the pallets must be provided.
3. The pallets should be positioned so that the load is balanced across the vehicle.
4. Where the load space is not fully utilised and where weight distribution is a problem, pallets should, if possible, be placed along the longitudinal (front to back) centre line of the vehicle and “closed up” to one another.
5. Where pallets are stacked on open platform vehicles, restraining lashings or webbing nets must be used to prevent movement of each layer of pallets carried. Rope nets on palletised loads and tarpaulin sheets and covers are by themselves not adequate for this purpose. Some additional form of restraint is required.
6. Where pallets are loaded onto vehicles that are equipped with a roller-loading system, extra care should be taken to ensure that the pallets are adequately restrained.

Employees working in the transport industry may be required to wear appropriate PPE (Personal Protection Equipment) for the various tasks undertaken

Vehicle loading

7. When part of the load is removed from the vehicle care must be taken that the remaining pallets do not cause the vehicle's maximum axle weight to be exceeded or its lateral stability to be impaired.
8. Empty pallets must be restrained and secured to the vehicle.

Drivers who handle loads should be appropriately trained. The training should be delivered by an Instructor with approved and recognised qualifications relevant to the area of work.

Curtainsiders

Goods carried within curtain-sided vehicles must be secured as if they were being carried on a flat, open-bed vehicle. If the loading configuration, or its securing, would cause concern when used on an open-bed vehicle, then it should be considered equally unacceptable with a curtain-sided vehicle.

Unless they are purposely designed, the curtains of curtain-sided vehicles should not be considered as part of any load restraint system. If the curtains have been designed as part of the load restraint system, the standard of restraint capability should be clearly marked on the curtains themselves,

i. e., EN 12642 XL. If no mark can be seen, then it should be assumed that the curtain has no load-bearing function.

Similarly, where vertical inner curtains are fitted (and they are not purposely designed for a specific load) they also should not be considered as part of the load restraining system. Curtains and vertical inner curtains should be considered purely as a means of containing within the vehicle any small, loose items that may have become dislodged during the journey.

Some curtain-sided vehicles or tautliners may have built-in reinforcements to restrain sideways movement of the load. However, there is still a need to apply internal restraints on loads.

Opening a curtain after a journey should be carried out with extreme care. Items that may have been dislodged will fall out when the curtain is removed and may injure the driver.

The manufacturers of vehicles fitted with curtain-side bodies may be satisfied that a degree of protection is given by the material used in their construction. However, this does not relieve the driver of the responsibility for ensuring that a load is properly stowed and secured so that it won't move while in transit.

Rolls and cylindrical items

Any load must be carried so that it doesn't endanger any other road users, and the securing of rolls or cylindrical items is known to cause many problems. In many circumstances additional dunnage, stopping blocks or wedges should be used, particularly on rounded sections where there is a tendency for roll to take place. This dunnage should be regarded as supplementary to the webbing restraints whose total strength should not be reduced because of its use. When securing cylindrical items practical consideration should be given to how the load is to be unloaded in a safe and controlled manner.

The picture above shows a load of paper or cardboard rolls. Between layers lashings may be omitted when loading metal or concrete pipes since their weight and abrasive nature could cause excessive damage. These lashings may have to be omitted to prevent damage to the load. Such omissions must be made good by additional top lashings and chocks and cradles.

If drums, rolls etc. are standing on end, lashings must be used to prevent lateral (sideways) movement and further cross lashings must be applied. If on their sides, they should have at least one cross lashing for each item. If there is more than one layer, the rearmost roll or drum must be restrained by lashing or blocking against rearward motion.

Boxes

Boxes must be loaded so that they are prevented from moving in any direction. They should interlock if possible, and be loaded to a uniform height. There must be at least one lashing for each row of boxes across the vehicle and any box which is above the general height of the load must have at least one cross lashing, or more depending on weight and size.

Sacks

Sealed sacks should be laid on their sides with alternate layers in opposite directions. In any event no more than two successive layers should be in the same direction. The load should be of uniform height when possible. There must be at least one cross lashing for each sack length. Loads of sacks should be sheeted if possible. Open sacks, for example those used for coal delivery, should be loaded and secured in a similar way with cross lashings for each layer. The total load should also be sheeted to prevent loose materials being lost from the vehicle. With certain loads the use of additional restraints may be desirable. This is particularly true of loads that tend to settle around the lashings. Empty sacks, which can fall or be blown from a vehicle when in motion, can be extremely hazardous and these must therefore be securely restrained to the vehicle's platform.

Loose bricks/blocks

Both the bulk mass and individual items must be restrained. The load height should not exceed the height of the surrounding body. Purpose-made restraint systems may be used provided their strength is sufficient for the load being restrained.

Mixed loads

When a load is composed of different items, each part of the load must be secured in a manner suitable for a load of its type.

Containers made from plastic materials

Over recent years there has been a significant increase in the use of drums, kegs, boxes, crates and bottles of assorted shapes and sizes made from plastics instead of metal. Plastic surfaces, particularly when damp, are very slippery and care must be taken in loading, securing and sheeting.

Example of unsecured load

Loose or dusty material

All loose or dusty loads such as sand, earth or lime must be sheeted to ensure they do not blow on to the road or on to other road users.

Clamping and securing techniques

The total load restraint system will generally consist of a combination of:

a. Lashings secured to anchorage points attached to the vehicle chassis, which includes cross bearers, outriggers etc.

b. Bulking arrangements, including headboards, bulkheads, spigots, transverse beams, shoring bars etc. which are securely attached to the vehicle;

c. Friction between the load and the vehicle platform.

d. Headboards, sideboards, stanchions and tailboards fitted to vehicles, if adequately constructed, may provide additional restraint to movement of the load.

On flatbed vehicles some form of load restraint will always be required. The load must be packed tightly before applying the restraints, which should be arranged so that no part can accidentally be released by vibration or road shocks while the vehicle is in motion. The restraints should be arranged so that failure or slackening of a single component does not render the remainder of the system ineffective. All items of loose equipment not in use (sheets, ropes, nets, chains, chocks, dunnage etc.) and loose surplus equipment in service (rope ends etc.) must be securely restrained at all times.

Always check that cargo doors are locked and that locking mechanisms are in good condition.

The driver of an open bodied vehicle must ensure that an appropriate cover is used when transporting any loose material.

Use of Securing Straps

A variety of materials are suitable for restraining loads, including chains, steel wire or fibre rope, webbing lashings and webbing or rope nets. Although the metal restraining devices may be stronger, they are less convenient and are required to be used with end attachments such as shackles, and unless the load is adequately protected it might be damaged. This could result in permanent distortion of the load and the slackening of the restraint system. It is the vehicle operator's responsibility to provide suitable vehicles and securing equipment for each load carried, and to ensure that drivers and loading staff are competent and have received sufficient instruction in its use.

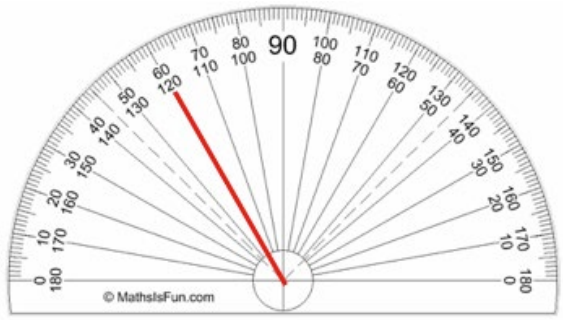
Various types of equipment can be used for restraining general freight loads. These include rope, chains, steel wire rope, webbing, strapping or netting. For the securing of loads inside van bodies and similar load containers, specially designed shoring bars used in conjunction with the appropriate securing fixtures on the vehicle are suitable. Purpose-built restraining devices should only be used for the application, and in the manner approved by their manufacturers.

The restraining method adopted will depend on the type and size of the vehicle, the position and number of anchorage points and the size and weight of the load. However, the following principles should be followed for whatever system is chosen:

- Vertical and tipping motions should be prevented by a lashing placed across the top of the load.
- Lashings should be positioned to prevent movement of the load in any direction.
- Where pallets are stacked, cross lashings must be such that each pallet of the top layer has at least one cross lashing. Any pallets which are above the general height of the load should have at least two cross lashings.

Lashings

The lashings and fastening devices (ropes, webbing, chains, cables, clamps etc.) should be in sound condition and must be capable of withstanding all normal forces. To avoid movement of the load, lashings must be properly tensioned at all times using a tensioning device specified by the manufacturer of the lashing. Never over- tension lashings by the use of levers. It is most important that lashings, which provide forward restraint, are as near to the horizontal as possible and never at an angle of more than 60°, because the effort required to restrain the load increases sharply as the lashings approach the vertical position.



Tarpaulins

Tarpaulin sheets are of two types:

1. General purpose tarpaulins, which provide weather protection only and should not be used as part of a restraint system.
2. Purpose-made load sheets incorporating webbing straps, which are satisfactory up to their rated load capacity provided the straps are secured to body attachments of equivalent strength.

Netting

Nets and their attachments (lashing ropes, border ropes, hooks etc.) should be in sound condition and comply with the EU standard. Nets must be properly tensioned using a tensioning device specified by the net manufacturer. Never over-tension a net by the use of a lever or other unauthorised device. The mesh size should always be less than the smallest item the net is expected to confine.

Protection against abrasion and/or cutting should be provided by the use of corner protectors or corner sleeves.

Blocking

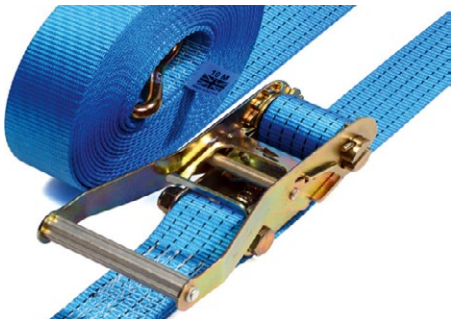
Chocks, wedges and scotches may be used to prevent individual items of a load from moving in any horizontal direction. Care must be taken to ensure that these are strong enough and are adequately secured to the vehicle platform.

Dunnage

It is preferable for all the individual units or packages comprising a load to be packed closely together before any restraint lashings are applied. If this is not possible then some form of packing, commonly known as dunnage, must be used to fill any gaps that exist between parts of the load or between the load and the vehicle sides. A number of materials are suitable for use as dunnage, the most common being timber, folded cardboard, hardboard, high-density foam and air bags.

Friction

Friction between the load and the floor should only be regarded as a bonus and should not be relied on when calculating the lashing force required to secure the load. A slippery platform surface is always dangerous and the aim should be to obtain the maximum advantage from the frictional restraint by keeping both the base of the load and the loading surface as clean, dry and free from grease as possible.



Example of ratchet and strap

Checking of Securing Devices

The load should be checked for security and the lashings tested for adequate tension after the vehicle has travelled a few kilometres and again at intervals throughout the journey. Weather conditions can affect the tension of lashings, which may lead to loss of security and damage to the load if not correctly re-tensioned so as to obtain the maximum efficiency from every part of the restraint system.

Anchorage points that are secured only to wooden members are unlikely to provide the restraint required. The fitting of additional anchorage points to existing vehicles must in no way weaken the chassis or body structure. In particular, the drilling of holes in the chassis and welding to it is not recommended without the approval of the original manufacturer. If the anchorage points are fixed at or in the loading area they should not project above the horizontal level of the loading area in their position of rest. The recesses in the loading area required because of the lashing points should be as small as possible.

Example of strap label

Load anchorage points

Lashings used to restrain the load must always be attached to anchorage points that have sufficient strength to absorb the expected loading. Any restraint system is only as strong as its weakest component. Anchorage points should themselves be firmly attached either directly to the chassis or to a metal crosspiece or outrigger. Rope hooks should only be used for roping, and then only for relatively light loads. They should not be used in place of the correct anchorage points. The rated load capacity of the anchorage point must never be exceeded.

Example of twist lock

Example of anchorage point

Vehicle related slips, trips and falls

Vehicle related slips, trips and falls (STFs) are a leading cause of worker injury in Ireland. Workers who drive or work with trucks and vans are most affected. Drivers and transport workers climb in and out of their cabs hundreds of times a week, and routinely access the rear and sides of their vehicles using platforms and tail lifts. Transport operations often involve substances that can lead to slippery surfaces. Oil, grease, diesel, rain, snow and ice can make the conditions even more dangerous.

Analysis by the HSA (Health and Safety Authority) shows that the areas most associated with vehicle STFs are:

- entering and exiting vehicles, particularly HGVs and vans
- load platforms and load area of trucks and vans
- trailer platforms
- 5th wheel areas of HGVs, and catwalks
- vehicle steps and ladders
- vehicle tail lifts
- road tanker platforms, and
- uneven ground and damaged surfaces where vehicles are parked

Most vehicle STFs are caused by:

- unsafe methods of exiting or entering vehicles and load platforms
- unsuitable, damaged or missing steps to access vehicle areas
- poor housekeeping leading to material lying around that is a trip hazard
- using footwear that does not protect against injury or provide slip-resistance
- poor vehicle and platform design and materials, in particular unsuitable steps, ladders and walk-on vehicle surfaces

Workplace health and safety law says that:

- a vehicle is a workplace and, like all other workplaces, requires a written risk assessment to identify the relevant hazards and associated controls to achieve safe systems of work. Safe systems of work must include safe ways of entering and exiting a vehicle
- designers, manufacturers, importers or suppliers of vehicles, tankers and trailers must make sure they are designed and constructed safely and provide relevant information to customers;
- suitable instruction and training must be provided to those who work in, on and around vehicles; and
- where the risk assessment identifies a need for Personal Protective Equipment (PPE) such as safety footwear then it must be provided by the employer. There are also additional specific legal requirements for certain classes of vehicles, such as specific slip-resistant surfaces for small and large public service vehicles.

Vehicles should be designed and operated so that it is always possible to enter and exit the vehicle safely. Steps that resemble stairs are easier to use than ladders.

- Vehicle steps should be slip-resistant
- Vehicle steps should be clean and in a good condition with no damaged or missing steps
- Vehicle steps should be big enough to at least allow the ball of the foot onto each step
- Always keep both hands free for entering and exiting the cab, for example, not holding phones, handheld devices or tools
- Maintain three points of contact. Grip the vehicle for support when exiting. Facing the vehicle is safer
- Handholds should allow proper access, in particular behind aerodynamic fairings, should allow a full grip, and be properly located, secured and used.

See example on page 38.

Keep the cab clean and tidy

- Keep floor area clear of materials, tools and equipment
- Never jump out of the cab
- Never enter and exit or ascend and descend moving equipment
- Use access steps
- Movement should be slow and steady to avoid injury from slips, falls, and striking other objects
- Wear safety footwear (with slip-resistance)
- appropriate for the weather conditions, access points and work being performed
- Remind passengers to take care on entering and exiting

Tail lifts should be serviced and thoroughly examined at mandatory intervals prescribed by Lifting Equipment Regulations

- Drivers should be provided with instruction and training on safe operation and access of tail lifts
- Never jump down from tail lifts
- Make sure the tail lift surface provides adequate slip-resistance in all working conditions, for example wet and icy
- Apply edge marking materials to help warn users of edges
- When working on an elevated tail lift, take extra care to avoid falling from a height

Tanker ladders and platforms should be inspected regularly and maintained in good working order

- Only authorised people should be allowed to access the top of a tanker
- Fall prevention instruction and training should be provided to authorised people
- Fall arrest and protection systems for work at height should be provided as appropriate
- Three-point contact should be maintained at all times for ascending, or descending the tanker

See www.hsa.ie/slips for further information.

Advice on work related vehicle safety can be found at www.vehiclesatwork.ie including vehicle checklists

Example of elevated catwalk

Summary

- Check the suitability of the vehicle for the load to be carried.
- Secure the cargo in such a way that it cannot move away, roll-over, wander because of vibrations, fall off the vehicle or make the vehicle tip over.
- Check that the vehicle and blocking equipment manufacturers' recommendations are adhered to.
- Check the cargo securing equipment is compatible with the constraints it will encounter during the journey. Emergency braking, sharp cornering to avoid an obstacle, bad road or weather conditions have to be considered as normal circumstances likely to happen during a journey. The securing equipment must be able to withstand these conditions.
- Determine the securing method(s) best adapted to the characteristics of the cargo (locking, blocking, direct lashing, top-over lashing or combinations of these).
- Each time cargo has been loaded, unloaded or redistributed, inspect the cargo and check for overloading and/or poorly balanced weight distribution before restarting.
- Ensure that the cargo is distributed in such a way that the centre of gravity of the total cargo lies as close as possible to the longitudinal axis and is kept as low as possible: heavier goods underneath and lighter goods on top.
- Check the cargo securing regularly, wherever possible, during the journey. The first check should preferably be done after a few kilometres drive at a safe place to stop. In addition the securing should also be checked after heavy braking or any other abnormal incident during driving.
- Wherever possible, use equipment which supports the securing of the cargo, such as friction mats, walking boards, straps, edge beams, etc.
- Ensure that the securing arrangements do not damage the goods being transported.
- Drive smoothly, i.e. adapt your speed to the circumstances so as to avoid sharp changes of direction and heavy braking. If you follow this advice, the forces exerted by the cargo will remain low and you should not encounter any problems.

Storage of equipment

Loose equipment, such as webbing, ropes, sheeting etc., should also be carried in a manner so as not to endanger other road users.

Never leave loose items such as steel bars, wooden chocks, chains, ropes, tools etc., unsecured.

Best practice is to have a separate locker in which to safely store these items when not being used.

See the following links to the HSA (Health and Safety Authority) website for further information on securing various types of loads.

https://www.hsa.ie/eng/Vehicles_at_Work/Load_Securing/Guidance_and_Publications/Curtain_Sided_Info_Sheet.pdf

https://www.hsa.ie/eng/Vehicles_at_Work/Load_Securing/Guidance_and_Publications/Site_Cabins_Info_Sheet.pdf

https://www.hsa.ie/eng/Vehicles_at_Work/Load_Securing/Guidance_and_Publications/Round_Timbers_Info_Sheet.pdf

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Information_Sheets/Safe_Load_Securing_of_Precast_Concrete_Loads.pdf

https://www.hsa.ie/eng/Publications_and_Forms/Publications/Information_Sheets/Safe_Load_Securing_of_Structural_Steel_Loads.pdf

Example of three point contact

Load Security Information Series - The Basics of Vehicle Load Security

This sheet gives basic information on securing loads on or in vehicles driven on the road. In this context, the term 'load' means any objects, tools, equipment, goods or cargo. The information is aimed at anyone who transports loads in any type of vehicle for work purposes.

Introduction

Loads carried in **any** vehicle, whether a motorbike, car, van, lorry, truck or trailer, should be secured so that they cannot move or fall off or out of the vehicle. Loose items such as a computer laptop on the rear car seat or tools in a vehicle cab are all potential missiles especially in a collision and can cause serious injury to the vehicle occupants, other road users and pedestrians. Loads must be secured even if the vehicle is only travelling a short distance or at low speeds.

What is Load Security?

Load security is a term used to cover load restraint and load containment.

- **Load restraint** means preventing the movement of the load in any direction in relation to the vehicle load bed.
- **Load containment** means preventing goods falling from the vehicle.

Unsecured loads can move in any direction (forward, backwards, sideways and even upwards). The weight of the load and the friction between the load and the vehicle are never enough to keep the load in place. Unsecured loads may become unstable during a journey and fall from a vehicle during unloading.

Loads must be secured so that they are unlikely to shift, fall, be dislodged or blown from the vehicle both during the journey and when the vehicle is being unloaded.

Why should loads be secured?

Unsecured or inadequately secured loads can injure and even kill people. Failure to secure a load properly can also result in financial losses due to damaged goods, vehicles, property and roads. Financial losses may also result from lost working time, clean up costs, time delays during unloading, legal costs and damage to company reputation.

Loads that are unsecured or inadequately secured often begin to move when the driver is accelerating, braking, going around corners or roundabouts, entering or exiting motorway slip roads or taking evasive action such as avoiding a collision. Sudden steering movements can also cause the load to move. Loads can move even at low speeds.

Drivers, vehicle occupants, other road users, pedestrians and anyone who may be involved in loading and unloading the vehicle may be at risk of injury.

- As well as being a distraction to the driver, shifting loads can make the vehicle unstable, result in loss of control of the vehicle and may cause the vehicle to overturn.
- Unsecured loads or objects may fall on or hit people and can cause road obstructions, traffic disruptions and collisions especially if drivers swerve to avoid fallen items.

HEALTH AND SAFETY AUTHORITY
www.hsa.ie

www.garda.ie

RSA
Údarás Um Shábháilteacht Ar Bhóithre
Road Safety Authority
www.rsa.ie

- Certain vehicle spillages may cause other vehicles to skid and lose control.
- Unrestrained goods may crash into the vehicle cab during emergency braking.
- Loads which have shifted may have to be manually removed from the vehicle which may increase the risk of an injury or a fall from the vehicle.

What Law applies to Load Security?

Load security is covered specifically by Road Traffic legislation, which requires that loads carried by vehicles must be properly secured at all times. It is an offence for a vehicle to be overloaded or to discharge material onto the public road.

Occupational Health and Safety legislation is also applicable to load security. Under the Safety, Health and Welfare at Work Act 2005 (No.10 of 2005):

- Employers must ensure systems of work are planned, performed and maintained for securing and transporting loads.
- Drivers, loading and unloading staff must also be provided with instruction, information and training about securing loads.
- Employers must ensure that adequate equipment is provided and maintained for securing loads.
- Appropriate plans and procedures must also be in place in the event of an emergency such as a load shifting.

The law also requires that employers co-operate, so where several parties are involved in ensuring the safe transport of a load, there should be adequate co-ordination and co-operation between the parties and clear responsibilities laid down.

Who is responsible for securing loads?

Load security is not the sole responsibility of the vehicle driver. Everyone has a role to play in ensuring that loads are transported safely.

- **Employers:** Must ensure that the vehicle is safe and suitable for the load being carried. They must also ensure that safe systems of work are in place for securing loads, that staff are trained and that during load securing the risk of people falling from the vehicle or suffering an injury is avoided or minimised.
- **Vehicle Owners:** If the vehicle is leased or rented, the company that owns the vehicle has a responsibility to ensure that the vehicle is safe and fit for purpose.
- **Loading & Unloading Staff:** Must be trained how to secure loads and competent to load and unload the vehicle safely.
- **The Driver:** On the road, the driver is responsible for the load so the driver should know how the vehicle has been loaded and how the load is secured. While carrying out the journey, the driver should check that the load is secure at regular intervals as the load may settle or move during the journey.

What do I use to secure loads?

Different loads will require different methods of securing for example, fastening straps, chains, adjustable brackets, sliding slatboards, use of dunnage, blocking or bracing. However, what works for one type of load will not necessarily work for another type. The vehicle must always be appropriate to carry the load and have suitable attachment points for chains, straps and other load securing devices. Whatever system is used it must not create an additional risk for people who have to use it. Carry out a risk assessment and select the safest and most appropriate method of securing the load. Consult the vehicle manufacturer, trade industry bodies and suppliers of proprietary load security systems who will be able to provide advice.

Where can I get further information?

- Visit **www.hsa.ie** for information on occupational health and safety or contact the Workplace Contact Unit at wcu@hsa.ie or **1890 289 389**.
- For information on Road Safety visit **www.rsa.ie** and **www.garda.ie**

HEALTH AND SAFETY AUTHORITY
www.hsa.ie

www.garda.ie

RSA
Údarás Um Shábháilteacht Ar Bhóithre
Road Safety Authority
www.rsa.ie

SELF-ASSESSMENT OF KNOWLEDGE

Please complete the following questions to help assess your understanding of the module so far:

Q1. What problems do the safe carriage of pallets present?

Your Response

Q2. What should pallets be checked for before loading?

Your Response

Q3. What is the safest way to enter or exit a vehicle?

Your Response

Q4. How should rolls or cylindrical items be secured?

Your Response

Q5. What should be provided to ensure weather protection for goods?

Your Response

Q6. What must you ensure about load anchorage points?

Your Response

Q7. What factors should be taken into account when securing a load on a vehicle?

Your Response

Q8. When carrying loose material in bulk on an open-sided vehicle, what should you do?

Your Response

Q9. When a load consists of different items, how should it be secured?

Your Response

Q10. When opening any laden vehicle, what should you be aware of?

Your Response

SECTION E – USE OF HANDLING EQUIPMENT

It should be remembered that any accessories or equipment, either permanently or temporarily carried by the vehicle, are also considered to be 'load' and as such their security is the responsibility of the driver. The damage that an unsecured stabiliser leg can do if it extends while the vehicle is in motion is enormous, and fatalities are not unknown. All ancillary machinery or equipment such as landing legs, loader cranes, tailgates etc. should be stowed and locked as per manufacturer's instructions prior to moving the vehicle. Any vehicle on which such a piece of equipment cannot be locked should not be used until the fault has been rectified. Loose chains on unladen skip vehicles should also be restrained so as not to present a hazard to other road users. Vehicles should never be driven, no matter how short a distance, with any equipment extended or in the unlocked position.

Tail lift

A tail lift is a mechanical device permanently fitted to the back of a vehicle, which is designed to facilitate the handling of goods from ground level or a loading dock to the level of the loading bed of the vehicle or vice versa. The majority of tail lifts are electro-hydraulic in operation.

Tail lifts are available for many sizes of vehicle, from standard vans to articulated lorries. There are two types of tail lifts available to operators, these are column lifts and cantilever lifts.

Example of tail lift

Column lifts

Column lifts run on tracks that are fitted to the rear of the vehicle. From the tracks a folding platform extends, which can be taken up and down. They are usually the easiest of the lift types to fit as they require little structural work. They also have the added advantage of being able to lift to a higher level than the load bed, and thus are more suitable for loads over one level in the truck. However they do have the disadvantage that the platform is usually only able to operate at a 90° angle from the truck, meaning that on uneven surfaces, the lift will not meet the ground properly.

Cantilever lifts

Cantilever lifts operate on an electro-hydraulic system. The system works by a set of rams attached to the chassis of the vehicle. These rams are on bushings, allowing them to move angle as they expand or contract. By using the rams in sequence, the working platform can either be tilted, or raised and lowered.

Cantilever lifts have the advantage of being able to tilt, which means they can often form a ramp arrangement, which may be more appropriate for some applications. It also means that it can be easier to load or unload on uneven ground. On some models, the ramp can be tucked away under the load bed of the vehicle, leaving the option of it not being used when at a loading ramp, and giving access and egress for operatives without the need to operate the lift.

Drivers should ensure that lifts are always operated as per the manufacturers instructions.

Drivers should be mindful of their personal safety, and of the safety of other persons in the vicinity, when operating a lift.

Pallet trucks

Drivers who operate pallet trucks should be aware that they can move when on an uphill or downhill slope.

Pallet trucks can carry more than a tonne and can cause serious injury if they move out of control.

Drivers who operate all power assisted lifting equipment such as lifts, forklifts, cranes, hoists, winches or any other type of loading equipment must have undertaken specific training on the equipment involved. Drivers must make themselves aware of the correct use of all such equipment and be conscious of their own safety and the safety of others at all times.

All lifting equipment must be inspected every twelve months and every six months if carrying persons.

Example of truck loading equipment

SELF-ASSESSMENT OF KNOWLEDGE

Please complete the following questions to help assess your understanding of the module so far:

Q1. On a vehicle equipped with a hoist, how can an unsecured stabiliser leg cause danger?

Your Response

Q2. What are the advantages of a cantilever lift?

Your Response

Q3. What must the operator of a tail lift have undertaken?

Your Response

Q4. How should chains on unladen skip lorries be secured?

Your Response

Q5. What should you be aware of when operating a pallet truck?

Your Response

SECTION F – DEFENSIVE DRIVING

As a professional driver you have a major role to play in ensuring that accidents are prevented. You must demonstrate a high degree of skill and expertise and drive your vehicle in a safe and responsible manner at all times. You must adopt a responsible attitude towards all road users, and ensure that your vehicle is always travelling at the correct speed, is always in the correct position on the road and that you are always ready for the next manoeuvre. The sheer size, noise and appearance of a truck can be intimidating to cyclists, motorcyclists, pedestrians and even car drivers. Never use the size of your vehicle in an aggressive way. A truck driver should create the best possible image by setting a good example to other road users. Driving large vehicles can be very enjoyable – even more so when you can be proud that you are doing it well. You should always have an idea of how other road users see you. They may not realize why you are adopting a certain position on the road and that you need that space to negotiate and complete a manoeuvre. Becoming impatient with other road users won't make your working life easier. Remaining calm will lead to a safer and more pleasant working environment for you.

Safe Driving Practices

A professional truck driver must always apply safe driving practices which should include the following:

- Looking after yourself (health, fitness, diet, proper rest, etc.);
- Looking after your vehicle and any load which is being carried (completing walkaround and load securing checks, vehicle maintenance, security, documentation);
- Looking after any other drivers, helpers or assistants at loading depots (considering their safety and comfort);
- Planning journeys well ahead (considering routes in advance);
- Practicing good observation (near, middle, far distance, mirrors, blind spots, being alert);
- Maintaining control (using experience);
- Eco-driving (reducing fuel consumption and wear and tear, looking after the environment);
- Being aware of vehicle tailswing and cut-in;
- Being aware of the dangers which your mirrors can cause; (pedestrians, cyclists, other vehicles);
- Wear the seatbelt if one is fitted; (any passenger should also wear a seatbelt if fitted)

Defensive Driving - Planning and Observing

Because you share the road with other drivers, you need to be aware of other road users all the time to know what other traffic is doing. You need to know the size of your vehicle and how it handles so you can always have enough space between your vehicle and others that can accelerate and brake more quickly than you can.

Lane markings are set up to leave plenty of room for smaller vehicles. For bigger vehicles, space can be restricted. **Special skill is required to share the road safely**.

You need to be observant and to constantly scan the near, middle and far distance.

Check in all directions around your lane. Failure to do so is a major cause of crashes.

Large vehicle drivers need to look further ahead because stopping, changing lanes and turning takes more time in a large vehicle.

You need more time to get ready to stop or move left or right. You need to look well ahead to be ready to make these moves safely.

Looking well ahead also gives you better fuel economy by enabling you to maintain a steady speed. You will be able to plan when to change lanes to avoid slow traffic and broken down vehicles. Even when you cannot change lanes you can ease off the accelerator. This puts less wear

and tear on you and your vehicle. Harsh braking is hard on you, and your vehicle, and wastes fuel.

How far ahead you should look

Because large vehicles take a longer time to slow down and stop, you should know what is on the road ahead. On the open road you should plan to meet road and traffic situations as far ahead as possible. If you are not planning that far ahead you may have to stop quickly or change lanes suddenly.

You have to notice things closer to you, on each side and behind you. Check both sides, especially in your mirrors, and near and far ahead of your vehicle all the time.

In a large vehicle you have the advantage of being higher, so you can see further down the road than the driver of a smaller vehicle. You can usually also see over the top of the vehicle in front of you.

However, the height of your vehicle can also be a problem. Know how high your vehicle is and watch for low bridges, telephone and electricity wires.

Hazard Identification

A hazard is anything with the potential to cause harm. It can be something that causes you to alter your position on the road, or to slow down or stop.

Driver error is a feature of nearly all collisions on the road.

There are predominantly three types of hazard

Stationary hazards include:

- Junctions
- Low bridges
- Low cables
- Railway crossings
- Road surface/works
- Temporary traffic lights
- Traffic islands
- Road signs
- Tram crossings and tram infrastructure
- Street furniture, e.g. lamp-posts, bins, bollards
- Pedestrian/zebra crossings
- Tunnels
- Speed humps/pinch points

Moving hazards include:

- Rear-view mirrors (striking pedestrians or cyclists)
- Pedestrians
- Cyclists
- Motor cyclists
- Other vehicles
- Animals

Environmental hazards include:

- Snow
- Ice
- High winds, etc.
- Low sun
- Rain
- Glare
- Shadows
- Hedges
- Road surface conditions – floods, oil slick, potholes, mud, leaves, chippings, gravel.

Traffic

Watch for vehicles entering the road in front of you. Watch out for vehicles ahead changing lane or turning.

Look for other vehicles' indicators, brake lights or movements. By checking these things you can anticipate and adjust your speed or change lanes to avoid problems.

Subject to the speed limits, you should always drive at a speed which will enable you to stop your vehicle safely within the distance you can see to be clear.

Road conditions

Watch for hills, curves or merging lanes. Watch for vehicles ahead, changes of width in the road and other situations for which you may need to slow down or change lanes.

The risk of losing control of a vehicle can increase as a result of deterioration in the road such as potholes, wheel ruts or grooves, slippery surfaces, loose gravel and weather conditions. Always try to be aware of the road surface conditions and if necessary adjust your driving technique according to the conditions.

Jack-Knife

The term 'Jack-knife' is commonly used to describe a particular type of accident which relates solely to vehicles towing trailers. Therefore it relates to all vehicles in classes BE, C1E, CE, D1E and DE. A jack-knife occurs when the drive wheels of the drawing vehicle lose adhesion with the road. This may occur for one of two reasons - when the drive wheels spin, or when the drive wheels lock-up. The two causes of vehicle jack-knife are separate and distinct - the first is called a 'Power Jack-knife' and the second is called a 'Brake Jack-knife'.

Power Jack-knife

A Power Jack-knife occurs when the drive wheels on the drawing vehicle spin excessively, causing

adhesion with the road to be lost. When this happens, the tractive unit will turn into the side of the trailer. Common places for a Power Jack-knife to occur are when negotiating a roundabout, or when heavy acceleration is applied when overtaking. Road conditions and the weight of the vehicle can increase the potential for a Power Jack-knife. Other contributing factors such as an oil spill can cause the wheels to spin even at low speeds. It is possible to recover from a Power Jack-knife, by releasing the throttle and correcting the steering, then gently re-applying the throttle.

Brake Jack-knife

A Brake jack-knife is caused by the drive wheels on the tractive unit locking under excessive braking. The trailer then pushes through to either side of the tractor unit. The possibility of recovering from a Brake jack-knife is remote. As with the Power jack-knife, road conditions play an important part in the likelihood of this occurring.

Trailer Swing

While trailer-swing is often confused with jack-knifing, its causes and effects are different. Trailer swing occurs when the trailer wheels lock under hard braking. The tractor unit remains straight but the trailer swings around to either side of the truck. When this occurs, the trailer can swing across the road in front of oncoming traffic or swing to mount the near-side footpath

Check for road signs and traffic signals

Be aware of advance warning signs, temporary signs and electronic messages.

If a traffic light has been green for some time as you approach, prepare to stop in case it changes to red before you get to it.

Beware of vehicles moving off too soon on the intersecting road.

If a light has been red for some time, slow down on the approach. It could turn to green before you get there and then you may not have to stop, but beware of vehicles running the red light on the intersecting road.

Where there are parked vehicles, keep a special lookout for:

- Vehicles leaving the kerb;
- Vehicles leaving driveways;
- Pedestrians crossing from between parked vehicles;
- Children – who are smaller, harder to see and may be less cautious than adults.

Good professional drivers recognise hazards, understand how to expect them and then act in time to avoid any danger.

Other road users

As a driver of a large vehicle you must be aware of the effect your vehicle has on other road users. For example, your vehicle creates air turbulence when travelling along, and will have an effect on other road users when you pass them. It may greatly affect:

- Cyclists
- Pedestrians
- Motorcycles
- Horse riders
- Older people
- Children
- People with a disability

At all times, be aware of the dangers which your rear-view mirrors can pose for those road users.

You should also be aware of the effects of air turbulence on :

- Cars
- Caravans
- Other buses and trucks
- Mobility scooters

Other road users may not know how long it takes you to stop. They can misjudge your speed, so you have to make allowances for other drivers' mistakes.

Cyclists

Cyclists are among the most vulnerable of road users. They have no protection, and in the event of a collision the consequences can be very serious.

Truck drivers are likely to interact many times with cyclists during the course of a journey, especially in urban areas, and should be extra vigilant once they observe them in the distance or in the vicinity of their vehicle.

In darkness or in poor light, cyclists can be hard to see in the distance, and equally hard to track in your mirrors.

Truck drivers should constantly anticipate what cyclists may do, as they may be obscured from view and may suddenly reappear at a time when your attention could be elsewhere.

The following are some key points to remember when encountering cyclists.

Before moving off check your mirrors for overtaking cyclists - remember your blind spots.

Always check your nearside mirror before turning left, or where the rear of your truck might enter a Cycle Lane.

Remember how close your nearside mirror may be to the head strike zone of cyclists.

Give cyclists plenty of room, they may need to avoid drain covers or other hazards and can easily be blown off course by wind or rain.

Moderate your speed when overtaking – be extra careful when they are cycling uphill or when they are approaching parked vehicles.

Trucks displace a lot of air, and turbulence can cause a cyclist to wobble. Make sure you're well past them before moving back to the left.

Don't travel too close when following a cyclist, it could make them nervous and it's possible that they may feel intimidated and stop suddenly, and you may not be able to stop in time, or may have to brake harshly.

Be aware where cycle lanes merge and diverge with mainstream traffic lanes.

Be patient. Never forget how vulnerable a cyclist can be.

Be aware that cyclists may come up on your nearside or offside.

Look for clues. If you see a cyclist ahead glance around to the right, they are probably going to try to turn right into the next road. Be ready for it.

Take extra care when:

- Crossing cycle lanes;
- You can see a cyclist near the rear of your vehicle;
- Moving up along the nearside as you're about to turn left;
- Approaching any children on cycles if there are gusty wind conditions.

Many junctions now have an advanced Stop Line for cyclists. These allow the cyclists to stop ahead of traffic so that they may be more easily seen by drivers.

Example of recommended cyclist clearance at 50 km/h or less.

Example of recommended cyclist clearance at over 50 km/h.

Pedestrians, older people and children

These are also among some of the most vulnerable of road users. You must watch the actions of pedestrians as they approach kerbs and cross the road. Older people and children sometimes change direction suddenly, step out, or even turn back.

Pedestrians
You must always yield to pedestrians:

- already crossing at a junction;
- on a zebra crossing;
- on a pelican crossing when the amber light is flashing, and
- when you are moving off from a stationary position.

To avoid doubt and in the interest of road safety a vehicle should always yield to pedestrians.

Older people and people with a disability
Be aware that their reactions may not be as fast as younger people. They may

- have mobility difficulties
- be hard of hearing and/or
- be visually impaired.

Children
By their nature, children are impetuous and have less experience than other people in using the roads, so you should make extra allowances for their behaviour.

Take extra care when you are:

- driving beside footpaths where there are young children
- coming out from junctions
- driving near schools and play areas
- reversing - you cannot see a small child behind your vehicle through your mirror. If in doubt, get out and check
- driving towards children who are walking or cycling

Mirrors

Your vehicle must have mirrors/mirror-cams fitted so that you can always be aware of what is behind (rear-view) and to each side. You must also check your mirrors when you change lanes, turn, merge into traffic, go through tight spaces and when other traffic is merging into your lane.

On large vehicles the fitment of a front mirror, often called a 'cyclops' mirror, has the potential to reduce fatalities and serious injuries from collisions between HGVs and cyclists or pedestrians by enabling the driver to see into areas which were previously blind spots.

HGVs must have 'cyclops' and wide-angle mirrors fitted to reduce 'blind spots' and protect pedestrians and cyclists to the front and sides of the vehicles.

HGV's registered since 2007 are obliged to have these safety enhancing mirrors.

From the 1st October 2012 the HGV annual roadworthiness test includes a check for compliance with the new regulations.

Example of cyclops mirrors

Example of blind spot

You must use your vehicles mirrors before moving off, changing lanes, overtaking, slowing down, stopping, turning, or opening doors.

In addition you should check your mirrors regularly whilst driving to maintain a picture of what is going on beside and behind your vehicle.

Clear vision: As with lights and reflectors, you must keep your mirrors clean, in good condition and correctly positioned to make sure they are effective.

Regular mirror checks

Use all mirrors to monitor traffic beside and behind you. It requires practice to use mirrors well.

Glance in your mirrors often. However, when you are looking in your mirror you are not looking ahead.

When you are travelling at 80km/h, you will have travelled nearly 22 metres in 1 second.

Glance quickly at all mirrors and back at the road ahead. Do not normally glance in mirrors for more than a second at a time. Make sure that you understand what you see in your mirrors. Do not go from one mirror to another without first placing your eyes back on the road. Use the mirrors to check that your vehicle is straight and not drifting to one side.

Ensure that your rear-view mirrors do not strike pedestrians or cyclists.

You must also check your mirrors when you change lanes, turn, merge into traffic, go through tight spaces and when other traffic is merging into your lane.

Changing lanes: Before you change lanes, check your mirrors to make sure no one is beside you, or is about to overtake you.

Check to be sure that:

- There is enough space;
- Your path is clear.

Then look, indicate and look again just before you change lane.

Turns: As you make a right turn, check your mirrors to make sure you will not hit any stationary vehicles parked or stopped close to the corner of the street you are turning into. Remember to allow space for the tailswing and cut-in of your vehicle.

As you make a left turn, use your left mirrors in particular, but not exclusively. Other mirrors should also be used. Check that your rear wheels do not mount the kerb, strike a post, or hit a parked vehicle.

Also be very careful to check that a car, jogger, cyclist or motorcyclist is not trying to overtake you on the left side.

Merge: When you are about to merge lanes, use your mirrors to check that there is enough room for you to enter your new lane safely. Traffic behind may have increased speed or changed lanes,

shortening the gap so that there is less room for your move.

Tight manoeuvres: When driving through a busy crossroads or narrow road, keep checking your mirrors to make sure you can get the full length of your vehicle through without hitting anything.

MirrorCams

Mirror Cams are increasingly replacing the conventional side mirrors on trucks and buses. The systems combine externally mounted digital cameras with display screens to provide the driver with an improved view of the areas to each side of the vehicle.

In addition to improving road safety, the elimination of large external mirrors reduces fuel consumption by reducing aerodynamic drag. The images captured are generally displayed on high resolution screens mounted inside the cab within the driver's field of vision. This gives the driver clear view past the pillars which has hitherto been impeded by external mirrors.

When driving forward, the normal field of view to each side of the truck is shown on the screens, as with conventional mirrors. However, when turning with an articulated unit the camera pivots so that the image on the screen provides a view of the entire length of any trailer/s being drawn.

The cameras consistently deliver a high resolution image, and due to their low light sensitivity, they help to reduce glare and provide enhanced visibility in rain compared to standard glass mirrors. When driving at night or when entering/exiting a tunnel, the system will adjust brightness of the displays automatically to compensate for the changing conditions. Depending on the manufacturer a driver may be able to customise a number of functions to suit their personal preference.

Another benefit allows the system to be activated when the driver is resting or sleeping and this means the driver can check the area around the vehicle via the screens while remaining in the cab. If an attempt is being made to interfere with the vehicle, this gives the driver an opportunity to raise the alarm.

Important Note:
Some mirror cam systems are not currently approved for use with certain types of ADR transports. It is advisable to check with the manufacturer/s to ensure compatibility of any system with the transport operation.

Example of Mirror Cam screens

Windscreens

Laminated glass must be used for the windscreens of motor vehicles registered since January 1986. It must also be used when replacing damaged windscreens of older vehicles.

Windscreen wipers: Keep your windscreen wipers and wiper blades in good working condition and keep your windscreen washer liquid topped up.

Clear vision: Keep your windscreen and windows clean and free of clutter to make sure you can see the road and other road users clearly.

Driving at night

When driving at night, it is important to use your headlights correctly to avoid dazzling other road users.

Ensure your lights and reflectors are clean, properly focused and in good working order. Give yourself time to adjust to dark conditions and remember it is more difficult to judge speed and distances at night and in dark conditions.

If you are dazzled, slow down and stop if necessary. If the dazzle is from an oncoming vehicle, avoid it by looking towards the verge (edge of your side of the road) until the vehicle has passed. If the dazzle is from a vehicle behind you and reflected in your mirrors, move your head out of the line of dazzle.

Always watch for pedestrians or cyclists on your side of the road – they may be unlit or wearing dark clothing and be all but invisible.

Route planning

Plan your route carefully. It's never advisable to take short cuts through residential or narrow streets to try to avoid traffic congestion.

In some towns, weight, size and other vehicle restrictions prohibit you from leaving the main through-routes and ring roads.

Clearways

These are roads where stopping is not allowed for any purpose (except for traffic reasons) or an area of road that must be kept clear for moving traffic during certain times of the day (usually busy periods).The times when stopping or parking is prohibited are shown on an information plate under the Clearway sign. Other vehicles may stop during these times only if they are waiting in a line of traffic, but they are not allowed to park, even if disc or metered parking is normally available.

Buses are allowed to stop to pick up or set down passengers at designated bus stops.

Roundabouts

When approaching a roundabout, decide as early as possible which exit you need to take. Take note of and act on all the information available to you from traffic signs, traffic lights and road markings that direct you into the correct lane for your intended exit. When negotiating roundabouts, follow the normal procedure of yielding right of way to the traffic already on the roundabout and traffic coming from the right. Be sure before you enter a roundabout that the traffic ahead of you has moved on so that you can enter the roundabout fully without blocking the flow of traffic from another road. Remember your vehicle is much longer and will need extra clearance to fit onto a roundabout safely.

Not every roundabout is the same.

They are different shapes and sizes and can have different numbers of exits. Some are controlled by traffic lights. Regardless of the size of roundabouts, the general rules below must be applied.

The purpose of a roundabout is to:

- reduce delays – traffic flows smoothly compared to the stop and go traffic at normal intersections such as at traffic lights;
- significantly reduce the risk of collisions;
- reduce pollution – emissions from vehicles on roundabouts are less than they would be at traffic light junctions.

Golden rule

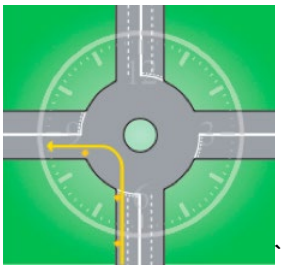
This 'golden rule' should help motorists to drive safely at any roundabout regardless of the number of exits: Think of the roundabout as a clock.

- If taking any exit from the 6 o'clock to the 12 o'clock position, motorists should generally approach in the left-hand lane.
- If taking any exit between the 12 o'clock to the 6 o'clock positions, motorists should generally approach in the right-hand lane.
- If there are road markings showing you what lane you should be in, follow those directions. Traffic conditions might sometimes mean you have to take a different approach but, in the main, the 'golden rule' will help you to drive safely on almost any roundabout.

Approaching a roundabout

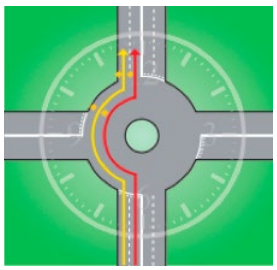
- Conditions at roundabouts may vary. When you are coming up to a roundabout, look for directional arrows, road markings or signs which might be indicating which lane you should use for the exit you're taking.
- Move into the correct lane in good time. Use the 12 o'clock 'golden rule' to help you plan a safe course of action unless road signs or road markings indicate otherwise.
- Treat the roundabout as a junction. You must yield to traffic coming from the right or already on the roundabout, but keep moving if the way is clear.
- Mini roundabouts must be regarded the same way as larger roundabouts.

Making a left turn



- Approach in the left-hand lane, indicate 'left' as you approach, and continue until you have taken the left exit.

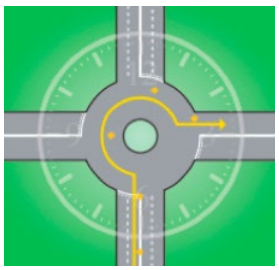
Going straight ahead (any exit between 6 o'clock and the 12 o'clock position)



Approach in the left-hand lane (unless road markings say otherwise) but do not indicate 'left' until you have passed the exit before the one you intend to take.

Where traffic conditions dictate otherwise, for example a long line of traffic in the left lane signalling left or roadworks in the left lane, you may follow the course shown by the red line in the diagram. When leaving the roundabout take extra care at all exits, checking for other road users – for example, cyclists and motorcyclists who may be continuing on the roundabout.

Taking any later exits (those from 12 o'clock to the 6 o'clock position)



Approach in the right-hand lane (unless road markings say otherwise), indicate 'right' on your approach and leave your indicator on until you have passed the exit before the one you intend to take. Then change to the 'left' turn indicator. Move over towards the left on the roundabout and continue signalling left to leave.

In all cases watch out for and give plenty of room to:

- pedestrians who may be crossing the approach and exit roads
- traffic crossing in front of you on the roundabout, especially vehicles intending to leave by the next exit
- traffic that may be straddling lanes or positioned incorrectly
- motorcyclists, cyclists and horse riders who may stay in the left-hand lane and signal right if they intend to continue round the roundabout
- long vehicles (including those towing trailers), which might have to take a different course approaching or on the roundabout because of their length. Watch out for their signals.

Remember;

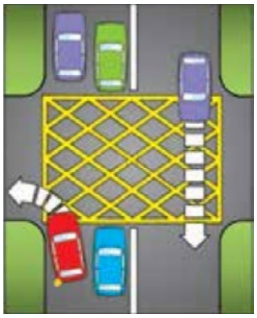
Conditions at roundabouts may vary. Exercise caution at all times. In particular, be aware of traffic signs, traffic lights, road markings and traffic coming from your right when approaching roundabouts.

Yellow box junctions.

You must not enter a yellow box junction unless you can clear it without stopping.

An exception may be when you are turning right when you may enter it while waiting for a gap in traffic coming from the opposite direction.

Yellow box junctions can also be found at railway level crossings and at tramway crossings.



Motorway driving

Accident records show that, statistically, motorways are the safest roads.

However, motorway accidents often involve several fast-moving vehicles and consequently result in more serious injuries and damage than accidents on other roads. Because of the high numbers of large vehicles using motorways many of these accidents involve trucks and, occasionally, coaches and minibuses.

There's often little room for error when driving at speed on a motorway. The generally higher speeds and the volume of traffic mean that conditions can change much more quickly on motorways than on other roads. Because of this you need to be:

- Totally alert
- Physically fit
- Concentrating fully
- Assessing well ahead.

If you aren't, you may fail to react quickly enough to any sudden change in traffic conditions.

Joining a Motorway

Before joining the motorway try to assess the traffic conditions on the motorway itself. You may be able to do this as you approach from a distance or, if not, just before joining it. Get as much advance information as you can to help you to plan your speed on the slip road before reaching the acceleration lane. You must give way to traffic already on the main carriageway. Plan your approach so that you don't have to stop at the end of the acceleration lane. Never use the size or speed of your vehicle to force your way onto the motorway. You must maintain all-round observation to ensure that you correctly assess the speed of any approaching traffic.

When entering the motorway, exercise care and attention, and yield to traffic already on the motorway. Use the mirror/signal/manoeuvre/position/speed and look routine. A quick sideways glance might be necessary to verify the position of other vehicles.

You must follow the steps below when joining a motorway.

- Use the acceleration lane to build up your speed before merging into traffic on the motorway.
- Use your mirrors and signal early to other motorists that you intend to merge.
- As you approach on the slip road, check in your mirrors and your blind spots for a safe gap in traffic on the motorway.
- Obey road signs and road markings.
- Do not drive on hatch markings before merging into traffic on the motorway.
- Give way to traffic already on the motorway.
- Adjust your speed as you join the motorway so you match, as near as possible, the general speed of traffic in that lane.
- Treat each lane change as a separate manoeuvre.
- Stay in the left-hand lane long enough to adjust to the speed of traffic before attempting to overtake.

You must not;

- Pull out into the path of traffic in lane 1 if this would cause it to slow down or swerve.
- Drive along the hard shoulder to "filter" into lane 1.
- Stop on a Motorway.
- Use the hard shoulder to stop except in case of emergency.
- Use a red warning triangle on a Motorway.

Using lanes properly

It is very important that you understand the purpose of each lane on a motorway. To help explain how and when to move from one lane to another, each lane is given a number. The diagram on page 55 shows that Lane 1 is the lane nearest the auxiliary lane or hard shoulder. (This is also known as the 'inside lane'). On a two-lane motorway, the lane nearest the central median is Lane 2 (also called the 'outside lane'). On a three-lane motorway, this lane is Lane 3.

Lane 1

The normal 'keep left' rule applies. Stay in this lane unless you are overtaking.

Lane 2

On a two-lane motorway, use this for overtaking only and move back into Lane 1 when you have finished. You may also use this lane to accommodate traffic merging from the left.

On a three-lane motorway, you may stay in this centre lane while there is slower moving traffic in Lane 1.

Lane 3

If you are travelling on a three-lane motorway, you must use this lane only if traffic in lanes 1 and 2 is moving in queues and you need to overtake or accommodate merging traffic. Once you've finished overtaking, move back to your left and allow faster traffic coming from behind to pass by.

You must not use the lane nearest the central median, that is, the outside lane (Lane 2 or Lane 3, depending on the number of lanes), if you are driving:

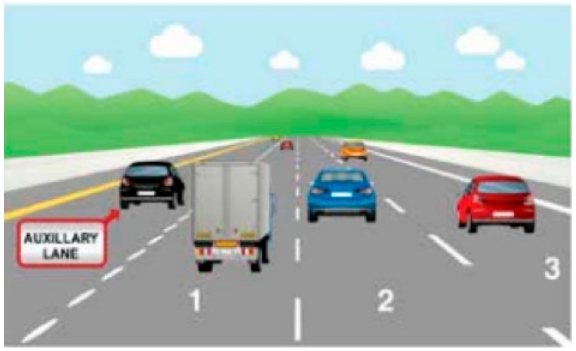
- a goods vehicle with a maximum authorised mass of more than 3,500 kilograms, such as a lorry or heavy goods vehicle;
- a vehicle towing a trailer, horsebox or caravan;
- a single or double deck bus or coach that is designed for carrying standing passengers.

It is a fixed-charge offence of up to €120 and 3 penalty points for a vehicle listed above to drive on the outside lane of a motorway (which may be Lane 2 or Lane 3, depending on the number of lanes). You may use it, however, in exceptional circumstances when you cannot proceed in the inner lane because of an obstruction ahead.

An obstruction is not slow (or slower) moving traffic.

A single or double-deck bus or coach that is not designed for carrying standing passengers may travel in the outside lane of a motorway and a driver of such a vehicle will not be guilty of an offence if they do so.

Auxiliary lane



These are normally identified by a broken white line to the right of the auxiliary lane, with markings that are shorter, closer and wider than the broken white lines normally seen in lane 1, 2 or 3. When joining the motorway, you may use this lane to adjust your speed before entering (Lane 1), or you may stay in this lane if you intend to exit the motorway at the next exit. If you do not intend to take the next exit off the motorway, you should join the main section of the motorway (Lane 1) to continue your journey. If you are already driving on the motorway (Lane 1) and you intend to take the next exit off the motorway, you may then enter the auxiliary lane (Lane A). If you are already driving on the main section of motorway (Lane 1, 2 or 3), you should not enter (Lane A) if your intention is not to leave the motorway at the next exit (unless instructed to do so by the Gardaí or Emergency Service personnel).

Emergency closure of sections on the Motorway.

The signs shown on page 56 are widely and successfully used on the motorway network throughout Europe and are strategically placed to inform motorists of an emergency or alternative diversion route for motorways. There are four shapes — square, triangle, circle and diamond — but each can be shown filled or in outline, making eight distinct symbols. Close to motorway junctions, and on roads near to or following the line of a motorway, they are commonly placed on direction signs. If a motorway is closed, e.g., because of a collision, the Gardaí will close the road at the previous junction and compel traffic to leave the motorway. These signs instruct motorists to follow a particular symbol in order to re-join the motorway at the next junction. Diversion routes are carefully chosen to follow roads of a suitable standard and width to carry all motorway traffic, and may make detours to avoid low bridges or other obstructions.

Assigning of Diversion Symbols;

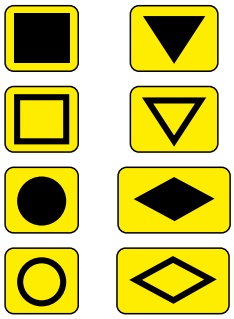
As the diversion route will generally be travelled in both directions a different symbol will be assigned to each direction of the diversion route to reduce the possibility of driver confusion at junctions along the route. Typically the solid symbols will be used in preference to the hollow symbols due to visibility and for use on Variable Message Signs (VMS). However, this will not always be achievable where multiple diversion routes interface at shared locations.

As a truck driver, you must always be aware of your speed and judge the appropriate speed for your vehicle, taking into account the driving conditions, other users of the road, current weather conditions, all possible hazards and speed limits.

If you are driving outside the country, different speed limits may apply. You must ensure that you

are familiar with the national speed limits for your vehicle type.

The breaking of speed limits can attract penalty points on your driving licence, and a fine.



Example of Motorway diversion signs

For additional Information on 'Motorway Driving' go to:
http://rsa.ie/Documents/Road%20Safety/Leaflets/Leaf_booklets/motorway_driving.pdf

Motorway – Dual carriageway Speed Limits

1. **HGVs;- The ordinary speed limit for HGVs is increased to 90 km/h on motorways where no lower speed limit is in place.**
   You must not use the lane nearest the central median, that is, the outside lane (lane 2 or lane 3, depending on the number of lanes), if you are driving; a goods vehicle with a maximum authorised mass of more than 3,500 kilograms, such as a lorry or heavy goods vehicle, or a vehicle towing a trailer, horsebox or caravan. See Appendix 5 on Page 89 for details of the penalty points offence of driving a vehicle subject to an ordinary speed limit of 90 km/h or less on the outside lane of a motorway. You may use it, however, in exceptional circumstances when you cannot proceed in the inner lane because of an obstruction ahead e.g. broken down vehicle, roadworks, etc.
2. The ordinary speed limit for HGVs is 80km/h on a dual carriageway. A HGV may use the outside lane of a dual carriageway.
3. **Buses;- The ordinary speed limit for buses is increased to 100km/h on motorways and dual carriageways where no lower speed limit is in place.**
   However, see restriction below relating to vehicles designed to carry standing passengers and Appendix 5 on Page 89 for details of the penalty points offence of driving a vehicle subject to an ordinary speed limit of 90 km/h or less on the outside lane of a motorway.
4. Buses not designed to carry standing passengers may use the outside lane of a motorway or dual carriageway.

Type of Vehicle	Built up Areas	Regional or Local Roads	Ordinary Speed limit on National Roads (Primary or Secondary)	Ordinary Speed limit on a Dual Carriageway	Ordinary Speed limit on a Motorway	Permitted in outside lane of a Dual carriageway	Permitted in outside lane of a Motorway
Car or Motorcycle	50 km/h	80 km/h	100Km/h	100 km/h	120 km/h	Yes	Yes
Bus/coach	50 km/h	80 km/h	80 km/h	100 km/h	100 km/h	Yes	Yes
Bus (designed to carry standing passengers)	50 km/h	65 km/h	65 km/h	65 km/h	65 km/h	Yes	NO. See list of Penalty Points and Fixed Charge Notices and Note 3 above.
Truck	50 km/h	80 km/h	80 km/h	80 km/h	90 km/h	Yes	No (See list of Penalty Points and Fixed Charge Notices and Note 1 above)

This table is provided for information purposes only. Drivers should always refer to the most recent version of the Rules of the Road.

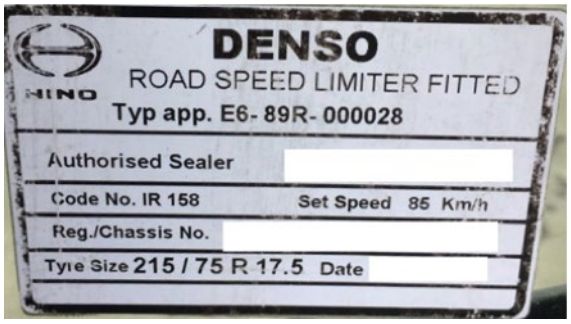
Speed limiters

Regulations provide that goods vehicles over 3.5 tonnes design gross vehicle weight (MAM) and passenger vehicles having more than 8 passenger seats must be fitted with speed limitation devices so that their speed may not exceed 90 km/h and 100 km/h respectively.

Vehicles fitted with a speed limiter must be fitted with a plate in the drivers compartment displayed

in a conspicuous position which must show clearly and indelibly

- the words “speed limiter fitted”,
- details of the type approval authority and the national or international approval mark,
- the type approval number,
- the name of the authorised sealer and the code number assigned to the authorised sealer by the approved body,
- the set speed, expressed in kilometres per hour, at which the speed limitation device has been set,
- the tyre size on the drive axle or axles,
- the date on which the speed limitation device was most recently sealed, and
- the vehicle registration number or, in the case of an unregistered vehicle, the chassis number.



Example of Speed Limiter plate

Driving time

Fatigue and speeding are common causes of accidents among drivers of lorries, coaches and company cars. Work-related road accidents are the leading cause of death at the workplace in industrialised countries.

Driver fatigue is a significant factor in a high percentage of heavy commercial vehicle crashes.

EU laws regulate the driving time of professional truck drivers where part or all of the journey is in EU territory.

Break times

After a driving period of no more than 4.5 hours, a driver must take a break of at least 45 minutes.

A full 45 minute break can be replaced by a 15 minute plus a 30 minute break, but must be distributed over the 4.5 hour period.

The maximum driving time in any two consecutive weeks is 90 hours.

The maximum weekly driving limit is 56 hours.

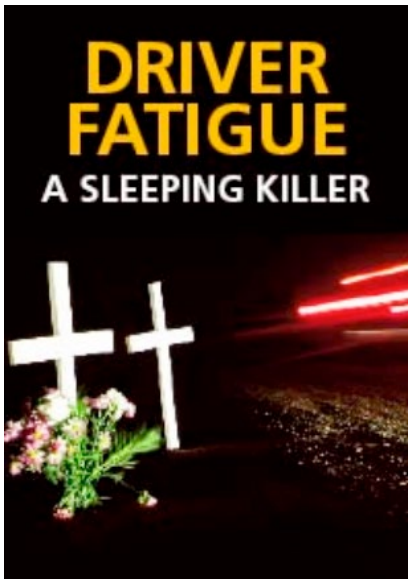
Example of tachograph card

Operators and drivers must complete an Attestation of Activities form to account for any time out of scope of the Drivers Hours regulations.

Road Transport Working Time Directive

Under the RTWTD (Road Transport Working Time Directive) which applies to drivers in scope of the Drivers Hours rules, drivers must never exceed a maximum working time (driving plus other work) of sixty hours in a week. Based on a standard reference period of seventeen weeks a driver must not exceed an average of forty- eight hours per week.

Where drivers are out of scope of the Drivers Hour rules the Organisation of Working Time Act 1997 is applicable.



Stopping distance

Stopping distances should take the following into account;-

- Tyres and brakes
- Road conditions
- Weather conditions
- Speed
- Vehicle laden or unladen
- Vehicle reaction time
- Vehicle braking ability

Remember

- Perception time and reaction time
- A smaller vehicle in front of you can probably stop more quickly than you can;
- It can take between 2 and 3 seconds for you to see a problem ahead and get your foot to the brake pedal.

So it could be as long as 3 seconds after you've seen a problem ahead of you, before your vehicle begins to slow down. In that 3 seconds at just 60km/h your vehicle will have travelled an extra 51 metres (60km/h is the same as 17 metres per second). At a higher speed you will have travelled even further.

If the road is wet, traffic is heavy, or vision is restricted, double the gap between your vehicle and the one in front. In icy or slippery conditions allow up to 10 times the normal gap.

Space around your vehicle

When driving you need space all around your vehicle. Space gives you time to stop. Space gives you time to check your mirror and make a lane change. Manage your space all the time. That way you will have space around you should things go wrong. All drivers should do this, but it is more important for drivers of large vehicles. These vehicles take up more space on the road and need more space to stop and turn.

Space in front

You need enough space in front so you can always stop safely and avoid crashing into the vehicle in front.

This also allows you to slow down gradually so that a vehicle behind you does not crash into the back of your vehicle.

Space behind your vehicle

You cannot force other vehicles to stay a safe distance behind you but you can make sure that you do the best you can in managing space around your vehicle.

Large vehicles are often tailgated when they cannot go as fast as other traffic, for example when going up a hill (tailgating is when another vehicle drives too closely behind you). In this situation, stay as far left as you can. Use slow vehicle lanes and do not overtake other vehicles unless you can do so quickly without hindering other traffic.

On multi-lane roads you must stay left unless you can safely overtake.

Space around the sides of your vehicle

The wider a vehicle is the more space it needs on either side. Lanes on some roads are wide enough for cars but may not be wide enough for heavy vehicles.

To keep a margin of safety on both sides, drive in the centre of your lane.

You may have to adjust your lane position to accommodate other road users whenever

- Another vehicle is approaching;
- Another vehicle is overtaking you;
- You are overtaking another vehicle.

Only move to the left of the lane to allow a vehicle approaching from the other direction more room if you are sure it is safe.

Travelling beside other vehicles

If you are travelling beside other vehicles keep in mind that:

- Another vehicle could change lanes suddenly and sideswipe your vehicle;
- You could be trapped in a lane when you need to change to another lane;
- The other drivers may not be able to see you in their mirrors. Be aware of their blind spots.

The best way to avoid these problems is to drive in the open and not in a convoy of vehicles. If traffic is too heavy to find an open space, try and keep as much space as possible between you and other vehicles. Drop back or pull forward to make sure that other drivers know that you are there. When it is safe to do so, stay in the left lane. Watch out for merging cycle lanes.

Space above your vehicle

Colliding with overhead objects causes damage to vehicles as well as to the object.

It can cause crashes involving other vehicles. Know the height of your vehicle and load. Be cautious when going under trees, bridges, overhead signs,

traffic lights, power lines and other wires. If you are not sure your vehicle will fit, stop and check.

When driving remember

- Check the height of wires and cables.
- Your vehicle might tilt to the left, because of the road's camber (slope) or different levels of surfacing.

Be careful of trees, signposts and electrical power-lines along the side of the road. You may have to drive closer to the centre of the road to clear them.

Space below your vehicle

Do not forget the space beneath your vehicle. When a vehicle is laden, especially a deep frame type, there is not much clearance underneath.

Watch out for:

- Railway tracks: They can extend above the road surface.
- Soft surfaces: Make sure that a soft surface will support the weight of your vehicle.
- Speed control ramps. These can vary in height, width, length and angle of elevation. If approached at speed they can have a damaging effect on the load, and on the vehicle itself.
- Manhole covers. These can come loose and tilt upwards.
- Shopping-centre parking and delivery areas. These are sometimes constructed for light vehicles only. Always get out and check.

Ask the management if you are not sure.

- Unpaved roads and parking areas. These could include hidden soft spots, especially after rain. Be very wary of grass and gravel surfaces.
- Construction areas are often dug up to connect services beneath the surface. Loose earth may be covered by planks that will not support your vehicle.

Space for turns

Space around a large vehicle is very important for turns. Cutting in occurs when the rear of a vehicle follows a shorter track than the front when making a turn.

Tailswing occurs when the rear of the vehicle pivots outwards in the opposite direction to that in which it is turning.

Because of cutting in, large vehicles can sideswipe other vehicles and objects during turns.

Left turns

Road markings are often too tight for large vehicles. It is likely that you will have to approach the turn wide to make a left turn.

Try to place your vehicle so that others behind you cannot overtake on your left. Make sure you have the best view possible of the road you are turning into. Turn as wide as you need so your vehicle safely enters the left lane of the road you are turning into. Large vehicle drivers need to start a left turn further into a junction than a car. This way, the back wheels do not run over the kerb.

Be careful of oncoming traffic in the street you are turning into. Watch the cut in of the back of your vehicle and the sweep of the front right corner of an articulated vehicle. Use your left mirror to check that you will clear poles and parked vehicles on your left.

Right turns

Adopt an appropriate position in order to negotiate the turn, and pay special attention to the cut-in of the vehicle, to the tail-swing and to the sweep of the front of the vehicle or trailer.

Leaving space when crossing or merging

You need to allow for the size and width of your vehicle when you cross or enter traffic lanes.

Remember:

- Your acceleration is slower and you need a large amount of space.
- You must have a large gap in traffic to get across intersections or turn into a new street.
- If your vehicle is laden, it will be much slower to respond than when it is empty.
- You need to judge a gap in the traffic that is big enough for you. You need to get all of your vehicle safely through the corner or junction.

Handle tailgaters safely

Tailgating means following dangerously close behind another vehicle at speed, perhaps just a few metres apart.

It often happens on motorways. Not only are tailgating and driving in close convoy with other vehicles bad driving habits, but they often have serious consequences. If you are tailgating, your view of the road ahead is seriously restricted and you have an unsafe stopping distance. If a vehicle in front brakes heavily you need time to react and move your foot to the brake pedal. At 80kph you'll have travelled 22 metres in one second. During that time the vehicle in front could have reduced

its speed significantly. Always maintain your safety margins. Considerate drivers also allow the drivers following them ample time to react.

When being tailgated, follow these tips:

- Slow gradually, this will encourage other drivers to overtake, and to do so more quickly.
- Avoid quick changes of speed, and signal early.
- Increase your following distance (the distance between yourself and the vehicle you are following). Opening up more room in front of you reduces the risk of having to make sudden changes to speed and direction.
- Do not speed up. Tailgaters will tend to stay behind you when you do this.
- Do not turn on tail lights or flash your brake lights. It could cause confusion. Remember you are the professional driver; so don't let the tailgater distract you into behaving unprofessionally.

Changing lanes

If you want to return to your lane after overtaking another vehicle, the extra length of your vehicle makes it hard to judge whether you can change lanes safely. You should follow these tips:

- When in doubt leave plenty of space and time, especially when it is a multi-lane road and there is no need to change in a hurry.
- Do not trust other drivers' signals that it is safe to change lanes. Always be sure yourself and make your own decisions.
- Use your mirrors to check that you can see the vehicle behind you before moving back into your original lane.

Driving in mainland Europe

In countries where driving on the right hand side of the road is the norm, you must be extra vigilant on roads you are unsure of. With your steering wheel on the right hand side of the vehicle, it is difficult to see out from behind a large vehicle when you want to overtake. Stay back more than you normally would and put your indicators on as soon as you are sure it is safe to move out.

As soon as you are sure it is safe, move out smoothly.

When you are being overtaken, do not speed up, reduce speed if necessary, and allow the overtaking vehicle space to move in.

Negotiating roundabouts will also be very different to you. Remember, traffic will be coming from your left (not your right!) in an anticlockwise direction.

The rules for negotiating roundabouts in continental countries vary widely from country to country so you must make yourself aware of the correct procedure before you enter the country.

In countries where they do drive on the right hand side, the general rule is to give way to the left, but you should fully research a country's "Right of Way" regulations before you attempt to drive on its roads, as poor knowledge of road procedures and regulations may cause accidents.

Eco-driving

Eco-driving addresses personal driving style and encourages people to drive in a way that delivers benefits in terms of road safety, savings in fuel consumption (with cost savings for the consumer) and therefore reductions in emissions. Eco-driving essentially means smooth and safe driving at lower engine revolutions. Many studies have shown a strong relationship between eco-driving, improved fuel economy and reductions in emissions.

Exhaust emissions from the use of fossil fuels are a cause of increasing concern to many people who are worried about the damage which is being caused to the environment. Some cities around Europe now penalise or ban the use of heavy vehicles in certain areas, and it is likely that this trend will spread to more cities over time. It is likely that the use of battery powered or gas powered vehicles will increasingly become the norm in urban environments.

By improving your hazard perception and forward planning skills, you can make maximum use of the vehicles momentum and engine braking. By doing this, you will avoid late braking and harsh acceleration. By timing your approach to e.g., roundabouts, traffic lights, pedestrian crossings and other potential hold-ups, you may be able to keep the vehicle moving rather than have to come to a stop. It takes much more fuel to get a vehicle moving than it does to keep it moving. **If your vehicle is using one litre of fuel to travel 3 kilometres, by adjusting your driving style to achieve 4 kilometres per litre, you are saving one third of your fuel costs. If fuel costs €1.30 per litre, the savings over 100,000 kilometres amount to €10,800.**

By taking your foot off the accelerator, momentum will keep your vehicle moving forward. It will slow down gradually and fuel consumption will be reduced. When driving away, avoid over-revving the engine and try to pull away smoothly. Use the accelerator smoothly and progressively.

When using a manual gearbox it is not always necessary to use each gear. Drivers should block-

change whenever possible, as this reduces the amount of time spent accelerating, which in turn reduces fuel consumption.

You should use the highest gear possible without making the engine labour. Fuel consumption should be checked regularly and any increase could mean that the vehicle needs to be serviced, or there could be some other reason such as a leak, or a different driving style being used.

To maximise fuel economy, think 'high gear-low revs', and always try to keep the tachometer (rev-counter) in the green band.

Aerodynamic fairing helps to reduce drag on the vehicle by reducing wind resistance. Correctly installed side and roof wind deflectors can improve fuel economy.

You should always source your fuel, and other fluids, from reliable suppliers in order to ensure the quality of the product.

Optimum range

Modern truck engines have a fairly small optimum range in the engine revolution band (giving maximum power at minimal fuel consumption). Manufacturers provide driver guidance in this respect by marking the optimum range on the face of the tachometer (rev counter). The driver should aim to keep the needle within this optimum band, and should also remember that the build and characteristics of diesel engines are such that they are capable of pulling considerable weight at comparatively low rpm.

AdBlue

AdBlue is a product developed to minimise the harmful effects of exhaust gases. The product is a Urea based solution that is light blue in colour and is generally not harmful, not dangerous or flammable. However, AdBlue may corrode some metals including copper and therefore should be kept away from contact with electrical components

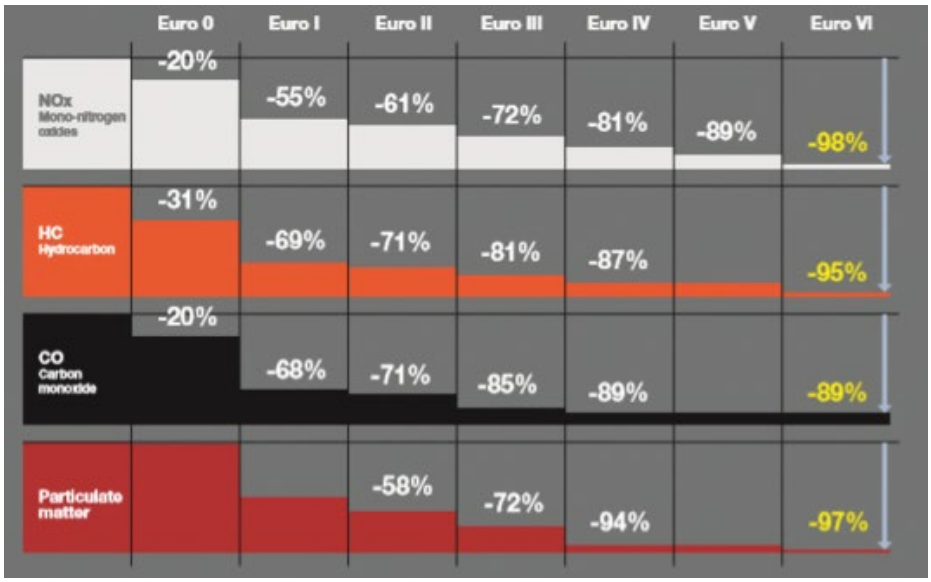


Table showing evolution of emissions reductions

and connections. As AdBlue may contaminate water courses, measures should be taken to prevent it entering drains and any spills should be quickly absorbed and cleaned up. On the vehicle AdBlue is held in a separate tank or reservoir usually located near the diesel tank but can be located anywhere on the truck. The AdBlue tank would normally be closed with a bright blue coloured cap and the filler neck has a much smaller opening (19 mm) than the diesel tank. The reason for this is to ensure diesel is not mistakenly pumped into the AdBlue tank.

IMPORTANT
Any cross contamination of the vehicle's AdBlue reserves can do serious and irreparable damage to the sensitive dosing system. Similar damage can also be caused by poor quality AdBlue.

The vehicles diesel fuel system can also suffer irreparable and costly damage if contaminated with AdBlue.

Example of AdBlue tank

Bridge strikes and Railway Bridges

High vehicles can pose serious risks to all bridges, including railway bridges.

A bridge strike is an incident in which a vehicle, or its load or equipment, collides with a bridge.

Every year, bridges are hit by vehicles that are too high to pass underneath. The damage done to the bridges is not always obvious but can be serious.

The Iarnród Éireann rail network covers the country and includes no less than 400 bridges that cross the public highways. If your vehicle should collide with a railway bridge or if you witness a vehicle striking a bridge, **ALWAYS** inform the Gardai **IMMEDIATELY** and call Iarnrod Eireann on 01)8555454 to report it. You could prevent a further more serious accident.

On average there are 186 railway bridge strikes each year - that's more than one bridge strike every 2 days. If the driver of the vehicle acts with due care and attention all bridge strikes are preventable. It is ultimately the driver of the vehicle that can prevent bridge strikes and the associated serious risks to people and property that result from them.

Most bridge strikes occur where roads pass under railway bridges. However bridge strikes also occur where the road passes over the railway and these can also have serious consequences.

Each headroom-restricted bridge has a unique number displayed on a rectangular yellow plate, This number helps identify the bridge by location when you call.

A railway under-bridge carries the railway over the roadway, river or other feature. Strikes to railway under- bridges can cause damage to the bridge and/or the track. In the worst- case scenario it could cause a derailment which could result in multiple fatalities.

Where arch bridges are concerned, the signed height is available only within the goalposts which are shown on the bridge.

A railway over bridge carries the roadway or other feature over the railway. A strike from any type of vehicle can result in material obstructing the railway line from either the vehicle or its load or parapet displacement.

Bridge strikes can result in:

- Death or serious injury to the driver and passengers;
- Death or serious injury to other road users;
- A serious incident resulting in a train being derailed and possible fatalities;
- Damage to vehicles and the bridge structure;
- Delay and disruption to transport services as well as to other road users.

Drivers of high vehicles should know the height of their vehicle and drive under railway bridges with care. Bridges with a height restriction are identified by regulatory signage on the bridge and a warning sign on the approaches.

As defined in the Railway Safety Act, it is an offence punishable by a fine and/or imprisonment to drive

or attempt to drive a vehicle, including its load, of greater height under such bridges.

Know the height of your vehicle and the height restrictions on your route before you start your journey – it's your duty to act responsibly when in charge of a vehicle and to be aware of any route restrictions.

Iarnród Éireann maintains a list of bridges with restrictions. For details of bridges with height restrictions a map is available on application to the following email address bridgemaps@irishrail.ie.

This map is also available online through Iarnród Éireann's website www.irishrail.ie.

Always check:

- Your vehicle height;
- Railway Bridge Map/Iarnród Éireann.

Remember – as the driver, you can prevent bridge strikes! The height of a Motorway bridge is 5.03 metres unless otherwise indicated.

The height of the Luas cables is 5.5 metres unless otherwise indicated. However, the safe headway is less than that.

Railway level crossings.

There are different types of railway level crossings

- Unattended railway level crossings with gates.
- Attended railway crossings with gates.
- Automated railway crossings protected by road traffic lights only.
- Automated railway crossings with barriers and flashing red lights.

You should never stop a vehicle on the railway tracks.

Road blocked

- Bring the vehicle to a stop a safe distance from the obstruction.
- Attempt to ascertain the nature of the incident.
- Ring the Emergency Services if they are not on the scene already.
- ollow the instructions given by any State Authorities at the scene.
- Follow any suitable diversionary route, either signposted or known.

Traffic Diversion

You should be particularly wary of diverting on to unknown roads or routes in the event of a diversion, due to e.g., road works, accident, or other hold-up.

Always ensure that the diversion route does not include a bridge which is too low, too weak, too narrow, or which includes a humpback bridge which your vehicle can not safely negotiate.

Be aware also that trees, power lines, poles and rock faces can also be a hazard on a diversion.

In the Event of a Railway Bridge Strike Call:

01-8555-454

-SAVE THIS NUMBER INTO YOUR MOBILE PHONE NOW!-

- Alert the signaller of the strike immediately
- Give the Location of the bridge using the unique Bridge number which is attached to the bridge (Examples Below)

Save Lives, Report Bridge Strikes Immediately to Iarnród Éireann

Don't assume someone has made the call already!

www.irishrail.ie

Iarnród Éireann

Fire

Fire can occur on trucks in a number of locations, for example:

- Engine
- Cargo area
- Transmission
- Tyres/brakes
- Fuel system
- Electrical circuits
- Cab area
- Running gear.

Lighted cigarettes discarded from a vehicle in front can blow back and lodge in a vehicle or load. If the vehicle has been in for a service, check for garage cloths or papers left around areas which are subject to heating up, such as the engine and exhaust system. If the vehicle has had new brakes or new bearings fitted, they may overheat. They should be checked after being driven for a short period. A vehicle and its load can be destroyed by fire within an alarmingly short period of time. If fire is suspected or discovered, in order to avoid danger to others it's essential to follow these general guidelines:

- Stop as quickly and safely as possible;
- Evacuate all individuals out of the vehicle;
- Tell them to stand in a safe place;
- Dial 999 or 112 or get someone else to do it immediately.

Currently, with the exception of ADR transport, goods vehicles are not required to carry fire extinguishers. However, if they are carried, the extinguishers must be inspected regularly, securely affixed to the vehicle, and the driver must be trained in their use.

Fire in a Tunnel

In addition to the procedures listed above, if your driving takes you through road tunnels, the following additional measures may be required if confronted with a fire while in a tunnel:

- Switch off your engine;
- Evacuate any helper or co-driver to a place of safety away from the fire, smoke and other traffic;
- Leave your vehicle immediately;
- Go to an emergency station and use the emergency phone to inform the tunnel operator;
- Leave the tunnel at the nearest available exit;
- Check all electronic signs in the tunnel for information.

If there is smoke or fire in another vehicle:

- If the fire is behind you, drive out of the tunnel;
- If the fire is ahead of you, turn off your engine, leave the vehicle immediately, and leave the tunnel by the nearest emergency exit.

Correct behaviour at the scene of an accident

The chain of help begins with those who are present or who arrive first at the scene of a crash.

Lay bystanders can also play an important role in various ways.

What drivers must do at an accident or in an emergency

If you are involved in an accident, you must stop your vehicle and remain at the scene for a reasonable time. If vehicles are blocking the roadway or posing a danger to other road users, the roadway should be marked and the vehicle should then be removed as soon as possible.

If you are asked by a Garda, you must give your

name and address, the address where the vehicle is kept, the name and address of the vehicle owner, the vehicle's registration number and evidence of insurance, such as the name of your insurance company or a disc or motor insurance certificate. If there is no Garda at the scene, you must give this information to any person involved in the crash or, if requested, to an independent witness.

If you or another person are injured and there is no Garda at the scene, the accident must be reported to the nearest Garda station. If the accident damages only property and there is a Garda in the immediate vicinity you must report it to the Garda. If there is no Garda available you must provide this information to the owner or the person in charge of the property. If, for any reason, neither a Garda nor the owner is immediately available you must give all relevant information at a Garda station as soon as reasonably practicable.

You are advised to carry an accident reporting kit containing a disposable camera with built-in flash, a measuring tape, a torch, a pen and a blank accident report form. (See sample Accident Report Form in the Appendix at the end of this manual. You should complete this form carefully).

Photographs taken by a digital or phone camera are now normally accepted as evidence by the Courts.

Take care when moving damaged or broken down vehicles and make every effort to warn oncoming traffic of the accident.

You should warn other road users by using your hazard lights. If you need to ask for another road users help to warn traffic, do so right away.

Use your reflective advance warning triangle. (Heavy vehicles and buses must have one – two is better). Place it on the road far enough from the scene of the accident to give enough warning to approaching traffic. However, do not place it on a Motorway, as it is too dangerous to do so.

When placing a triangle you should take account of prevailing road conditions, traffic speed and volume. This is particularly important on dual-carriageways. If the breakdown occurs near a bend in the road, make sure you give warning to traffic on both sides of the bend. Leaking fuel from a crashed vehicle is dangerous, so be careful approaching any vehicle after an accident.

Carry a high visibility vest or jacket and a torch in your vehicle. If there is an accident, wear the vest or jacket and use the torch to alert other road users of your presence.

Reversing

A major problem with reversing is poor visibility. For instance, when articulated vehicles are reversing into loading bays, the trailer can block the visibility of the back of the vehicle. The driver's awareness of people or objects may be hindered by the size of the vehicle, by equipment on the vehicle, by lack of functioning equipment on the vehicle such as badly positioned mirrors or non- functioning CCTV cameras, or by other vehicles in the vicinity. Environmental noise or the noise of the vehicle itself when it is reversing can also be a driver distraction. Environmental conditions such as poorly laid out sites or poor weather can also hinder the drivers visibility.

However, the majority of reversing accidents actually occur at low speeds. On investigating reversing accidents, the main causes can usually be attributed to failure to manage the workplace, the vehicle, the driver or a combination of those three aspects of workplace safety.

A driver should

- Always look out for and be aware of pedestrians.
- Use the safe systems of work provided and follow the traffic management system that is in operation.
- Reverse slowly, checking the mirrors at all times.
- Where possible, avoid reversing over long distances.
- Use the relevant auxiliary devices and visibility aids provided. Keep the vehicle mirrors and windscreen clean and in good repair, including any mirror cameras fitted.
- Ensure that the mirrors are correctly aligned.
- Report any defects in equipment, such as faulty CCTV cameras or reversing sirens, or systems of work or any accidents, incidents or near misses to your employer
- If there are particular sites where reversing is unsafe, notify your employer and the site

management.

Some companies may not allow a driver to reverse on their own, so you should check the companies policy on this issue.

- Inspect your path. Check your line of travel before you begin. Get out and walk around your vehicle.
- Check your clearance. Make sure the road or surface will support the vehicle.
- Check for overhead wires, signs, and air conditioners in windows.
- Reverse slowly. This way you can easily correct steering errors and stop quickly.
- Where you have a choice, reverse and turn to the driver's side. Because you see more in the right mirror than the left mirror, it can be safer to reverse to the right. When reversing towards the driver's side, you can watch the rear of your vehicle out the side window and in the right mirror. You cannot see as much in the left mirror, and may lose sight of the rear of the trailer.
- Instead of reversing to the left, you may be able to drive to a roundabout a short distance away to turn around and approach the same location so you can reverse into it from the right.
- Turn off the entertainment system and open the cab window to enable you to hear warnings or approaching traffic more clearly.

Safe driving in road tunnels for professionals

Tips for truck and coach drivers

Produced by European Commission
Directorate-General for Energy and Transport
Based on a text by the World Road Association (PIARC)

KD-52-03-942-EN-D

Typical safety equipment in road tunnels

Tunnel lighting
The lighting systems enable the human eye to adapt to the reduced visibility in tunnels. Emergency exits and stations are fitted with continuous emergency lighting.

Traffic radio
Signs may indicate the radio frequency for traffic information. The tunnel operator may use this frequency to broadcast emergency announcements.

Ventilation systems
In the event of a fire the ventilation system either extracts smoke from the tunnel or pushes smoke in a single direction.

Traffic surveillance cameras
If there are traffic surveillance cameras and if an emergency call comes from an emergency station inside the tunnel, the images from the camera in that particular section may appear automatically on the monitor in the tunnel operator's control room.

Emergency exits
These are clearly marked by appropriate signs and lights and have fireproof and smokeproof doors.

Emergency stations are located in the tunnel at frequent intervals. They are normally equipped with:
- emergency phones to the tunnel control room
- fire extinguishers
- push-button alarms

Emergency lanes or lay-bys
If there are either emergency lanes or emergency lay-bys at regular intervals use them, if your vehicle has broken down. Lay-bys usually have an emergency station.

European Commission Energy and Transport DG • B-1049 Brussels
http://europa.eu.int/comm/dgs/energy_transport/index_en.html

SELF-ASSESSMENT OF KNOWLEDGE

Please complete the following questions to help assess your understanding of the module so far:

Q1. List 5 safe driving practices

Your Response

Q2. Complete the following. `Subject to the speed limits, you should always drive at a speed ...

Your Response

Q3. What is the purpose of a Cyclops mirror?

Your Response

Q4. At a speed of 80km/h, how many metres are travelled in one second?

Your Response

Q5. Where are your vehicles blind spots?

Your Response

Q6. What is the number to call if you witness a bridge strike?

Your Response

Q7. What is the maximum permitted speed of a truck on a motorway?

Your Response

Q8. What dangers can arise when driving at night?

Your Response

Q9. How many hours can you drive before taking a break?

Your Response

Q10.What are the difficulties with driving in mainland Europe?

Your Response

SECTION G – VEHICLE TRANSMISSIONS, BRAKING, AND DRIVER ASSISTANCE TECHNOLOGIES

The purpose of a transmission in a vehicle is to provide a selection of ratios to suit varying road and load conditions, to provide a position for neutral and to provide a means for reversing the vehicle.

This means the driver can select from the gearbox a ratio which multiplies the torque produced by the engine. This allows the vehicle to operate over a wide speed range, while maintaining the same engine speed. The torque developed by the engine is maximized by the gearbox before it is transmitted to the final drive located in the rear axle, before being delivered to the road wheels.

Crash Gearbox

Originally passenger cars and heavy vehicles were fitted with what is commonly referred to as a 'Crash Gearbox'. While remaining widely used in heavy vehicles throughout the world, in Europe their popularity has been in decline for many years and would now be quite rare.

The Crash Gearbox required the driver to 'Double-Clutch' when changing gear. This method would enable the ratios to achieve the same speed and so the desired gear could be selected.

Synchromesh Gearboxes

The vast majority of manual transmissions fitted to commercial vehicles are described as Synchromesh Transmission.

The transmission uses a small hub device, which contains a 'baulk ring' and a 'cone'. This device synchronises two gears that are rotating at different speeds. When the gear speeds are synchronised to the same speed, gear selection is effortless. All ratios in a synchromesh transmission will have a synchromesh hub attached to aid gear selection, with the exception of first gear and reverse gear. These should only be selected when the vehicle is stationary.

It is recommended the driver use a 'Single-Clutch' action when selecting gears, as would be normal in a passenger car.

Number of Ratios

The number of ratios in heavy vehicle transmissions has been reducing over recent years. Typical transmissions may offer a standard six, or eight speed options. For heavier applications, the same six or eight gears can offer a 'high and low' ratio for each of the gears.

6 Gears X Low/High Ratio = 12 speeds.

8 Gears X Low/High Ratio = 16 speeds.

(This is not inclusive of Crawler Gears, or Reversing Gears)

The Range Change Transmission

With a 'Range Change Transmission', the gearbox is fitted with an air/electric switch, which when activated, changes between a lower set of gears and a higher set of gears. The number of gears in the Low Set and the High Set may vary between transmission types.

Some may have three low and three high, giving a total option of six gears.

Others may have five low and five high giving an option of ten gears. The Range Change switch should be operated when in gear prior to changing range, but the 'range change' only operates when the gear selector passes through Neutral.

Low Range Gears 1 – 4

High Range Gears 5 – 8

The Range Change Transmission with 'Splitter' Function

The Splitter function fitted to many transmissions allows the driver to select an alternative ratio in each gear. The benefit is that when heavily loaded or when climbing hills, vehicle momentum may not allow a full gear to be changed. By splitting the gear, the vehicle can increase momentum gradually. Split gears are sometimes referred to as half gears. The Splitter switch can be pre-selected, but will only engage the desired ratio when the clutch is depressed.

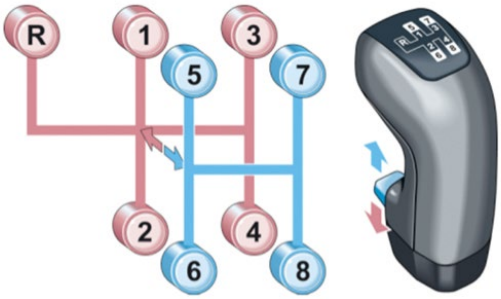
Example of splitting gears with a 12-speed transmission from a standing start

(Ls = Low Split) (Hs = High Split)

(1st Ls) (3rd Ls) (Change to Hi Range) (4th Ls)

(5th Ls) (5th Hs) (6th Ls) (6th Hs)

For drivers new to heavy vehicles it may appear somewhat daunting at first. However from the example above, moving from stopped to cruising speed requires only five movements of the gear selector.



Note:
The Range Change operates only in Neutral. The Splitter is activated by the driver pressing the clutch.

Gear Shifting Patterns

Shift patterns vary widely between vehicle types and manufacturers may arrange the selection patterns of gears in formats such as- Five speed / Six Speed / Eight Speed.

For transmissions used in vehicle Categories D1 and C1 and for some smaller vehicles of Categories D and C, they may use Four-over-Four / Four-beside-Four / Three-over-Three.

For transmissions used in heavier vehicles of Categories C and D, and vehicles in Categories DE and CE, manufacturers recommend the use of 1st. gear to move the vehicle from a standing position.

From 1st gear, ratios may be skipped depending on load and road conditions.

Four-over-Four

This type of gear selection arranges the shift pattern in a similar manner to a four-speed passenger car. Moving from 1st through to 4th in the 'Low Box'. When in fourth gear, the driver should then operate the 'Range Change' Switch, normally this would mean moving the switch to the 'up' position.

When the vehicle has reached a suitable road speed, the gear selector should be moved back to the 1st gear position. As the selector passes through neutral, the Range Change switch is activated and moves into the 'High Box'. This means that when the selector arrives at the 1st gear position the transmission is now in 5th Gear.

Once in the 'High Box' 6th, 7th, and 8th gears can be selected.

To return to the lower ratios 1-4, the Range Change switch must be flicked down and pass through neutral. Most vehicle and transmission manufacturers fit a device called an 'inhibitor' so as not to allow this action to occur when the road speed is too high, generally at speeds in excess of 25-30 Km/h.

Four-beside-Four

This transmission type in most cases is the same as the 8 or 16 speed Four over Four. The two transmissions only differ in the method of gear selection.

The primary difference with this version is that the range change switch is an installed component of the gearbox itself. The driver is not required to flick an external switch. The range is changed as the gear selector passes from the lower four ratios to the higher four ratios and vice-versa.

Three-over-Three

Due the wider usable torque bands of modern engines, a number of vehicle producers have moved away from 8 and 16 speed transmissions.

Instead, they have opted for 6 and 12 speed models. This has realised benefits for the driver and many believe it leads to reduced fuel consumption.

In principle it operates in the same manner as the 8/16 speed in that it is fitted with a range change for the 6 speed and a range change and splitter for 12 speeds. The difference is that the gear selector only moves through three gear positions.

In the low box the available gears are 1st, 2nd

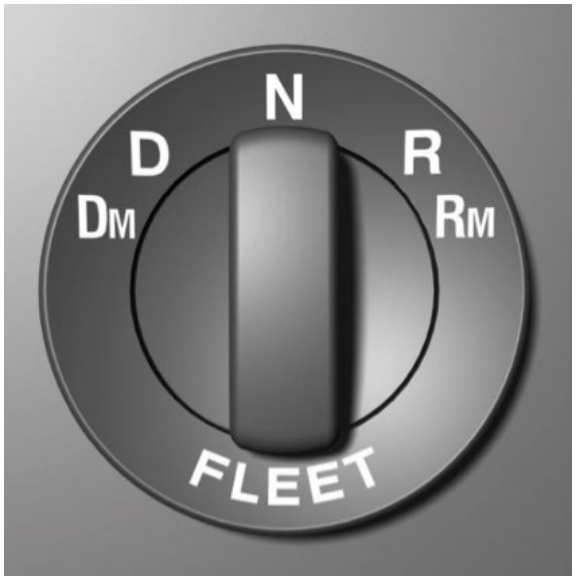
and 3rd. When in 3rd, the range change switch is moved up and the gear selector is returned to the 1st gear position. The range change is activated as the selector passes through neutral. When the lever arrives in the 1st gear position, it is now in the high box and 4th gear has been selected.

From here, available ratios are 4th, 5th, and 6th. The splitter switch offers a high and low ratio on all of the six gears and it provides a total of 12 speeds for the driver to choose from.

As previously stated the number of ratios noted here does not include transmissions which are fitted with 'Crawler' gears. It also does not count gears for reversing the vehicle.

Automated Manual Transmission (AMT)

The popularity of AMT's has increased dramatically in recent years. On a European wide basis, in excess of 90% of all new commercial vehicles sold are now fitted with an Automated Manual Transmission and the percentage is increasing.



Example of AMT selector

While each manufacturer will apply a different brand name to their version, in principle all AMT's operate in the same manner.

"An Automated Manual Transmission is: A manual transmission where the process of gear selection is automated"

It is most important to note that an AMT is not an 'Automatic Transmission', and that it is only the changing of gear ratios, that is automated. This is achieved via an electro mechanical system controlled by an ECU.

An Automated Manual Transmission fitted to a heavy vehicle, is in effect exactly the same as the Standard Manual Transmission alternative fitted to the same vehicle.

AMT's offer the driver many benefits and relieve the stresses associated with continuous gear changing. This is of particular benefit for those engaged in city or urban driving where dealing with high traffic volumes and vulnerable road users pose constant hazards.

Depending on vehicle specification, the driver selects the 'Drive Mode' and the ECU will ensure that the correct ratio is selected at any time during the journey. A separate 'Manoeuvring Mode' can be selected for low speed driving either forward or when reversing. At anytime during the journey the driver can override the automated system and select a ratio manually, or hold a lower gear if approaching a hill.

The majority of AMT's do not have a clutch pedal and as such are often referred to as 'two pedal' systems. Manufacturers recommend that when stationary for any extended period of time, or when holding the vehicle on a hill, that the driver selects 'Neutral', and applies the Parking Brake, or uses the Hill Holding device - as would be the case with manual transmission.

This is recommended because most AMT's are fitted with the same clutch disc and pressure plate arrangement as the manual versions, and to leave "in gear" for prolonged periods may cause the clutch disc to overheat resulting in excessive wear.

Since their introduction, AMT's have proven to be very reliable, improve fuel economy, and reduce driver stress and fatigue. The rate at which they are being improved and enhanced is ever increasing.

Automatic Transmission

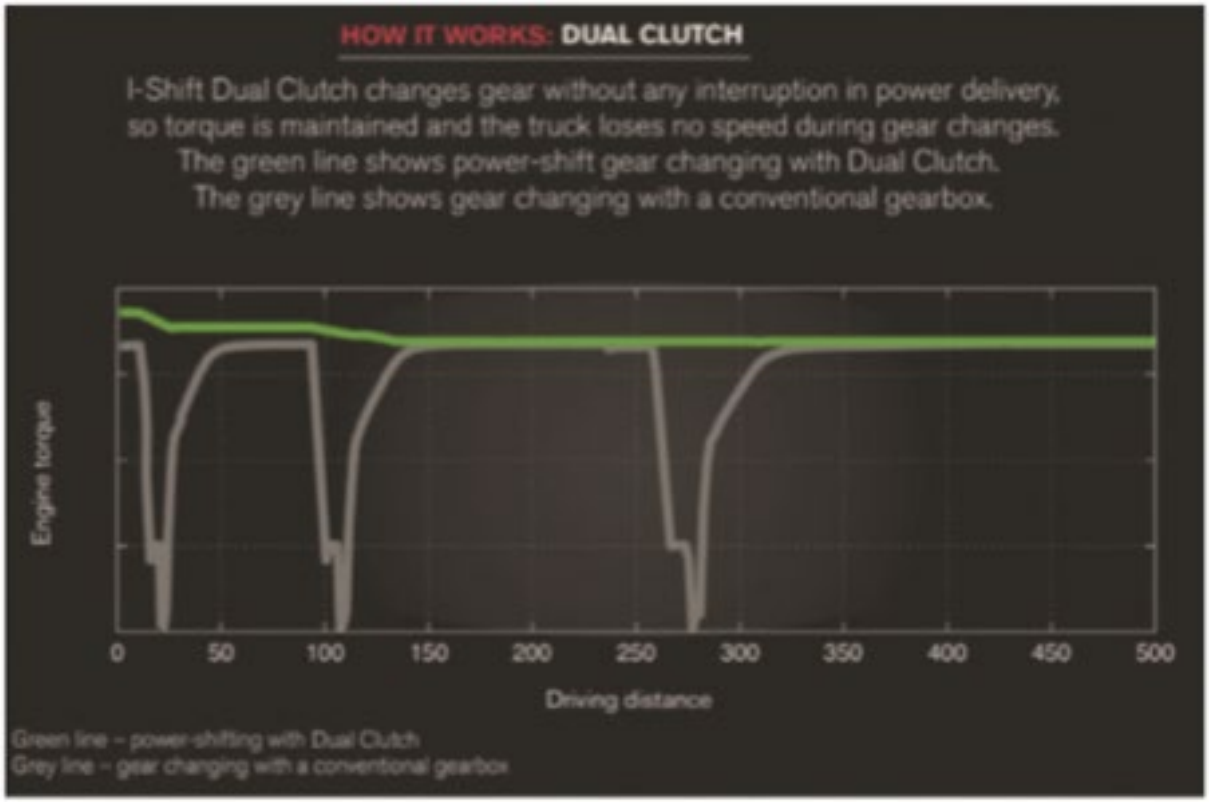
A full Automatic Transmission in a heavy vehicle operates in the same manner as one fitted to a passenger car, using a hydraulic fluid (ATF) to change ratios. In a fully Automatic Transmission the clutch pressure plate and disc is replaced by a 'Torque Converter'.

As the engine speed increases, the Torque Converter also increases in speed, and moves hydraulic fluid from one side to the other. This movement operates a series of clutch bands, which multiply the torque in the transmission.

Automatic Transmissions are well suited to multi stop/start operations such as refuse collection, city centre passenger services, and multi drop deliveries. Another benefit of the torque converter is it's ability to absorb large amounts of stress acting as a damper or impact absorber for the driveline. This ability makes the fully automatic transmission well suited to heavy haulage applications.

Dual Clutch Transmissions

A Dual Clutch Transmission is best described as a method of running two gearboxes in parallel, with all the odd number gears in one gearbox and the even number gears in the other. This allows the next gear ratio to be preselected and then engaged instantly when required. Being able to preselect means that there is almost no interruption in the transfer of torque through the driveline to the road wheels. This results in reduced driveline wear and an improved ability to climb hills. The technology behind Dual Clutch Transmissions (DCT) is not new. In the passenger car sector DCTs have been available for many years and their popularity is increasing. However, the fitting of DCT systems to heavy vehicles has previously posed some engineering problems. Currently, some Dual Clutch Powershifting only works for sequential gear changes. This means that the transmission will only change from e.g., 7th to 8th to 9th, etc. in sequence. However, when driving conditions allow the vehicle to skip gears – for example when moving off – the transmission may shift from 2nd to 4th to 6th. In this case the transmission behaves as a normal AMT. Also, when changing range from 6th to 7th or using the kick-down function, (if fitted) a Powershift does not take place. When operating in Powershift mode the gear changes are hardly noticeable unless you are watching the rev counter. The DCT system delivers particular benefits for certain transport applications, an example being when running laden on twisting roads or over hilly terrain.



Example of dual clutch transmission

Effects of acceleration, braking and cornering

Forward planning and anticipation is essential in order to avoid the need for harsh braking. Much more effort is needed to stop a fully laden vehicle than an ordinary car travelling at a similar speed. It is important to avoid having to brake hard, which has the effect of propelling your load forward.

Sudden acceleration or braking can lead to loss of friction between the tyre tread and the road surface. Under these conditions the vehicle may:

- Lose traction (wheel spin);
- Break away on a turn (skid);
- Not stop safely (skid);
- Overturn.

The same will happen when changing into a lower gear if travelling too fast, or if the clutch is suddenly released, because the braking effect will only be applied to the driven wheels.

The most common causes of skidding are:

- Excessive speed for the circumstances;
- Coarse steering in relation to a speed which is not itself excessive;
- Harsh acceleration;
- Sudden or excessive braking.

If you brake hard in wet or slippery conditions it is likely that your road wheels will lock and you will lose directional control. Your vehicle will skid in a virtual straight line and could collide with something before the skid ends. When a skid develops, the driver should immediately remove the cause. Once the initial cause is removed your next action may depend on the exact circumstances.

You should develop a 'vehicle sympathy' style of driving which gets the best return from the vehicle while reducing wear and tear.

Brake Fade

Continuous use of the brakes results in them becoming over-heated and losing their effectiveness, especially on long downhill gradients. This effect is known as 'brake fade'. It's important, therefore, to try to avoid prolonged or harsh braking in order to reduce the effects of 'brake fade'.

Tyres

All tyres must have a minimum tread depth of 1.6 mm

The grip which the tyres have on the road surface transmits the driving force (traction) which is essential when:

- Moving away or accelerating;
- Turning/ changing direction;
- Braking/slowing down.

The amount of grip will depend on the weight and speed of the vehicle, the condition of the tyre tread and whether the tyre is under inflated or over inflated.

It will also depend on:

The type and condition of the road surface:

- Smooth;
- Anti-skid;
- Fine and dry;
- Wet;
- Icy or affected by snow

Any other material present:

- Mud;
- Wet leaves;
- Oil spillage;
- Other slippery spillages;
- Inset metal rails;
- Loose road surfaces;
- Whether the vehicle is braking or steering sharply;
- The condition of steering and suspension components.

All tyres must be suitable for the vehicle, and the tyre construction must conform with the European E-mark requirements.

All tyre pressures should be checked regularly. An under-inflated tyre can pose particular dangers when the vehicle is cornering or braking.

If you are aware that a wheel has been removed and replaced on your vehicle, always ensure that the wheelnuts have been retorqued at the recommended odometer reading/ interval, and always check the wheelnuts at the daily walkaround check. Always follow company policy.

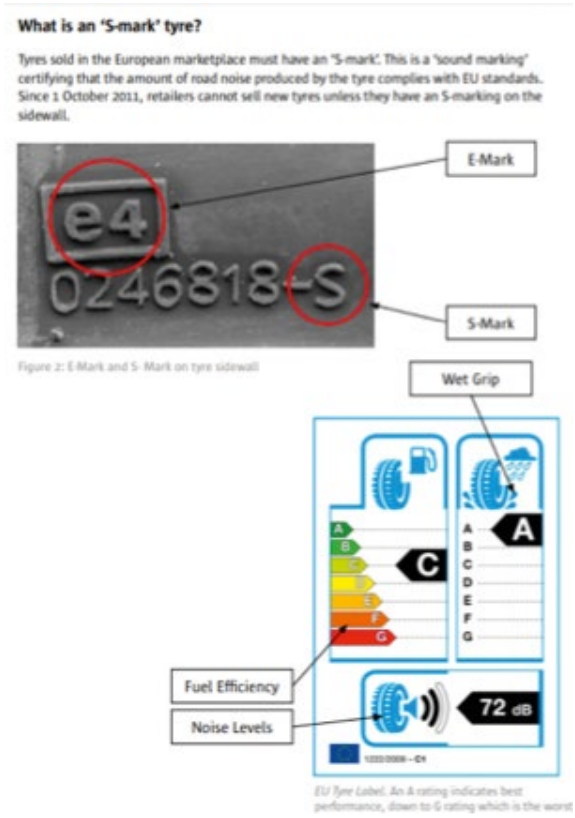
Example of tyre system warning

Markings on the tyre wall will include the tyre type, width, aspect ratio, rim diameter, speed index and load rating.

If your vehicle suffers a tyre blowout

- It will tend to weave about on the road, especially at higher speeds;
- Hold the steering wheel firmly, release the accelerator and let the vehicle slow down without using the foot brake;
- Your immediate instinct might be to apply the brakes, but if the vehicle is starting to move sideways, braking will make matters worse and the vehicle could skid out of control;
- Harsh braking is the single worst thing that you can do if a tyre blows out;
- Keep looking ahead and adjust your steering wheel to keep in a straight line;
- A front tyre blowout will cause the vehicle to pull heavily to one side;
- Steer firmly to correct the pull;
- Avoid braking if there is space in front, concentrate on steering and allow the vehicle to lose speed naturally;
- Any use of the footbrake should be very light;
- Remember that extra effort will be required for steering

The instrument shown above is a RFID (Radio Frequency Identification Disc) scanner, which can check the tyre location, pressure and tread wear



Endurance Braking Systems and Retarders

These systems provide a way of controlling the vehicle's speed without using the wheel-mounted brakes (service brakes/footbrake). They operate by applying resistance to the vehicles driveline. This may be achieved by:

- Increased engine braking;
- Exhaust braking;
- Transmission-mounted electromagnetic or hydraulic devices.

Retarders can be particularly useful on the descent of long hills, when the vehicle's speed can be controlled without using the service brakes. The

system is sometimes designed to operate either with the service brake (integrated) or by using a separate hand control (independent).

Always follow the manufacturer's instructions in the use of any type of endurance braking system.

Antilock Braking System (ABS)

The original idea for an Antilock Braking System (ABS) dates back to the mid 1930's. However, at the time the cost of components and manufacturing restricted its application mainly to the aircraft industry.

It was not until the late 1970's that materials and production techniques developed sufficiently, allowing for a more widespread application to motor vehicles. Initially fitted as standard equipment to luxury saloon cars, the ABS is now fitted to in excess of 90% of vehicles in the EU.

It is one of the most valuable safety systems fitted to motor vehicles in recent years, but is sometimes misunderstood.

The reason for this may stem from the systems title of 'Antilock Braking' - this infers that because the system prevents the wheels from locking up that an ABS shortens stopping distance.

The primary function of an ABS is to maintain control of the vehicle's steering when braking on slippery or icy road surfaces. It achieves this function by preventing the road wheels from locking up, thereby allowing the vehicle to be steered around or away from a hazard.

The Antilock Braking System does not shorten stopping distances.

There are four main components of the ABS

- A Rotational Speed Sensor
- A phonic wheel
- An Electronic Control Unit (ECU)
- A Brake Pressure Modulator

The rotational speed sensor registers a change in the wheel's speed of rotation as the wheel decelerates under braking. It senses that the wheel has slowed too much and is about to stop rotating completely - i.e. lock up.

The information gathered by the wheel sensor is fed back to the ECU, which assesses the data.

If the wheel speed is ok, no action is taken.

If the ECU finds that the wheel speed is too slow, it then sends a signal to the brake pressure modulator to release pressure in the braking system and allow the wheel to rotate freely again.

Again, the speed sensor informs the ECU that the wheel is now rotating too fast, and the ECU then instructs the brake modulator to increase pressure again.

If the rotating wheel now being braked shows signs of excessive deceleration, the pressure is again released.

Depending on vehicle make and type of ABS employed, this cycle of pressure increases and decreases may occur up to 50 times per second.

The following information relates to ABS (Antilock Braking Systems) in general. For specific vehicle operating instructions, always refer to the manufacturers recommendations.

Correct use of ABS

The onus is on the driver to establish if any vehicle and or trailer they are operating is equipped with ABS.

If a vehicle is fitted with an ABS, a warning lamp will be illuminated when the ignition is switched to the 'on' position. After a short period of time or on some vehicles, once the vehicle is driven to a speed of 5 to 10 Km/h, the lamp should go out.

If this does not happen the system is registering a fault, which should be reported to an appropriate person.

Under heavy braking or braking on slippery surfaces, if the ABS is activated, the driver will feel a 'pulsing' sensation in the brake pedal.

This pulsing is the result of the brake modulator increasing and decreasing pressure in the system.

If this pulsing sensation is felt, it is important for the driver to keep the brake pedal fully depressed.

Keeping the brake pedal fully depressed will ensure that maximum braking effort is applied to the road wheels.

- The primary function of an ABS is to maintain directional control of the vehicle.
- In normal conditions, the ABS should not engage if the vehicle is being driven correctly - it will only activate in adverse road conditions or under emergency braking.
- An ABS will not shorten stopping distances.
- A vehicle fitted with an ABS should not be driven faster or braked harder than one without an ABS.

Electronic Braking System (EBS)

The EBS integrates with, and enhances the ABS in a vehicle. As the title suggests it controls the braking function electronically. With the EBS, the brake pedal in effect becomes an electric switch, which transmits a signal to the EBS Electronic Control Unit.

This ECU then assesses the signal received from the pedal actuation, and instructs a brake modulator to apportion braking pressure to all wheels individually.

Braking pressure is also controlled and apportioned to any trailer being drawn at the time.

As the EBS fully integrates an ABS facility, it performs the same functions in respect of steering control as detailed in the previous section. In addition to an ABS function, EBS also provides monitoring of brake lining wear, and automatically balances the distribution of braking effort between axles depending on the load on that axle.

Because the EBS is electrically operated, the 'activation time' from the driver pressing the brake pedal to the wheels decelerating is greatly reduced.

Conversely, the brakes are also released faster and in a more even fashion, helping to reduce drag when moving away from a stop.

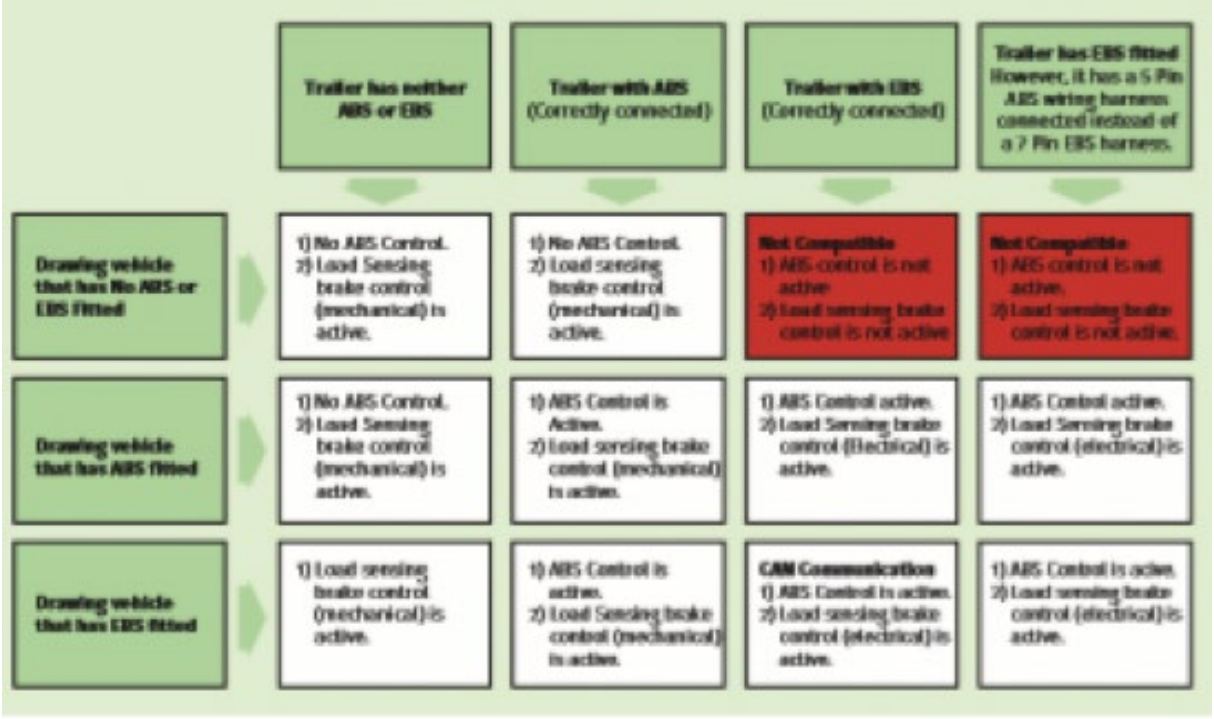
Some advantages of EBS

- Faster response times for brake activation
- Even brake force application to individual road wheels
- Balanced braking effort across axles
- Constant monitoring of brake lining wear rates
- Quick release of brakes to reduce drag when moving off
- Controlled uniform braking reduces lining wear rates, and therefore downtime
- Integrated ABS to enhance directional control
- Automatic tractor and trailer compatibility

Depending on vehicle type and specifications, Electronic Braking Systems can incorporate other driver assistance technologies.

Traction Control programmes such as ATC and ASR can be easily integrated. Moreover, EBS can be combined to work in conjunction with most engine brakes and retarders.

Correct use of these devices helps to enhance road safety and reduce operational costs.



Note:

For the purposes of this table the term 'Drawing Vehicle' refers to either

(1) a rigid truck being used to draw a trailer, (truck and drag or drag and drop) or

(2) a tractor unit being used to draw a semi-trailer, (artic).

The table above shows the various combination possibilities and the effect on the braking systems of the combinations being used.

It is essential to understand that whilst it would be possible to connect a drawing vehicle that does not have ABS or EBS fitted to a trailer which does have EBS fitted, it should never be attempted as the combination is neither safe or roadworthy.

Check that all ABS/EBS lights on the control panel are functioning correctly.

If in any doubt consult the manufacturers guidelines.

Example of compatible braking systems

Keeping control of your vehicle

When driving:

- You cannot alter the severity of a bend;
- You cannot change the weight of the vehicle and its load;
- You cannot alter the design and performance characteristics of your vehicle and its components;
- Be aware of the limitations of your vehicle.

You do have control over the speed of your vehicle and the forces acting upon it. If you ask too much of your tyres by turning and braking at the same time, you will lose some of the available power and grip. If the tyres slide or lift, you will no longer be in full control of the vehicle.

Maintaining control of the vehicle

In order to maintain control of the vehicle all actions must be considered carefully.

Therefore, you must ensure that all braking is:

- Done in good time
- Controlled
- Made when travelling in a straight line where possible

Reduce speed and, where necessary, select the appropriate gear before negotiating:

- Bends
- Roundabouts
- Corners
- Hills

Avoid braking and turning at the same time (unless manoeuvring at low speeds)

Reduce speed first

Look well ahead to assess and plan your action.

Most of the forces described above act on a vehicle in motion. If you disregard them you could lose control.

In the event of service brake failure, it may be necessary to use the handbrake as a secondary braking system in order to bring the vehicle to a safe stop. Depending on the vehicle speed at the time, the stopping distance required is likely to be much longer than normal.

In Summary

Smooth braking leads to

- Improved safety and comfort
- Reduced risks of accidents
- Reduced environmental pollution
- Reduced wear and tear on tyres and components
- Improved fuel consumption.

Other Driver Assistance Technologies

The following section will describe in brief some of the driver assistance technologies available. It is not an exhaustive list and can only provide information in a general sense. There are variations between different manufacturers and the specifications of any given vehicle.

It is important to adhere to the manufacturer's recommendations for any particular vehicle you may operate.

Vehicle manufacturers often use different names to describe what are essentially the same system/s fitted to their product range.

Vehicle safety and driver assistance programmes have become commonplace in modern motor vehicles of all classes. Since the initial introduction of the ABS, further advancements in vehicle safety have been made possible through the application of electronics. The primary reason that has allowed this to take place is the now common use of a CAN-bus interface.

The term CAN means 'Controller Area Network'.

What the CAN allows is similar to a computer network within a building.

It enables all the computers to send information back and forward to each other through a server.

In a motor vehicle, the CAN allows a multitude of sensors performing different monitoring functions to relay information to and from the Electronic Control Unit (ECU).

Because the flow of information is carried electronically, it is instantaneous. Therefore, processing the information and reacting to it in order to alter vehicle dynamics is immediate.

This is what enables an ABS to cycle the brake pressure up to 50 times per second.

The use of a CAN-bus allows driver assistance systems to be added or altered by simply re-programming the ECU.

Anti Skid Control (ASC)

When driving in slippery conditions or when too much engine power is applied by the driver, the ASC programme is activated to prevent the drive wheels from spinning and losing traction with the road. In a situation where only one of the drive wheels is spinning, the ASC intervenes to brake the spinning wheel until an equal traction effort is achieved across the drive axle. This is of particular benefit to articulated vehicles where the possibility of a 'power jack-knife' is greatly reduced.

Cruise Control

This enables a driver to set a speed which will be maintained by the vehicle without the use of the accelerator.

The driver can immediately return to normal control by pressing the brake pedal or by switching off cruise control.

Predictive Cruise Control (PCC)

A programme of continuous development by vehicle manufacturers has significantly reduced fuel consumption - in some cases by up to 12% - over the last four to five years. One system contributing to the savings has been the development of Predictive Cruise Control (PCC). While different manufacturers call Predictive Cruise Control different names, in essence they all work in a similar fashion. Using GPS to determine exactly where the truck or bus is located, PCC is able to read the topography of the road ahead for approximately two to five kilometres and knows where the inclines and declines begin and end. It therefore can increase or reduce engine power as required. This can allow the vehicle to roll in a controlled manner in order to save fuel. The systems are highly accurate and work whether the driver is familiar with the road or not. PCC works equally as well in daytime or night time, and in all weather conditions including heavy rain or fog. In achieving a fuel reduction of up to 12% the importance of PCC should not be underestimated. Some vehicle manufacturers report a 70% uptake of PCC across Europe with no individual country recording an uptake figure of less than 50%.

Predictive Cruise Control (PCC) was nothing less than revolutionary when launched, and its popularity with operators has exceeded all expectations. Now the latest version 'PCC+' benefits from advances in digital technology with better mapping of road networks and topography. This now allows the use of PCC on winding country roads and roundabouts where previously engaging Cruise Control may not have been the best driving style to adopt. PCC+ will now assess the bend or the hill and set the required gear and speed. This speed setting can then be adjusted from Stage 1 to Stage 5 as is appropriate for the load being transported at the time. Some manufacturers have now further enhanced their PCC programmes with a more precise mapping of the road network. This improved mapping will now decide at an advanced level what gear ratio to select for the topography ahead.

Using the updated predictive cruise control, the system will decide the best option to select when cruising. Depending on the topography it may decide whether to engage Eco-Roll and select Neutral in the transmission with minimal fuel being used, or it may decide to engage 11th gear which is often a direct drive ratio. Selecting 11th gear results in a higher rpm although it completely shuts off fuel delivery to the combustion chambers. Alternatively, it may opt for a third option. In this third case, the system will engage 12th gear which is an overdrive ratio and while it will not use fuel there is some increased friction due to parasitic driveline loss.

This may pose a dilemma for drivers who have been told they should be in the highest gear whenever possible. It is important that this new driving style be clearly understood and that it is ok for the truck to run in this manner. It is also important to note that when such systems are engaged, updates to Telematic systems ensure that the driver will not be penalised for not running in top gear.

Adaptive Cruise Control (ACC)

Using an integrated radar system ACC regulates the distance between a vehicle and the vehicle in front if the system determines that the distance is too short for the cruising speed selected, and the driver does not take corrective action. The ACC will apply the brakes to slow the vehicle and increase the available stopping distance.

Example of adaptive cruise control

Cornering headlight control

Cornering headlights operate at slow vehicle speeds and will direct the vehicle lighting at an angle to the vehicle. Adaptive lighting illuminates the area into which the vehicle is turning.

Activation normally occurs when the driver switches on an indicator.

The adaptive lights are then directed to that side. The system provides a high level of safety especially in urban or city driving. A number of versions will also automatically dip headlights when meeting oncoming traffic.

Adaptive headlight control

Adaptive headlight control can switch on the headlights automatically when the ambient lighting fades or becomes dull. A number of versions will also automatically dip headlights when meeting oncoming traffic.

Anti Rolling Brake (ARB)

Typically, ARB devices are activated by a dash mounted (master) switch. Once switched on, the system remains passive until the vehicle is brought to a stop. When the vehicle is stopped, the brakes remain on, until the driver presses the accelerator pedal and the drive is taken up. As the vehicle begins to move forward the brakes are released. Up to a certain speed the ARB may engage again once the accelerator pedal is released - without the brake pedal being applied. After that speed the ARB is fully disengaged until the footbrake is applied again.

It must be noted that an ARB is not a parking brake, and should never be used as such.

Some systems may have a predetermined time limit on how long the ARB remains on, after which an audible warning informs the driver that the brake will be released.

The master switch can be used to switch the system off when manoeuvring.

Collision Warning Systems (CWS)

CWS provides the driver with advance warning of an impending impact, including with pedestrians in urban or city driving situations.

Electronic Stability Programme (ESP)

ESP monitors the vehicle's momentum and dynamics on the road. It receives information from sensors monitoring wheel speeds, steering angle, and the load on each individual wheel. It will engage when it senses that a wheel or set of wheels may begin to lift off the road. In this case, it will apply a braking force to specific wheels to decrease road speed and/or reduce engine power to bring the vehicle under control. While the ESP system greatly assists the driver in emergency situations, it is not designed to handle a deliberate dangerous action by the driver.

Lane Changing Assistance (LCA)

LCA provides the driver with assistance when changing lanes to the passenger side by using a proximity sensor to establish if another vehicle is within the 'blind spot'. It will alert the driver with an audible signal and or a warning light. The system is activated when the driver uses the indicator stalk, signalling their intention to change lanes.

Lane Departure Warning (LDW)

In some ways similar to the LCA system - Lane Departure Warning uses a small camera to monitor the driving style. If the vehicle is wandering out of its traffic lane, it will warn the driver by a haptic (seat or steering vibration), visual and audible warning. When performing manoeuvres such as overtaking where the driver intends to change lanes, the LDW is de-activated once the indicator is switched on.

Night Vision Assistance (NVA)

NVA assists the driver at night by employing an infrared camera to survey the road ahead and displays the image in an information cluster. The range of infrared is greater than that of standard vehicle lighting systems.

In addition, it performs this function without dazzling oncoming drivers.

Tyre Pressure Monitoring (TPMS)

TPMS helps to ensure that the vehicles tyres are always operating at the optimum recommended pressure. Correct tyre pressures help to reduce fuel consumption and will increase the lifespan of the tyres.

The TPMS may need to be recalibrated after a change of tyre or puncture repair.

Cyclist Detection System (CDT)

A CDT works by alerting the driver to the proximity of cyclists on both sides of the vehicle by a visual and audible warning system.

Example of cyclist detection system

Current and Future Developments in Driver Assistance and Vehicles Technologies

All vehicle manufacturers are focused on efforts to improve road safety, and a number of these manufacturers believe this can be best achieved through increased levels of automation. Vehicle autonomy is often categorised across five levels from Level 1 (Basic) to Level 5 (Full). While the move towards fully autonomous vehicles may appear to be relatively slow, it is gaining in popularity and some recent advances in technology have been quite significant. These advances allow companies to buy vehicles today with an on-road performance at Level 2 (Partial). Some commercial vehicle producers state they will skip Level 3 and move straight to Level 4 (Highly) automated.

To achieve legal, fully autonomous 'road-going' vehicles will require the full deployment and standardisation of the systems currently available. Many of the advances needed to fill in the gaps on the path to fully autonomous vehicles are in real terms just enhanced versions of today's readily available systems. One such system developed by Mercedes-Benz is called 'Active Drive Assist' (ADA).

ADA is an important step towards autonomous driving and the Level 2 (Partial) automated system can operate in almost any conditions. ADA integrates a number of the Driver Assistance programmes currently available such as Lane Keeping Assist, Adaptive Cruise Control, and Adaptive Brake Assist into one system. ADA achieves this by using a camera and radar system to maintain the truck's position within the lane markings. Although the function of maintaining a truck's position on the road is already done to some degree with standard Lane Keeping Assist, the difference with ADA is that the system will intervene and correct a wayward vehicle.

ADA also includes an enhanced version of Adaptive Cruise Control (ACC) which will slow the vehicle as it approaches traffic. The enhanced ACC is now linked to a Proximity Control with the Stop-and-Go function. The combination of these programmes allows the truck to slow down on the approach to other vehicles in traffic, and to accelerate again as the preceding traffic moves away.

Traffic moving away is usually not a problem - traffic moving alongside is, and this is where Sideguard Assist comes into its own. While Sideguard Assist has been available for several years, it has now been combined with Mercedes-Benz Mirror-Cam. This means it can identify potential hazards alongside a truck and trailer, including drawbars, and will alert the driver with audio and visual warnings. It can also alert the driver to a potential risk due to tail-swing from the trailer.

Further developments in braking have now culminated in the 5th generation of Active Brake Assist (ABA 5). The automated emergency braking system has been further enhanced with improved pedestrian detection. ABA 5 goes from an initial warning to the driver of a potential hazard, to full activation of an emergency brake response through a number of stages. As the truck is being brought to a full emergency stop the hazard warning lights are activated, and once the vehicle is halted ABA 5 then applies the parking brake. The system is not fool-proof and manufacturers do not claim otherwise. These are driver assistance systems, they are there to assist the driver, and if an unfortunate event occurs the systems can make a valuable contribution to mitigating the outcomes.

However, the driver is ultimately responsible for their own safety, the safety of the vehicle and all other road users who may be encountered on the road.

Another recent and quite novel innovation by one manufacturer in their efforts to achieve reductions in fuel consumption is their new speed-dependent chassis. At a speed of over 60 k/mh, the truck will lower the running height by about 40 mm. This is done from the rear and will deliver a small saving by reducing drag, and is available on their models with full air suspension. The minimum 60 k/mh setting helps to ensure that it will only occur outside urban areas or away from hazards such as speed bumps.

Telematics

For fleet management the telematics data being derived from the on-board computer can include operating hours, vehicle location, fuel consumed, and odometer reading. It can also provide for managing the driver and vehicle performance, controlling communication, reporting on operating costs, active (real-time) and passive (after-the-fact) tracking of vehicles, location management, communication and messaging, route planning, trailer management, vehicle maintenance reporting, service reminders and much more.

Telematics can include additional information such as an in-cab display through which drivers are able to obtain route information, as well as driving-related events such as over-speeding, over-revving, harsh braking, harsh acceleration and excessive idling. An advanced fleet management solution has numerous benefits: reducing fuel costs; better managing of routes and delivery schedules; improving vehicle utilisation; tracking vehicles and drivers in real-time, and assigning jobs accordingly; identifying, monitoring and managing driver behaviour; managing vehicle servicing schedules resulting in reduced wear and tear and increased vehicle utilisation; reducing carbon emissions, and helping to create a healthier, more sustainable environment. Modern tachographs can now rely on Driver Decision Support (DDS) to relay real-time information to the transport operator to assist with decision making, e.g., drivers hours, breaks, speeds, etc.

Additional Driver Assistance Technologies

The following are some driver assistance technologies which are also being developed and introduced by manufacturers

- Advanced emergency braking assist
- Hi-Intensity flashing emergency brake lights
- Alcohol interlock
- Drowsiness and attention detection
- Distraction recognition
- Event (crash) data recorder
- Voice activated controls
- Improved seat belts
- Intelligent speed assistance
- Reversing cameras and proximity sensors
- Mirror cams
- Vulnerable road user detection and warning on front and side of vehicle
- Vulnerable road user improved direct vision from drivers position
- Road sign recognition

Summary

The driver assistance technologies described above are a sample of the ever-increasing number of active and passive safety systems currently available. Manufacturers are constantly updating and improving vehicle safety, and it is important for drivers to keep themselves informed of developments in the automotive industry. It is also very important for drivers to familiarise themselves with the systems fitted to any vehicle which they may operate.

Studies have shown that they can provide immense benefits to road safety.

One such study conducted in Germany showed that "serious rear-end collisions on motorways would drop by more than 70%" if all German trucks were fitted with Adaptive Cruise Control. In addition, the fitment of Lane Departure warning systems could reduce inadvertent lane departure accidents by 49%.*

Research carried out by Mercedes-Benz Trucks over 2017 and 2018, showed that of the 100,000 trucks fitted with ABA 4 and Sideguard Assist, drivers were warned over 15 million times of critical situations. It also highlighted that the systems intervened more than a million times with a partial application of the brakes, and in over 1,000 cases a full brake application occurred. Moreover, the trucks reacted around 155,000 times to pedestrian situations. While these figures appear to be significantly high they must be viewed in the context of the vast number of kilometres covered by 100,000 trucks. Nevertheless, a separate field study of over 1,000 vehicles by the Accident Prevention and Insurance Association for Transport and Traffic, and KRVAG Insurance found that trucks equipped with driver assistance systems had an accident likelihood that was 34% lower than reference vehicles of the same type.

*Source: Joint study by Allianz Centre for Technology & MAN Nutzfharzeuge (MAN Commercial Vehicles).

SELF-ASSESSMENT OF KNOWLEDGE

Please complete the following questions to help assess your understanding of the module so far:

Q1. What do the gears in a gearbox allow the driver to do?

Your Response

Q2. Where should a driver aim to keep the needle of the tachometer?

Your Response

Q3. What is the difference between an automated manual transmission and an automatic transmission?

Your Response

Q4. What is the difference between an ABS and an EBS?

Your Response

Q5. What causes brake fade?

Your Response

Q6. What should you ensure in relation to your tyres?

Your Response

Q7. What is the purpose of an endurance braking system. (Retarder)?

Your Response

Q8. Name 4 types of driver assistance technologies?

Your Response

Q9. What must you not do in the case of a front tyre blowout?

Your Response

Q10.What is a CAN-bus system?

Your Response

Notes

Notes